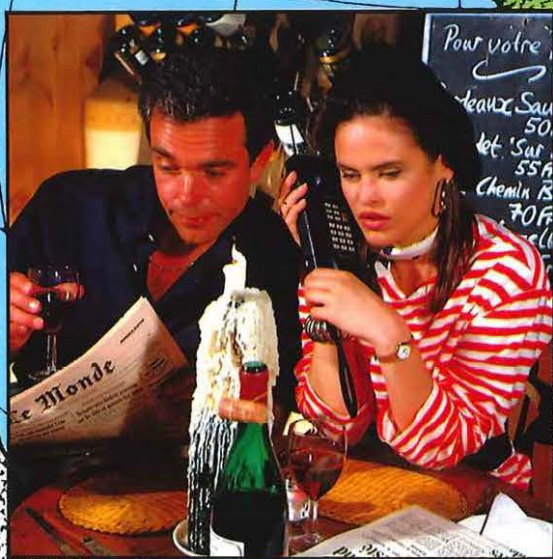
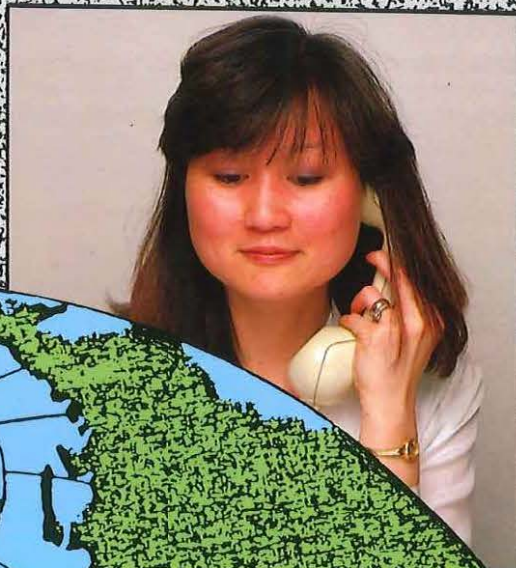


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Give BT a break!

British Telecom critics have had a field day recently. Few other companies in the private sector have ever had to face such a barrage of ill-informed and confused comment. Why?

Take vandalised phone boxes, for instance. Any company's products which have to exist on the street are liable to abuse these days. Street dispensers of anything from chocolate raisins to bubble gum have all but disappeared. Why?

Because social changes have made their continued presence untenable. Vandalism, sadly, is at an all time high and in today's climate any company has to take a serious look at the economics of wishing to provide its products on demand and the cost both in terms of cash and manpower in waging war against those whose sole aim in life is to destroy.

British Telecom, still regarded by the ill-informed as an 'authority' rather than a company, is in the front line. But its £160 million public payphone modernisation programme seems lost on the critics. Whose fault is it likely to be when a smashed up phone box ceases to function - the company's or the public's?

Take politics, for example. BT has been described as the cornerstone of the privatisation doctrine.

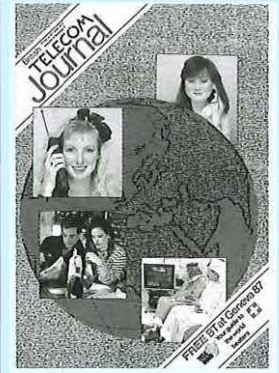
Those providing or depending on telecommunications should not have to think of the politics behind the service they rely upon.

British Telecom is spending £1 billion a year on improving its network and is leading the world on research and investment in the future. What then do the critics want - a structure led by faceless 'mandarins' or a positive, go-ahead company which has its eye to the future?

Public criticism that BT has provided a poorer service since privatisation has been shown to be wholly unfounded. Professor Bryan Carsberg, Director General of Telecommunications, has acknowledged BT's massive efforts to improve its service.

The company has also poured its resources into providing jobs throughout the British electronics industry, helping the old and disabled, answering to its customers on service quality and into building for the future.

Chairman Sir George Jefferson said recently that the company will try even harder to improve its service. It is time that the critics give BT a break and let it get on with the job and gave credit where credit is due. ■



Cover: Today British Telecom spreads its message loud and clear around the world. While the company's most innovative ideas will be exhibited at Geneva, Arabs in London can now press a button and 'look in' to Dubai, people who can't speak each other's language can have their telephone conversations miraculously translated by a computer as they speak, and visitors to Europe will soon find the cell phone that ceases to work as soon as it crosses a border to be a problem of the past. And the global barriers will shrink even more as BT forges ahead into the Nineties. Cover and design by Pencil Graphics and Advertising.

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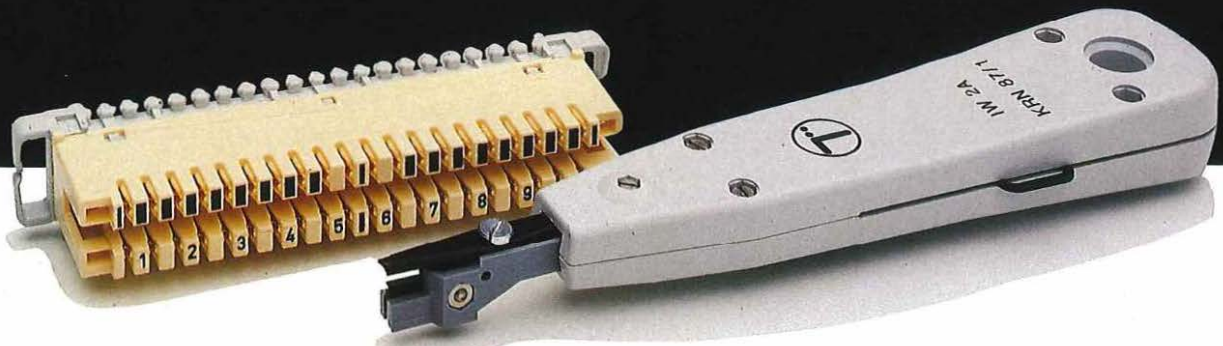
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Teeing off at the Open... eXchanges on the move

Phil Taylor

Mobile digital exchanges,
the winning stroke.



Mobiles consist of a System X Remote Concentrator Centre (RCC), with a maximum capacity of about 1,800 customers connections and 170 erlangs of bothway traffic, in a standard container of the type used worldwide for transporting of cargoes by land and sea. The containers have been specially modified and adapted by BT Fulcrum for UK Communications HQ Local Network Switching and Operations who have sponsored and managed the project.

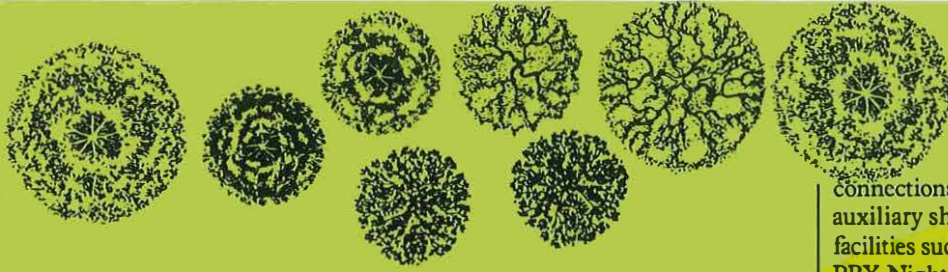
The first System X Mobile to enter service in the UK network was introduced in June at Gullane exchange, East of Scotland District, to provide national and international speech and data links to enable the world press to cover Nick Faldo's triumph in the Open Golf Championship held at the nearby Muirfield Golf Course in July.

The second Mobile entered service during July where it is being deployed by South Midlands and Chiltern District to bring immediate modernisation benefits to customers on the Milton trading estate near Abingdon.

The two projects are typical examples of how local planners will be able to rely on System X Mobiles to give them flexibility in provision of service.

Bert Peattie, the Exchange Planning Manager at Edinburgh, said that he was delighted to be able to offer comprehensive modern communications facilities so efficiently. He added that East of Scotland District was hoping to redeploy the Mobile after the Championship to ease the turnaround at one of their local exchanges which ▷

As part of British Telecom's digital local exchange modernisation programme two Districts have recently taken delivery of newly developed Mobile System X exchange units. The units are intended to provide connections at instant notice. They can also be used to augment the change-over arrangements from analogue to digital exchanges when other methods are not viable.



The System X RCC equipment is housed in three standard TEPIH racks which can be equipped with various shelf types to cater for the complete range of customers analogue and digital (IDA)

connections. The Mobiles are also fitted with auxiliary shelves to support special customer facilities such as private meters and key control of PBX Night Service. Payphones can also be supported, and by equipping an alternative line shelf type on the racks analogue DDI PBXs may be served.

The installation is served by a standard Power Equipment Rack (PER) housed in the container. This is fitted with batteries which ensure that service can be maintained in the event of a mains power failure. A standby generator can be associated with the Mobile in emergency situations.

A particular feature is the installation of the



was being replaced by a modern system. At least one other district in Scotland has already made enquiries for its use for the Troon Open Golf Championship.

The container housing the RCC is only 20 feet long, 8½ feet wide and 9½ feet high and is carried on a flat-bed low loader for speedy delivery to any part of the UK.

The System X RCC equipment is similar to that which has been installed in hundreds of exchange

Right: heading for the fairway – a mobile exchange in transit.



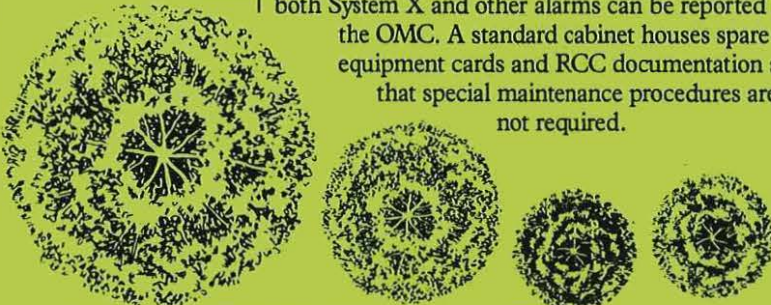
Centre: it's a birdie as a crane lowers the exchange for a hole-in-one.

buildings but it was necessary to adapt the equipment to make it suitable. BT Fulcrum developed methods of securing racks and equipment cards so that the unit can be powered up on arrival at site with a minimum of preparation.

The Mobile RCC has all the standard operational features including VDU and keyboard with the modem link to the Operations and Maintenance Centre (OMC). An alarm panel is provided so that both System X and other alarms can be reported to the OMC. A standard cabinet houses spare equipment cards and RCC documentation so that special maintenance procedures are not required.

COSMIC miniframe which uses insulation displacement techniques for quick and accurate connection of customers lines. It also means that the tie cables connecting the mobile to the local network can be preterminated on miniframe connectors to speed up the process of bringing the Mobile into service. The Mobile is also equipped with transmission equipment to enable connection of digital links to a host exchange using coaxial or optical fibre cables.

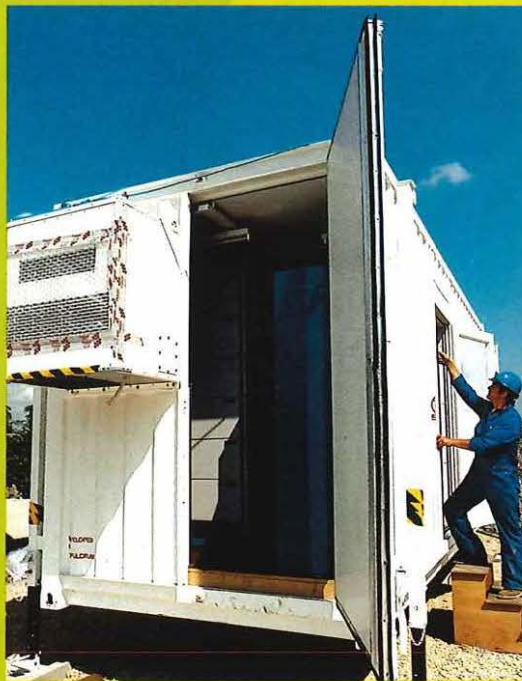
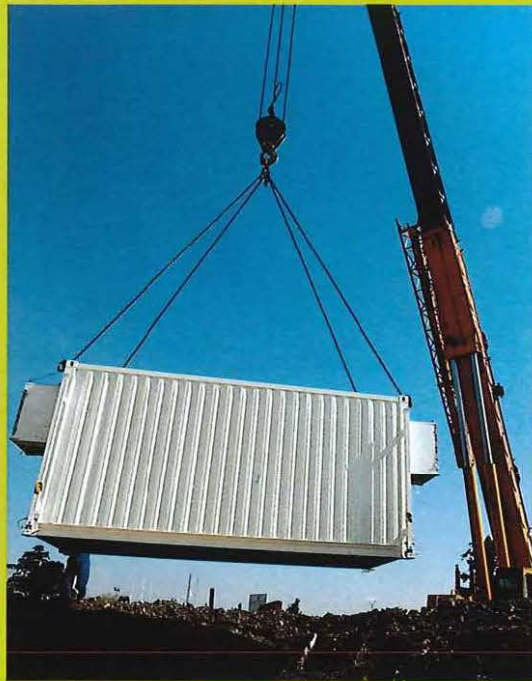
An important feature of the Mobile design has been the provision of suitable air handling units which are essential to ensure that heat dissipated by the equipment is vented from the container to avoid overheating. Each Mobile is fitted with two units, main and standby, either one of which is more than capable of handling the total heat dissipated. The standby unit is switched in automatically if the worker fails and an alarm is raised. The air management system which has been installed was



adopted following extensive feasibility tests which were carried out by UKC ETSS before the development commenced.

The positions of the equipment racks and miniframe inside the container were decided after careful consideration of such things as gangways to enable optimisation of personnel access and maintenance activity. All rack cabling within the container has been successfully routed down the racks into a cavity floor. This has removed the need for overhead ironwork with the double benefit of increasing the efficiency of the air management system and improving the working environment.

All the design features which have been adopted have been aimed at producing a standard RCC which can be delivered to site and brought into service rapidly. With the new development of System X concentrator hardware expected to be available in the near future, it will be possible to increase the connection and traffic capacity in a 20



Left: getting the exchange ready for the world's press to buzz news of the day's play for the morning headlines.

feet Mobile RCC to approximately 590 erlangs of bothway traffic and over 3,000 connections. The capability to provide a complete small local exchange in a 30 foot Mobile, serving about 2,000 customers, will also be possible.

This continuing development will ensure that British Telecom planners will be able to increase their options for the immediate provision of service and ensure that BT is able to compete vigorously to meet market demand. ■

Mr P Taylor works for British Telecom's System X Development and Planning Group.

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System X was designed from the outset as an ISDN switch. And one of the most important facets of that design was the development of the right processor to handle ISDN's high calling rate and short call holding times.

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By loose-coupling 4 clusters, we have MEASURED a throughput of 1 million BHCA. What's more, its economic in-service expansion allows growth of one CPU at a time from 50,000 to nearly 2 million BHCA without disrupting normal traffic.

As for the memory, cards can simply be plugged in up to 56 Megabytes though today System X needs no more than 7.

Lastly, for total security, we've built in the highest possible fault tolerance, even multiple faults only result in a controlled reduction in grade-of-service - NOT a total loss of service.

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TELECOM '87*

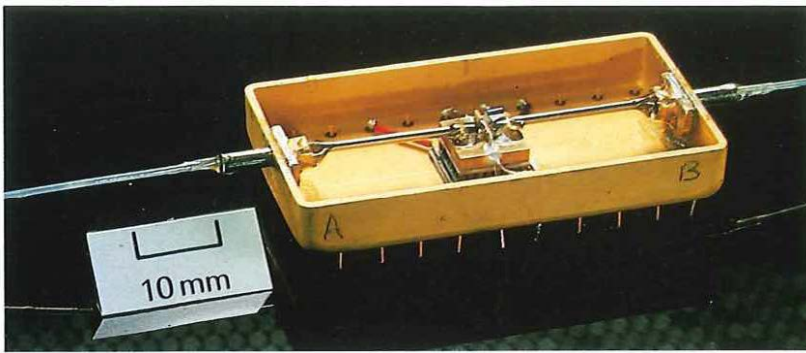


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System X



With the advent of low loss fibres in the 1970s, it was realised that a glass fibre provides an almost ideal medium for the transmission of information, as it provides very wide bandwidth, low attenuation and is physically compact.

Using a laser to convert the source information, whether telephone or data, into a series of light pulses the fibre can carry the information over long distances before the signal becomes very weak. At the far end, the light pulses are reconverted to electrical pulses using a photodetector and the normal process of amplification and reconstruction of the initial telephone call or data is undertaken.

Currently, most of the installed optical systems are in the trunk network, where the greatest savings are obtained, but there is a rapidly increasing interest in providing glass fibre links into subscriber houses.

In many cases, the total distance spanned by the optical link is very large. For example, the TAT8 transatlantic system to be installed between the UK and USA in 1988 has a total length of approximately 6,000 km. Using even the best of today's fibres the loss or attenuation of a signal passing along a fibre is the order of 0.2 dB per

Lasers light up a new era

Mike O'Mahony

Since the possibility of transmitting information in the form of light over long distances using glass fibres was first proposed by C K Kao and G Hockham at Standard Telecommunications Laboratories in 1966, the growth and development of optical fibre systems has been dramatic. Research work on optical amplifiers, by British Telecom and others, heralds a new and exciting era.



kilometre – after 15 km, for example, the brightness or intensity of the signal would be diminished by a factor of two. After about 100 km the signal is weak and needs to be amplified.

Present day long haul systems, therefore, require regenerators at regular intervals to amplify the weak light pulses, restore their original shape and to redefine the position of each pulse. At present most of these functions are performed electrically.

A typical regenerator would comprise a photodetector at the input to convert the weak optical signal to an electrical current. A number of integrated circuits are also needed to perform all the electronic amplification, pulse shaping and retiming, and then a semiconductor laser to convert the electrical signal to an optical signal for transmission along the next section of optical fibre. In all, present regenerators are very complex opto-electronic systems.

In 1983, work commenced at British Telecom's Martlesham laboratories to investigate the use and advantages of optical amplifiers. Such amplifiers have the ability to amplify light directly without the need to convert the input light to an electrical signal prior to amplification. The objective was to investigate the use of optical amplifiers as repeaters

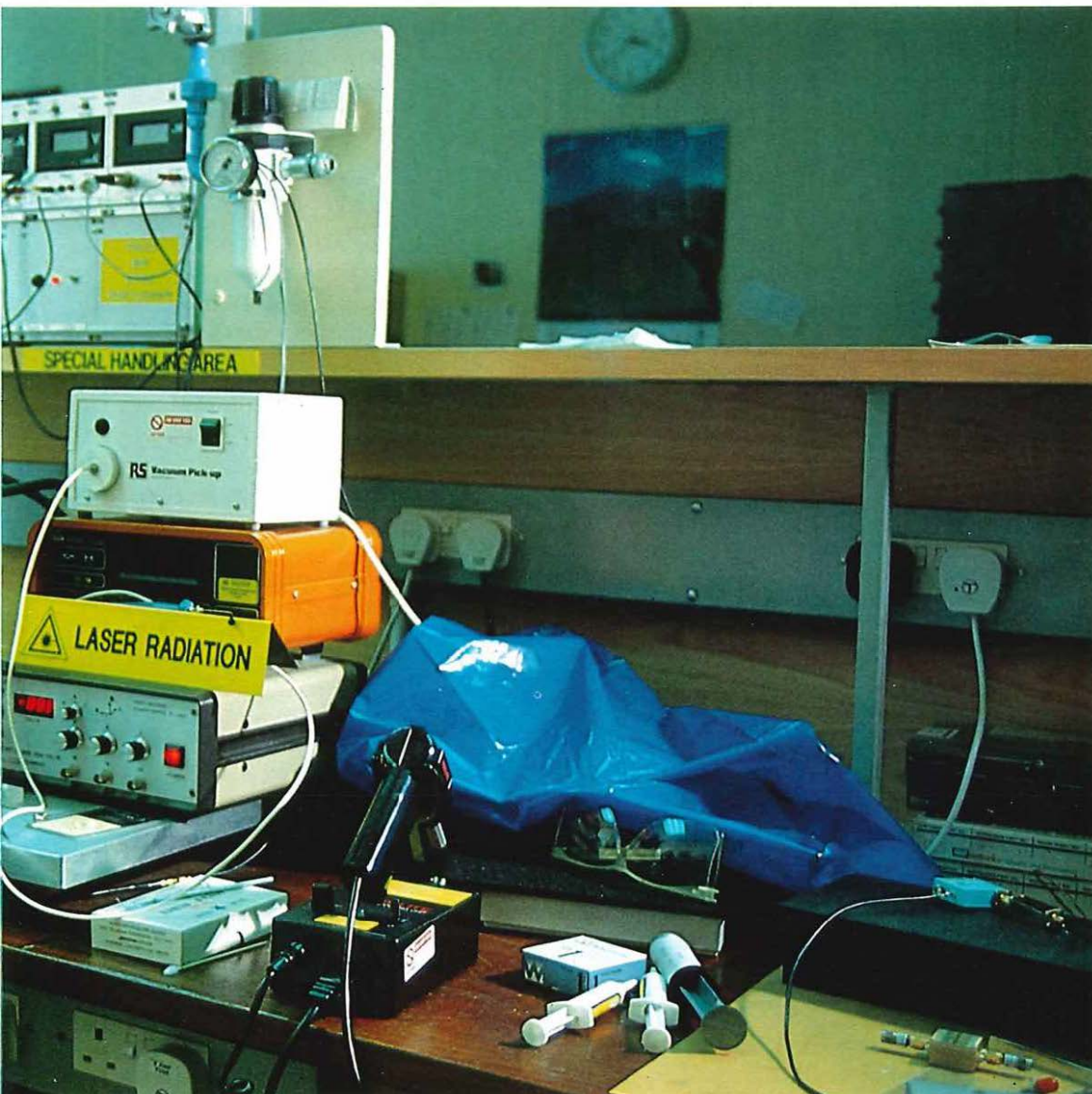
and as general 'gain blocks' for use in optical systems.

Initial investigations centred on the use of a standard semiconductor laser as the amplifier. The laser is a semiconductor diode with an active region which emits light under the appropriate biasing conditions.

The dimensions of the laser are small, typically with a cross sectional area of 100 x 100 microns (the thickness of a human hair) and a length of 300 microns. It is helpful to think of the semiconductor laser as an electrical oscillator and to construct one it is necessary to have both gain and feedback because oscillation occurs when the combination of electrical gain and feedback reaches a critical value (the loop gain is unity).

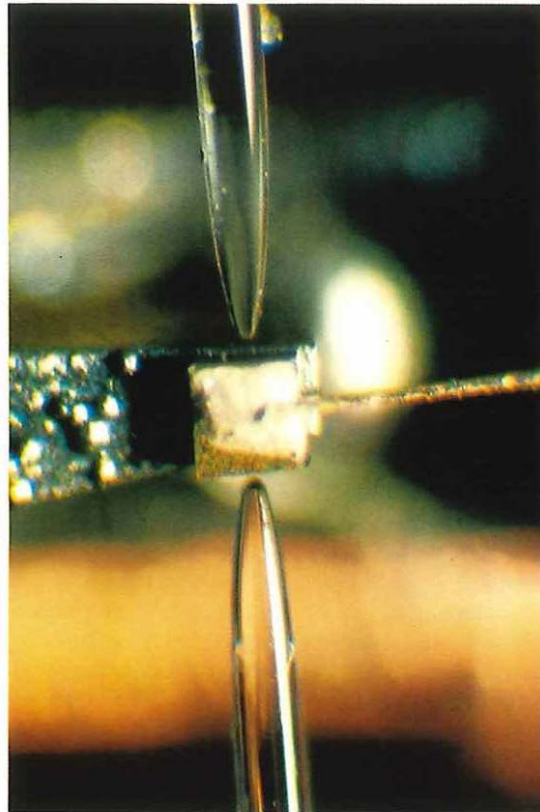
In the semiconductor laser the active layer material provides optical gain when a bias current is applied and this gain increases with current. The laser crystal ends (facets) act as mirrors and provide feedback so that when the bias current is increased above a certain level, the combination of optical gain and feedback is such that oscillation occurs resulting in an intense beam of light. This is the normal mode of operation of a semiconductor laser and is widely understood. ▶

Opposite page: the heart of the amplifier package showing the chip in the centre. To the left and right are tapered fibres, the thickness of a human hair, which carry light to and from the amplifier.



Technical officer Phil Constantine assembles a laser amplifier package.

A microscopic amplifier repeater package, showing input and output fibres.



To obtain a semiconductor laser amplifier (SLA) it is necessary to eliminate the feedback caused by the laser facets, as it is only the optical gain associated with the laser material that is required. This is done by the application of a special anti-reflection coating to the laser ends, similar to the type of coating on camera lenses and spectacles, but designed for the longer wavelengths (1.5 microns) used in optical systems. The design of these special coatings is crucial to the amplifier performance and is a current area of study at Martlesham Heath.

Brighter

In essence, the SLA comprises a semiconductor laser chip with special coatings applied to the end facets. When light is applied to one end it is amplified on passing along the device and at the other end may be 1,000 times brighter than at the input (a gain of 30 dB). If light is considered as a number of photons then as each photon enters the amplifier it stimulates the emission of an additional photon causing a chain growth in the number of photons along the amplifier length. By altering the bias current (which in present devices is typically about 40 mA) the gain can be varied.

For convenience, the packaged optical amplifier used in many of the Martlesham experiments was designed to have input and output fibres so the unit could be simply spliced into a fibre system. The fibre ends close to the laser chip are tapered and the distance between fibre end and laser is approximately 20 microns on both sides.

The fibre ends are tapered so that a small lens (of radius 10 microns) can be formed on the tip using an electric arc. The fibre lens enables the light to be focused on the tiny active area of the laser (about one micron square) and provides good coupling efficiency. The laser chip itself is mounted on a

thermo electric cooler which together with a temperature sensor and control circuit allows the temperature to be accurately controlled.

The laser amplifier has been extensively characterised in the laboratory and various experiments have been undertaken to evaluate its performance in a variety of applications in real systems.

A particular attraction of the amplifier is that it is a linear amplifier and will amplify all types of optical signal whether digital or analogue (with intensity or coherent modulation). It provides a gain currently in the region of about 20 dB between input and output fibre, and has an extremely wide bandwidth (equivalent to 5000 GHz).

Unlike a standard electronic amplifier, a laser amplifier is completely symmetrical so that either of the fibre tails can be used as input. This property leads to one of the unique features of the optical amplifier in that it can be used to simultaneously amplify two optical signals travelling in opposite directions. An optical link using amplifiers can, therefore transmit information simultaneously in opposite directions.

Furthermore, because of the very wide bandwidth it is possible to amplify simultaneously a number of signals of differing wavelengths. These features underline the main differences between this new generation of optical amplifiers and conventional complex opto-electronic regenerators.

The first reported field trial of an optical amplifier involved four optical fibres between Colchester and Ipswich exchanges, which are separated by a distance of 30 km. Fibre pairs were spliced at Ipswich to enable the testing of a 120 km system with one repeater - the optical amplifier - at Colchester.

A distributed feedback laser, which provides a well defined wavelength, was used as the transmitter and provided power of 2 dBm. This was modulated at 565 Mbit/s by a data test source to simulate a standard 565 Mbit/s transmission system.

A fibre directional coupler was used at the amplifier input to monitor the power after the first 60 km. A fibre polarisation controller was also used to adjust the received signal polarisation to the optimum state.

The second fibre section terminated in a commercial optical receiver, with a sensitivity of -36 dBm at 565 Mbit/s. The total fibre path loss was 49 dB. The optical amplifier gain was set to 17 dB by adjusting the bias current and at this point data could be transmitted over the 120 km without any errors. This trial, therefore, demonstrated the feasibility of optical amplifier repeaters.

The idea of using optical amplifiers in glass fibre systems is almost as old as fibres themselves, however it is only in the last few years that technology has advanced to a state where useful high gain amplifiers are available and there is now a considerable international effort, for example in Japan and USA to develop these components. Their use is not limited to repeater applications and they can be used, for example, to provide very wideband optical receivers for future systems or in another form as components of future optical computers. ■

Dr M J O'Mahony is head of the optical amplifier group at BTRL, Martlesham.

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It's better by design!

Christine Drake

In the five years they have been in use, British Telecom's corporate identity elements – the company logo, the T-roundel and the dot-dash strip – have become some of the best known business identifiers in the country. This article looks at why they are necessary and explains why a new design manual has been compiled to protect them.

To avoid confusion and time wasted with conflicting ideas designers should be briefed in two stages – in outline at first and then in more formal detail.

The strength of a good corporate identity is not just how memorable a logo is, or whether the colours stand out, but in the consistent application of those elements in everything the company does. In British Telecom's case that covers millions of points of contact including every building, phone box, phone appliance, vehicle and company service. Phone books, bills, leaflets, advertisements and shareholder communications also bear the corporate identity to endorse and promote the company's image.

The new design manual, published earlier this year, sets out to show how the identity can be used to maximum advantage in a company which is moving at a tremendous pace. With the changes in the communications business and the new opportunities this creates, it is important that British Telecom and its divisions can respond quickly. A corporate identity therefore must not be rigid and stifling but should add authority and reassurance to the products and services on offer.

Since privatisation and deregulation there has been an explosion of new services and products as British Telecom acts to meet the challenge of information technology.

This has meant market-led initiatives to meet the demands of the customer, and to meet the challenge of competition.

Many of BT's newer services, for example, require the customer to grasp new communications concepts. The backing of British Telecom, clearly emphasised, is reassurance that the new services are tested, proven and fully backed by maintenance. The design manual has been written to take the pomposity out of design theory and practice. BT realised that the manual had to show the benefits of a design-led image, not merely to lay down a set of strictures.

Like most design manuals, the new BT corporate guidelines lay down the permitted uses of the main elements of the identity – the T-roundel, the logo, the dot-dash strip and the blue and yellow livery – plus any allowable alternatives. And it shows what happens when the elements are used incorrectly.

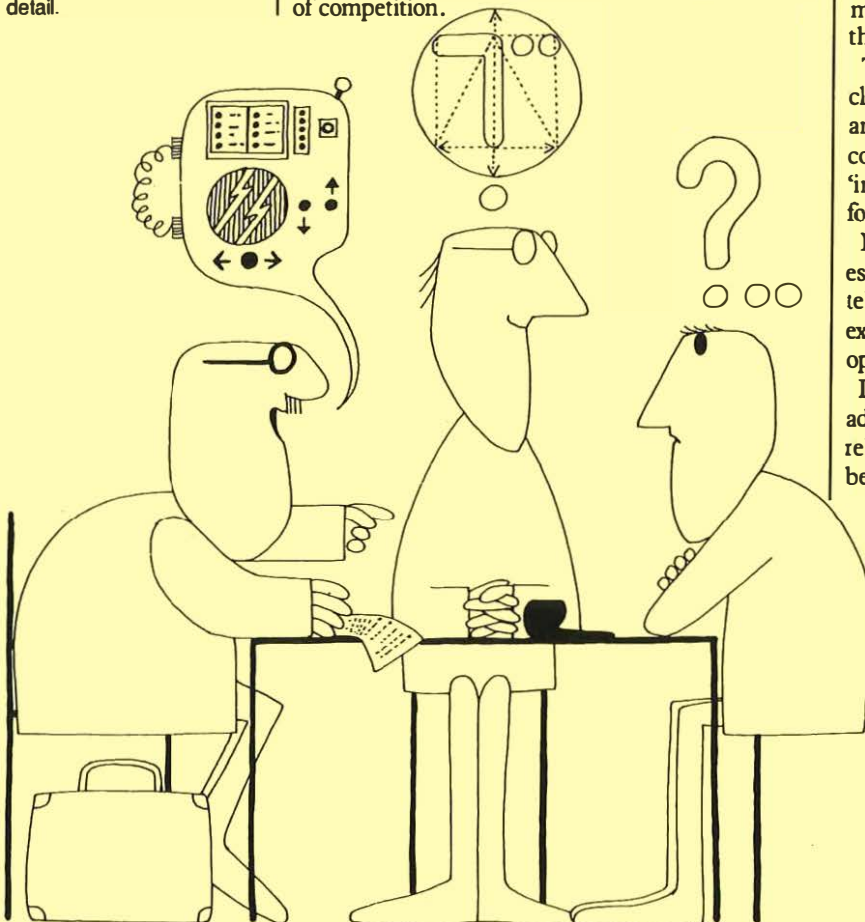
There's another important reason behind the new insistence on corporate consistency in design. The law covering the ownership and protection of registered trade marks and names is complex, and with an organisation as much in the public domain as telecommunications, there are many services who might seek to add the endorsement of BT to their own.

The manual points out that BT can only claim clear ownership of trade marks, registered designs and other business identifiers if it is itself consistent in how they are used. This area of 'intellectual property' as it is called, is dealt with for the first time.

No manual can lay down guidelines for all time, especially in a business as fast moving as telecommunications and it has to be capable of extension as BT adapts to new market opportunities.

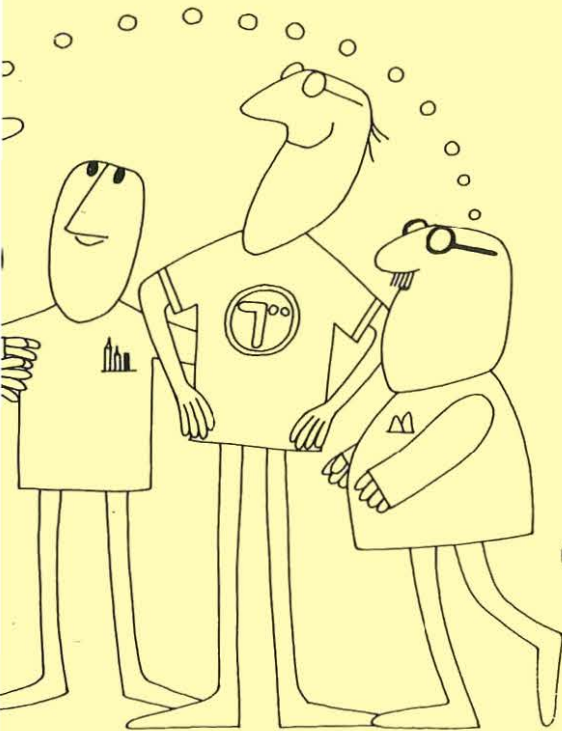
Physically, the manual has also to be capable of additions as needed to keep the identity fresh and relevant, wherever it develops. Overseas markets beckon, for example, and these will pose a fresh challenge for the corporation and its image.

Use of the design manual is mandatory for BT staff and responsibility of its implementation rests with Corporate Design Unit. The object, however, is not to stop staff having notepaper prepared, buildings signed, vehicles painted and brochures produced but to do so in a consistent way. In effect, the manual is stage two of BT's corporate design implementations. It builds on the success of its predecessor which has helped make BT one of the most immediately visible of British companies, and it provides a framework for growth and diversification. ■





Basic misunderstandings will be avoided if the role of everyone in the design team is clearly understood.



A detailed design brief is an agreed document between client, Design Unit and designer and spells out the exact requirements for a project.

Miss C Drake is head of British Telecom's Design Unit.

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Stand No. 5/251

The introduction of a £1 billion standard digital cellular mobile communications system throughout Europe has been brought a step closer. Member countries of the Conference of European Posts and Telecoms are now pushing to open a service for the lucrative Pan-European market in 1991.

In May, telecommunications ministers from four countries met and endorsed a narrowband standard for the Pan-European cellular radio network; and in June all 15 member countries of CEPT agreed on a technical basis for the network. Specific details will be worked out during the next stage of the project.

The United Kingdom will play an important role in the programme's development. Already, the Department of Trade and Industry has approved a £1 million project to establish a prototype narrowband digital cellular radio system. As well as British Telecom, the project involves Racal, Plessey and GEC. It will be co-ordinated by the UK Cellular Radio Advisory Group - made up of representatives from STC, Philips, UK trade associations and the companies involved in the prototype.

In a significant move, the DTI has also allocated the two cellular operators, Racal and Cellnet, space in the European band for testing prototype Pan-European cellular systems.

This is seen as the Government's first public hint that Cellnet and Racal are likely to be awarded licences to operate the UK part of the Pan-European network. However, because of the heavy investment needed to develop such a system, both companies will need more definite Government support before fully committing themselves.

In anticipation, British Telecom has started its own three-year £6 million development project, involving test bed work, setting up a prototype system and a pre-operation network. This will take until 1990, and will allow BT to be ready for the start of the commercial service in 1991.

Unlike the present network, the Pan-European system will use a digital service. Digital communication converts voice messages into a digital code, and then transmits the code a little at a time. This system is less vulnerable to interference than the existing analogue network, which transmits speech patterns in a constant flow.

If Cellnet is granted a licence to operate the UK end of a European network, the new digital service will initially be run in parallel to the existing analogue network.

Decisions

Manufacturing for the European project will be at three levels: mobile equipment; cellular base stations and network switches. While BT is keen to assist development at all levels, it is not a manufacturer. But by assisting development it should be able to make informed purchasing decisions.

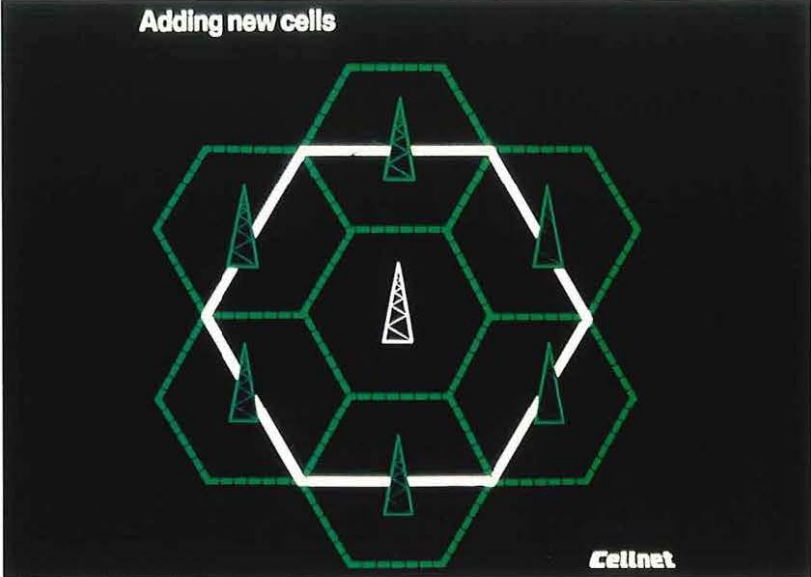
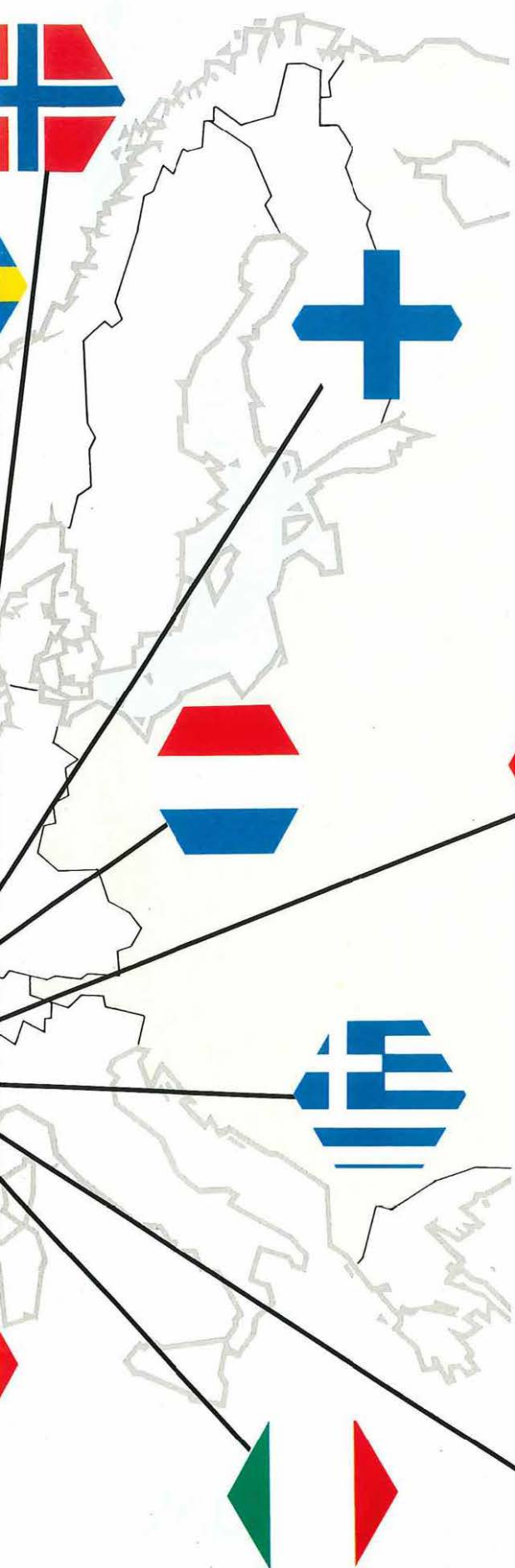
British Telecom is discussing possible co-operation with a number of UK and European companies such as GEC, Plessey, Racal - all co-partners in the UK prototype work - and Ericsson, Motorola UK and Philips.

A number of manufacturing consortia are likely to emerge as leaders in the network - probably with

All for one, one for all!

Kevin Taylor





two or three at each level of manufacturing. The groups are likely to involve companies from different countries. This will widen each group's potential market, and achieve economies of scale. At present more than 500,000 mobile phones are used in Europe - about 200,000 in the UK. By 1990, the British market is likely to reach 500,000 and the European market two million. The best

estimate is that eventually 10 per cent of all telephone customers are likely to use mobile phones.

The dramatic growth in the cellphone market has caused severe problems - especially in heavily populated areas. Racal's problems in London were eased only slightly when the Government allowed them access to 40 of the reserved European channels until the end of the year.

Because Cellnet grew more quickly than Racal, it realised earlier that capacity could be a problem in Central London. Cellnet, therefore, invested £22 million in a cell sectorisation programme - the first of its kind in the world.

Each Central London cell was divided into six smaller parts. These then operated as mini cells, enabling greater re-use of radio frequencies. The sectorisation programme has increased by more than two-and-a-half times - congestion has been relieved, and there is more room for continued growth.

Until fairly recently, the use of mobile communications was restricted to specialist areas - the military, emergency services and public utilities. The advent of cellular radio and developments such as the Pan-European system, has changed the perception and use of mobile equipment.

Today, the mobile phone is seen as simply a natural extension to the PSTN as indicated by its rapidly growing popularity. ■

Mr K Taylor works for British Telecom Mobile Communications' Press Office.

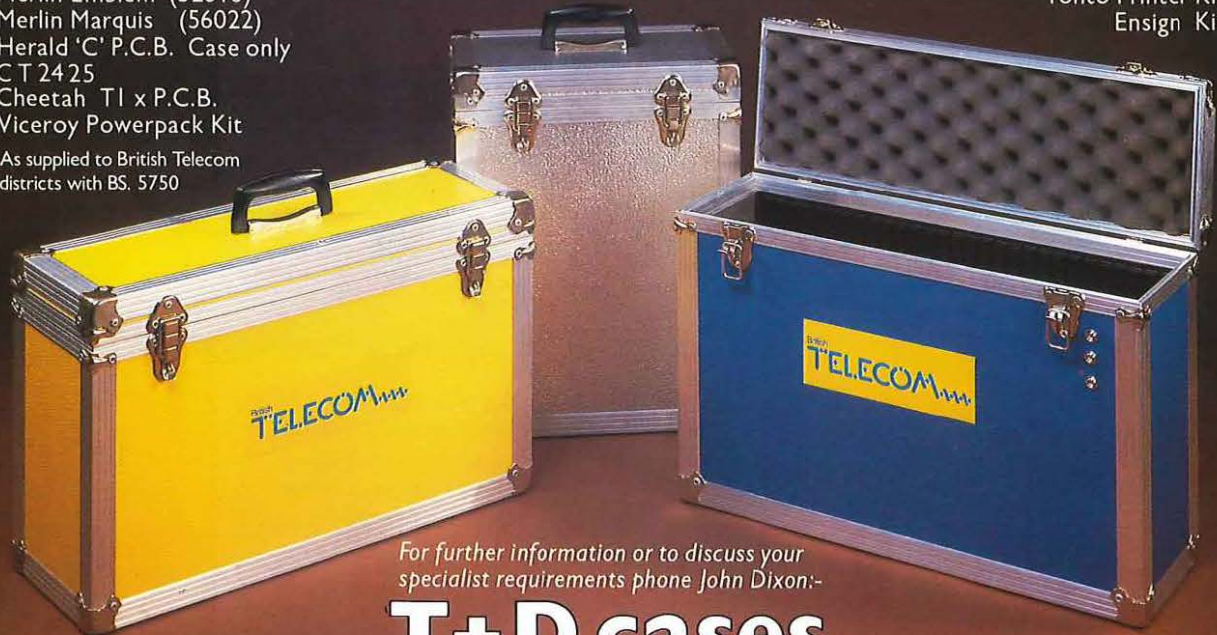
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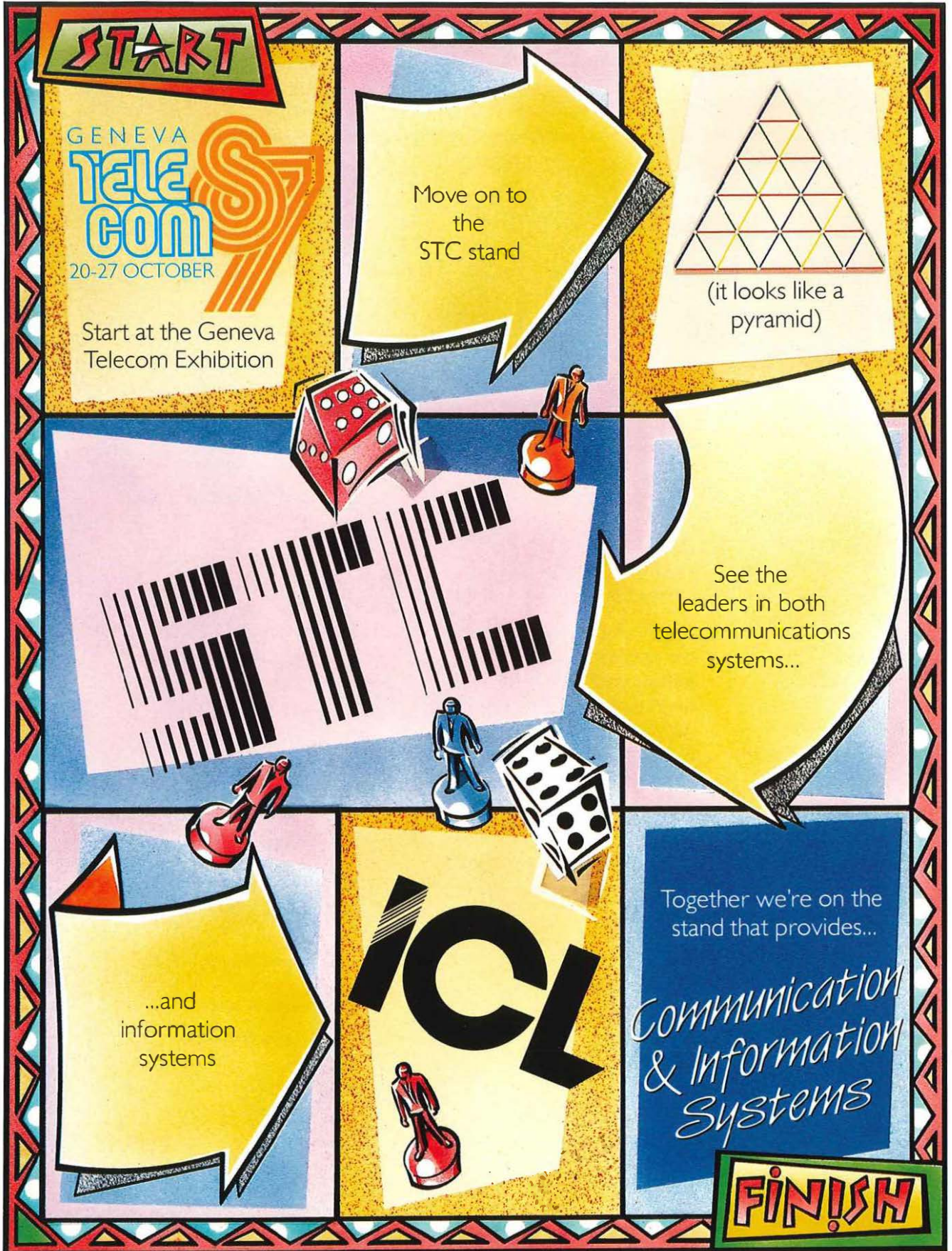
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BETTER PEOPLE COME FROM

B R O O K S T R E E T

At a time when the first fibre-optic Trans-Atlantic cable is about to be laid and when high-efficiency communications systems assume the low-profile role of a wolf in sheep's clothing, the humble telegraph pole could be dismissed as obsolete. But wooden poles – the first of which was erected 150 years ago – are still the cheapest and most versatile means of providing service to customers and will be in evidence well into the next century.

British Telecom has about 4.3 million poles in service and, despite a slight decline recently, some 80,000 new poles are issued each year to replace decayed or damaged poles and to connect new customers or re-route existing lines. Wood is a relatively cheap material with a high strength-to-weight ratio but being a natural product its properties can vary.

In the early days poles were often used to carry heavy open-wire trunk lines which required a more rigid structure than could be provided by a single pole, but today very few open-wire routes remain in service and the loads on poles are much lighter.

Poles are used to provide overhead distribution points from which dropwire feeds radiate out to the customer. Where more than one span is required to reach the customer, intermediate poles are erected.

They are also used to support aerial cable routes.

Wood poles are used in most countries in the world for telecommunication and power supply lines. They range in size from the 600mm diameter poles used in North America for electric grid lines to British Telecom's 150/200mm diameter poles in widespread use throughout the country for the local distribution of telephone services.

Great Britain has a total pole population of some 8.5 million split, almost equally between BT and the Electricity Boards. This represents a pole density of 35 poles per square km.

The statistics for other countries show considerable variation which reflects national policies. For the EEC as a whole, with 51 million poles, the pole density is 18 per square km. The United States of America, where there are 125

Timber! Poles defy high-tech invasion

Peter Pledger



Tall Stories!

The British Telecom External Plant Test Site at Smallford, near St. Albans, Hertfordshire, has facilities for investigating the suitability of poles. New, and sometimes existing, species can have their mechanical properties checked by subjecting them to bending in the pole loading rig. There is also a stand of poles with known amounts of decay. This is used to compare and evaluate various decay detecting devices.

Damage to poles sometimes occurs due to attacks by woodpeckers. At one time the repair method was to fill holes with concrete and there is a recorded incident where one hardy old bird pecked out the concrete filling in one telegraph pole on three consecutive occasions.

Various incidents occur each year involving poles. One such was when an overhead wire feed across a road was caught by a high sided vehicle. This caused the pole to be catapulted out of the ground and into the roof of a nearby bungalow.

million poles in service, has a density of 14 per square km.

Because of their highly variable properties, poles for use in BT must not only meet the requirements of a rigorous specification but must also be acceptable to the specialist pole inspectors employed by the company who take account of such features as size of knots, grain distortion, severity of shakes and the presence of rot.

Loads are imposed on the poles by the wires and cables that they carry and these loads are



Opposite page: times have changed – when a telegraph pole collapsed in Brighton in 1914, crowds gathered to watch.

Above: no matter how remote and rural the surroundings, overhead maintenance work has to be carried out at regular intervals.

Left: they may be 150 years old, but telegraph poles move with the times – this pole top concentrator can be sited on buildings such as flats to give up to 14 separate customers their own telephone service using just four trunk lines back to the exchange.

Below: a flying telegraph pole may seem a strange sight. But in deep-freeze weather it is part of the Highland scenery as BT in the North of Scotland fly in equipment to keep communication lines open.

particularly severe under extreme wind and ice conditions. The timber used must be strong enough to resist the stresses induced and sufficiently stiff so as not to deflect by an excessive amount. In addition, poles must be visually acceptable to the public as 'items of street furniture'. They must also have a life much longer than is normal for other telecommunications plant and the wood must be readily available in sufficient quantities at a competitive price.

British Telecom uses only coniferous trees for its poles. The vast majority of those in service are of the 'Pinus sylvestris' species more commonly called Scots Pine, if home grown, or European Redwood, when imported from Northern Europe. It is an ideal timber for poles combining adequate strength with moderate weight and is readily available in terms of quantity and quality. A number of other species are used for poles, examples being Corsican Pine, Larch, Douglas Fir and more recently Southern Pine imported from the U.S.A.

Various materials other than wood have been tried from time to time but none has yet challenged its predominant position and some trials have ended in disaster. For example, early this century tubular iron poles with cast iron bases were introduced at the request of some local authorities in order to improve appearance in urban locations. Unfortunately, a route of these poles collapsed at Brighton in 1914 when one was hit by a van. The spread of the collapse was only halted when the first wood pole was reached.

The most recent development is the hollow pole made from galvanised steel, stainless steel or glass re-inforced plastic (GRP). However, it has a much higher initial capital cost than the equivalent wood pole.

Left untreated, wood will rapidly decay and lose

the mechanical properties which make it an ideal pole material. Decay is the final stage in a long process brought about by micro-organisms. The fungi which cause decay are simple plants which contain no chlorophyll and they must, therefore, obtain their food from other organic material.

For wood rotting fungi to grow they not only require the food provided by wood cell walls but also a suitable temperature, a supply of moisture and oxygen. These ideal conditions can be found at most pole locations particularly around the point at which the pole enters the ground.

Investigations

The life of the pole is dependent on many factors such as tree species, growing conditions, the effectiveness of the preservation and the environment in which the pole is situated. Investigations have shown that the average physical life of a BT pole is 44 years.

Different species of timber resist decay in varying degrees and although 'Scots Pine' is one of the least resistant it does readily accept preservatives. Of all the different types of preservative, creosote has been found to produce the most satisfactory results.

Creosoting is normally carried out by the Rueping process - an empty cell method in that it removes surplus creosote from the wood cells. Larch and Douglas Fir poles are relatively resistant to the impregnation of preservatives and the standard process has to be modified for them.

Decay or other damage can cause poles to fail under extreme weather conditions or during installation and maintenance operations. This costs money and could even result in death or injury particularly if staff are working on the pole at the time. Every year, British Telecom spends large sums of money to ensure that below strength poles do not enter, or remain in service.

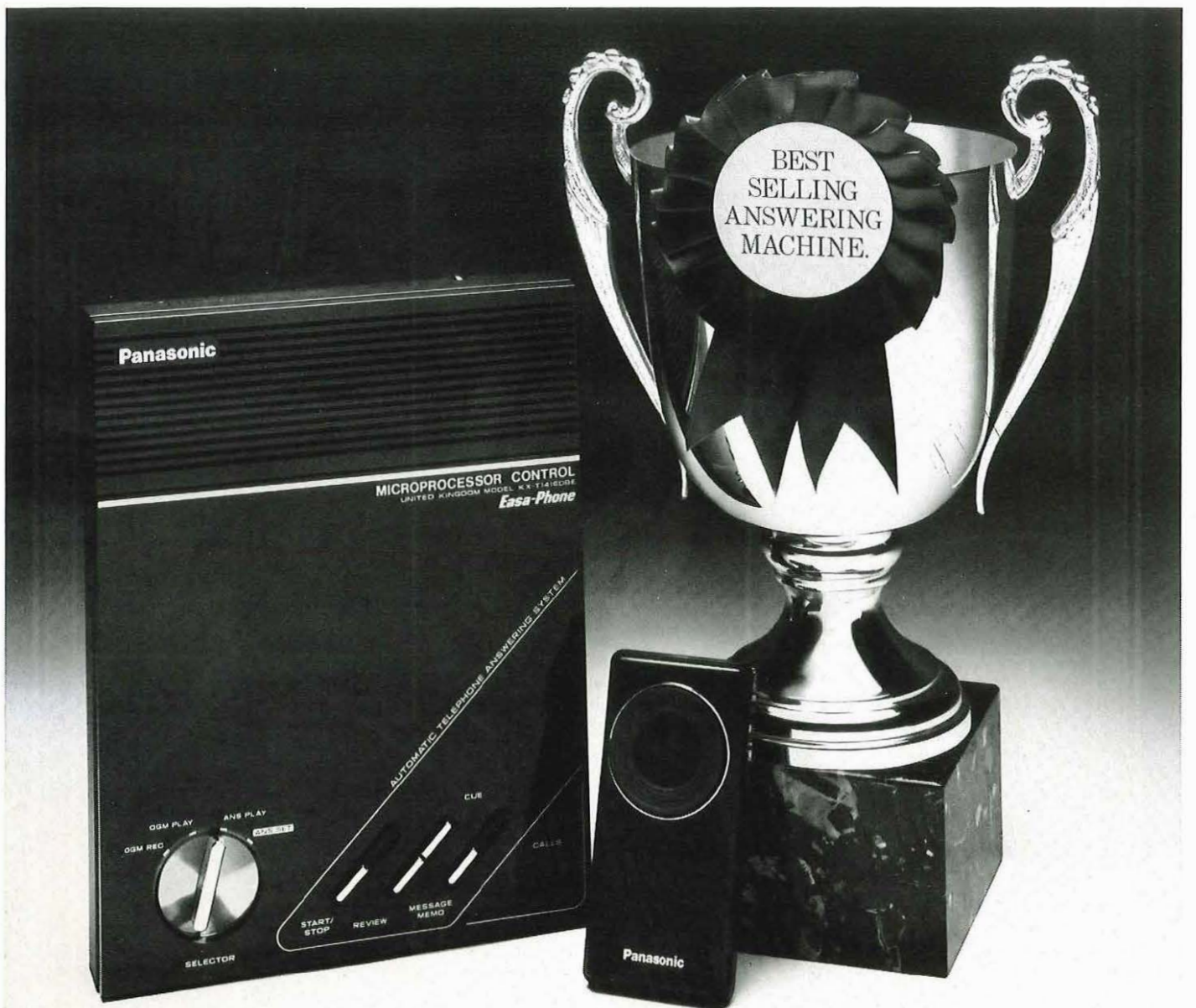
To minimise the danger, existing poles must be tested before being climbed. In addition, all poles are subjected to a rigorous examination every six years by a specialist pole testing party. The test method used is the one most commonly employed throughout the world - tapping the pole with a hammer and listening to the resultant vibrations. BT is currently involved in a project aimed at developing a non-destructive testing instrument. The work is being sponsored by the Commission of the European Communities and will be carried out in Britain, Denmark and West Germany.

The pole population varies considerably around the country ranging from less than 200 poles in West End District to more than 300,000 in North Wales District. These differences are influenced by such factors as customer density, local authority regulations and economics.

Wood poles will continue to have a major role in telecommunications well into the future. Optical fibre aerial cable routes already exist and many cable television customers receive their service from overhead feeds. A number of changes can be expected with different species becoming economically available, the development of new selection/inspection techniques and an increase in pole life brought about by better preservation and possibly in-situ remedial treatments. ■

Mr P N Pledger is head of group (overhead plant).





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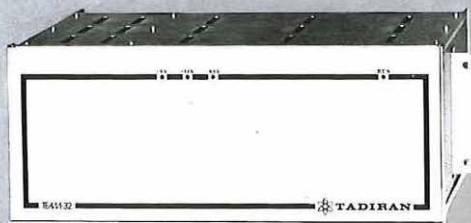


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Main picture: the Open Area Test Site (OATS) at Martlesham which has been carefully designed to measure the radio frequency signals emitted by anything from a computer to a PBX exchange.

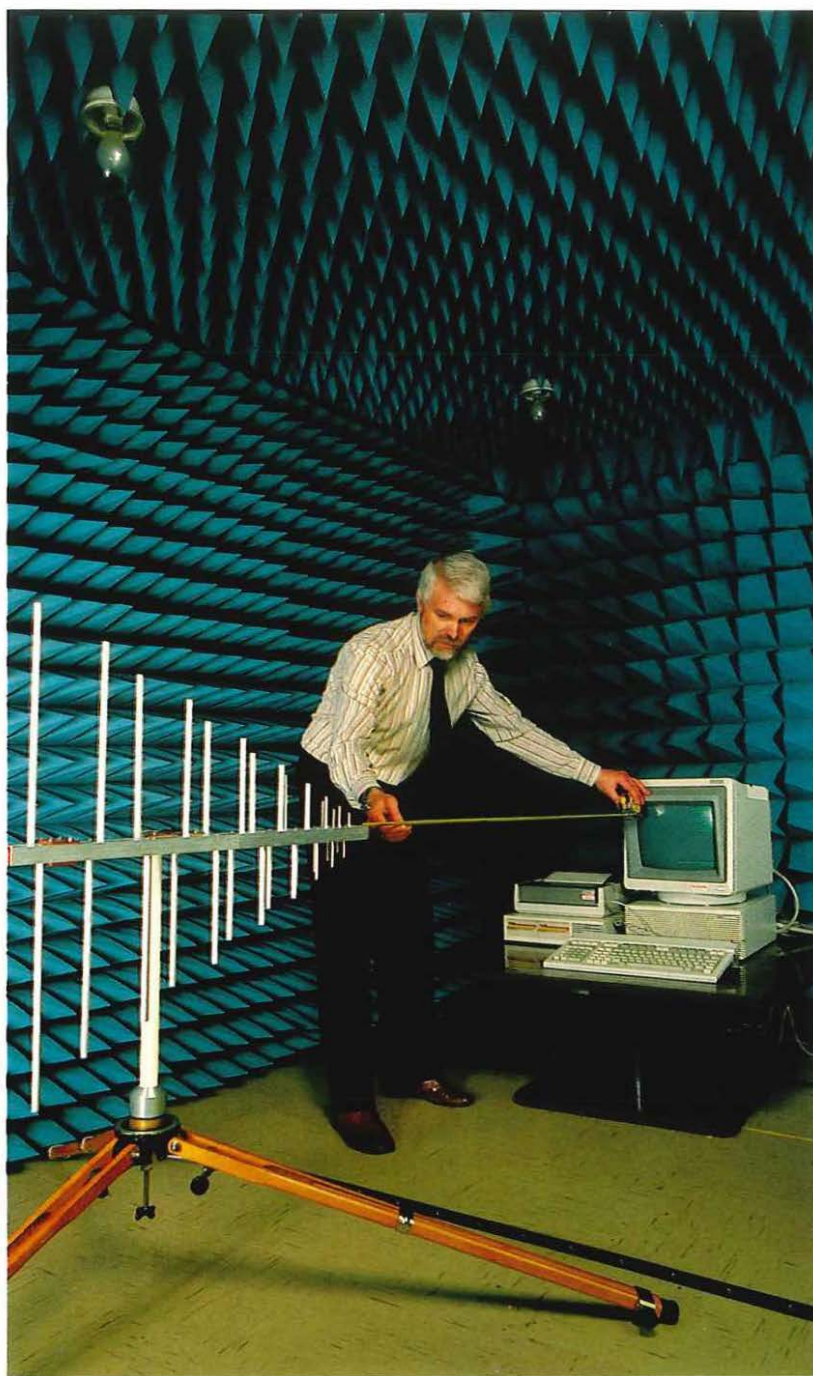
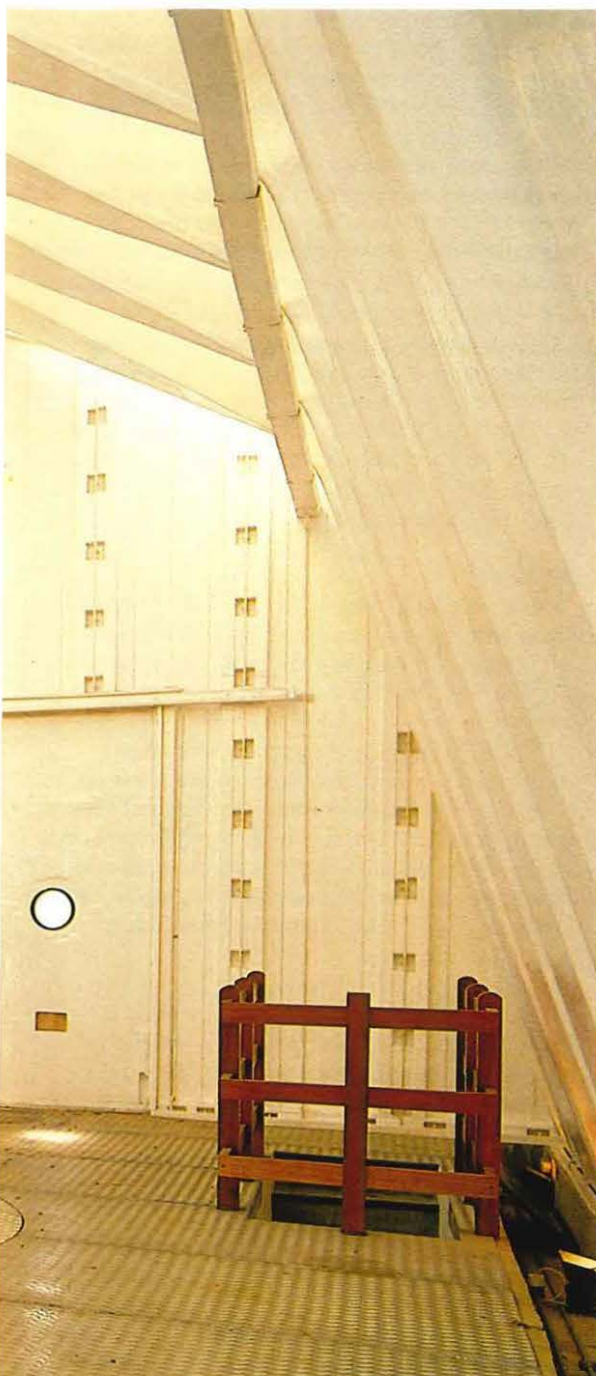
Right: Dave Stanley, an EMC engineer, shows the broadband log-periodic aerial receiving unwanted radio signals coming from a VDU.

Below right: a glass reinforced plastic building, transparent to EM radiation, protects OATS from the weather.



Keeping pollution at bay

Mike Berry
and Andy Slater



Electromagnetic interference can cause serious malfunctions in any telecommunications apparatus, from a simple terminal to an entire telephone exchange. Experts at British Telecom Research Laboratories, Martlesham Heath, near Ipswich, are committed to a dedicated programme of work both to minimise the interference generated by BT equipment, and to

ensure that it continues to operate correctly in interference conditions.

By the end of 1989, it is expected that new EEC regulations will lay down mandatory standards regarding the emission of unwanted signals — whether from a desk-top computer or a digital telephone exchange. After that date, any new equipment that does not comply with the regulations may have to be modified or withdrawn from the market.

Clearly, the business of Electromagnetic Compatibility (EMC) — the control of radiated, conducted and induced electromagnetic interference, both from and to electrical and electronic apparatus — is a subject of growing importance to the telecommunications industry.

By its very nature telecommunications apparatus can be particularly sensitive to interference. ▷

Information technology products are rapidly changing modern life but they have brought with them their own kind of pollution — electromagnetic interference. This article investigates the latest moves to keep serious trouble at bay.



Modern digital electronic equipment, using high data rates, is more likely to produce interfering radio transmissions than the old style apparatus. The use of wideband high-gain amplifiers can also make such equipment susceptible to radio signal interference.

The importance of EMC to customers first became evident about five years ago with the introduction of the modern, all-electronic telephones. Soon after they began selling in significant quantities, British Telecom started to get a small but disturbing number of complaints from customers that BBC Radio Medium Wave transmissions were disrupting their telephone calls.

This problem was solved by the research group at Customer Products Division, Martlesham, and demand for their EMC expertise has grown enormously. Now they have started to identify these other EMC-related problems, ranging from electrostatic discharges from people - 'static' - to disturbances on the power supply.

The new group has three major tasks — the first two having the most immediate impact for the business:

- to provide an EMC test and certification service to BT;
- to provide a consultancy to Technology Executive on EMC matters and give technical support to Operational Divisions through field investigations.

But the third task is most important - the development of new techniques to predict EMC problems at a very early stage during the actual design of equipment.

At present, EMC compliance testing must wait till a prototype is fully assembled. If, at this late stage, design modifications are necessary, costs and delays can be considerable.

If techniques could be developed which predicted the EMC performance of a circuit board before assembling it into a prototype both the cost and timescale of developments could be significantly reduced.

The research group also represents BT's interest on national and international bodies where EMC standards are formulated and set. So all this work

requires a heavy investment in test equipment and accommodation. A programme of work is just completed that gives Technology Executive an EMC test and certification facility that is among the best in Europe.

To meet the forthcoming European emissions standard tests, as in the United States, equipment has to be tested on an Open Area Test Site (OATS). Such a site has been completed at Martlesham which complies with a strict specification of characteristics over a frequency range 30MHz to 1,000MHz.

The site chosen, in a field just over a mile from the main laboratory buildings, was investigated for background electromagnetic noise, and is so orientated that the main sources of interference — the Sudbury TV transmitter some 25 miles away, and the Martlesham Radio Tower, are on the nulls of the OATS measuring antenna.

Infinite

Ideally, emissions from equipment are measured on an open site, with an infinite ground-plane, and with no obstruction above the ground-plane to interfere with the radio frequency signals to be measured.

The OATS, carefully designed to satisfy these requirements, is situated in an open-field position, with its 20m x 10m floor completely covered with 5mm aluminium plate serving as the ground-plane. To prevent reflections affecting the measurements, laboratory accommodation for both the measuring instruments and operating personnel is located beneath the test area.

It is all protected from the weather by a glass reinforced plastic building which is transparent to EM radiation. A turntable allows the equipment being tested to be rotated under remote control so that the direction of maximum emission can be identified.

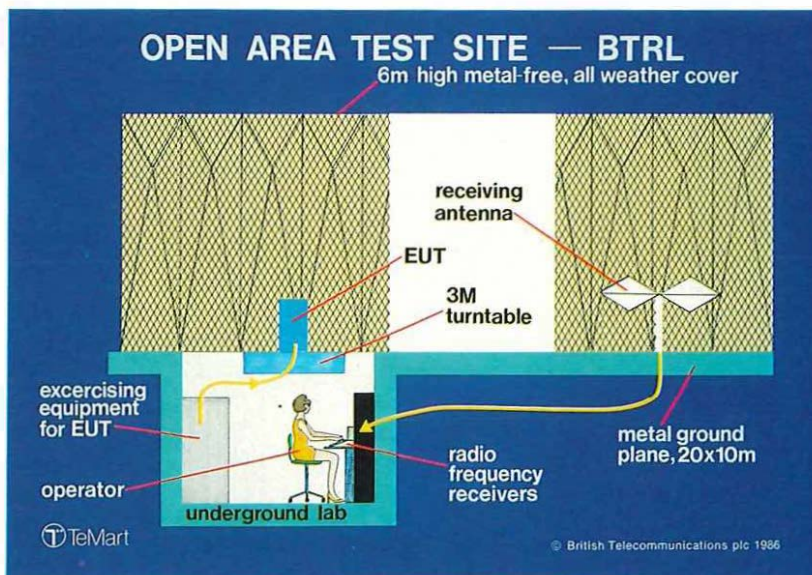
Any electronic equipment can go wrong if it is subjected to a sufficiently high level of electromagnetic interference. With the simple standard telephone this can show up as Radio One pop music or a news item during a telephone call. Equally, a small digital telephone exchange can be severely degraded either through being too close to a powerful EM source or because of disturbances on the mains. All these problems can be overcome by adopting sound EMC practices during the design stage.

Performance of the equipment can then be investigated in the electromagnetic screened anechoic chamber completely isolated from any interference coming from outside. This year many pieces of equipment being developed by BT have already been tested in it.

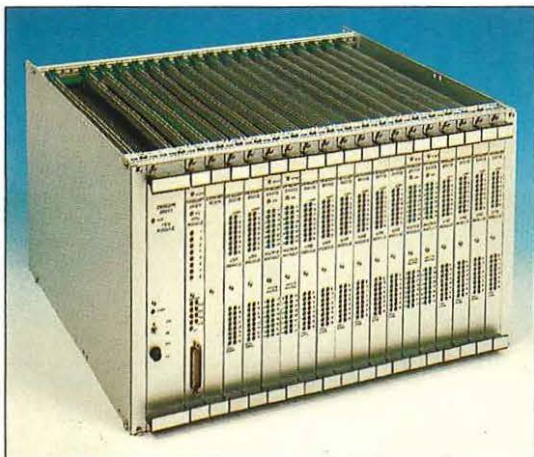
Future research will be aimed at developing measuring techniques to both simplify EMC testing of equipment parts being developed and verify the EMC performance of entire equipment during production.

As the EEC Directive will insist there is a defined level of confidence that equipment being made continues to comply with the emission standard, work is progressing on developing new, low-cost measuring techniques which are easy to use and also suitable for a factory environment. ■

Mr M Berry is head of the products support section and Mr A Slater is a member of the EMC engineering group at BT research laboratories, Martlesham Heath.



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ESTJ

The nation's politicians were on the move throughout the 1987 election campaign by aircraft, coach, train and even by canal barge. Candidates and journalists alike depended heavily on their mobile phones but to provide immediate access to the most detailed information, Maggie's Battlebus - the Prime Minister's election coach - was also fitted out with Keystream, British Telecom Mobile Communications' newest product.

Keystream has been developed to allow data information to be sent, or received by, Cellphone users. For the Prime Minister and her staff the use of Keystream meant that the latest details of the many polls, of opposition statements and of complex itineraries could be received quickly and efficiently whilst touring the country.

The system allows the transmission of data to and from computer terminals or fax machines, across the cellular radio network. Users can gain access to their own company databases, mainframe computers and public data network services such as Telecom Gold (which allows access to the Telex network) and Prestel through BT's PSS (Packet SwitchStream).

Keystream consists of a 1,200 baud modem, a device which enables text to be converted into signals for transmission by telephone, and a cellular interface unit to allow the modem to be used with cellular phones.

It can be used with a number of BTMC products - Amethyst, Ruby and Ruby II in-car Cellphones - and it is planned to introduce other interface units to make it compatible with a wider range of Cellphones.

Problems normally associated with transmitting data over a cellular radio network, such as varying signal strengths, system signalling and hand-off



Phone, fax and facts-a

Tony Brett Young



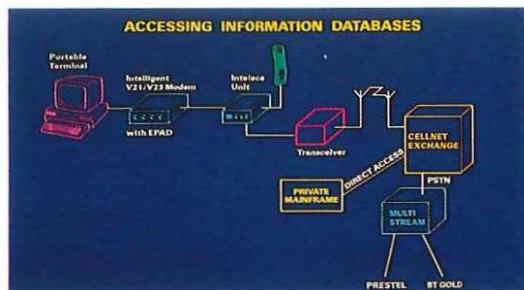
between base stations, are removed by using error-correcting software. This ensures that information presented to the user is uncorrupted.

Keystream is flexible enough to allow the mobile modem to be removed from the vehicle for use - without modification - at home or in the office, with the public telephone network.

The system is attractive to a large number of potential markets. It could, for example, be used by salesmen out on the road who need precise details of stock levels before visiting customers. Afterwards they can order directly, using Keystream to link into their warehouse computer, ensuring faster delivery. For users like this, the car becomes a second office.

There is also considerable potential for such organisations as British Gas. Meter readers with Keystream in their vehicles could call on a customer, use the system to transmit the reading to the central computer, receive a printout of the customer's statement, and deliver it within minutes of the reading.

Journalists could also benefit from the development. With the dramatic changeover to the new technology and the widespread use of electronic news gathering systems, journalists chasing a story would be able to file copy from the scene - perhaps where there were no fixed telephones. Using a lap-top personal computer, a Cellphone and Keystream, they would be able to



have direct input to their computers, as though they were in the office.

According to Mark Humphrey, BTMC's Product Group Manager, a number of other products are to be developed to suit the varied applications required by British Telecom's Cellphone customers, extending the range of data products covering both transportable and in-car Cellphones.

"We have been enormously encouraged by the reliability of our first products, and given the tremendous potential of the whole data communications field, we are confident that BTMC will expand and maintain its role as leader in mobile communications," he said.

And having had its rigorous baptism of fire in the 1987 election campaign, there can be little doubt that Keystream will play its part in fulfilling that prediction. ■

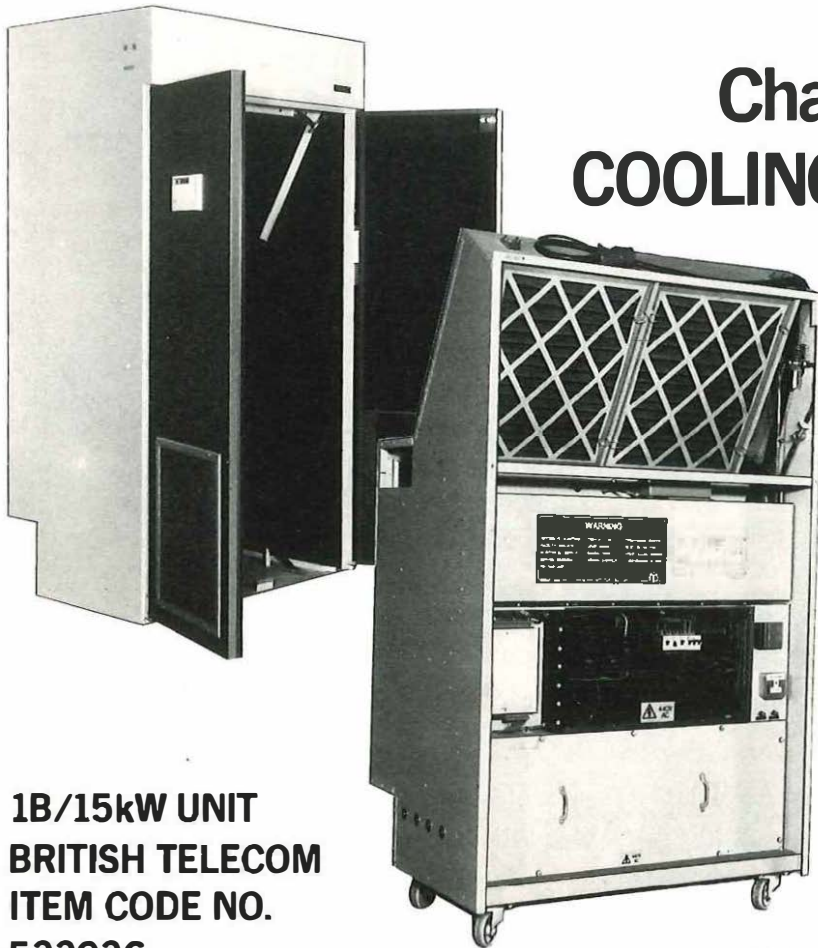
Opposite page: Brian Shallock, political correspondent for TVS, using Keystream to send a red-hot story from the House of Commons back to his studio.

Below: the Prime Minister used Keystream to keep in touch with Norman Tebbit and other party chiefs from her 'Battlebus'.

Mr A Brett Young works for BT Mobile Communications, press office.

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The 1B/15kW cooling unit will be available from October 1987 and technical literature is available now – send for your copies.

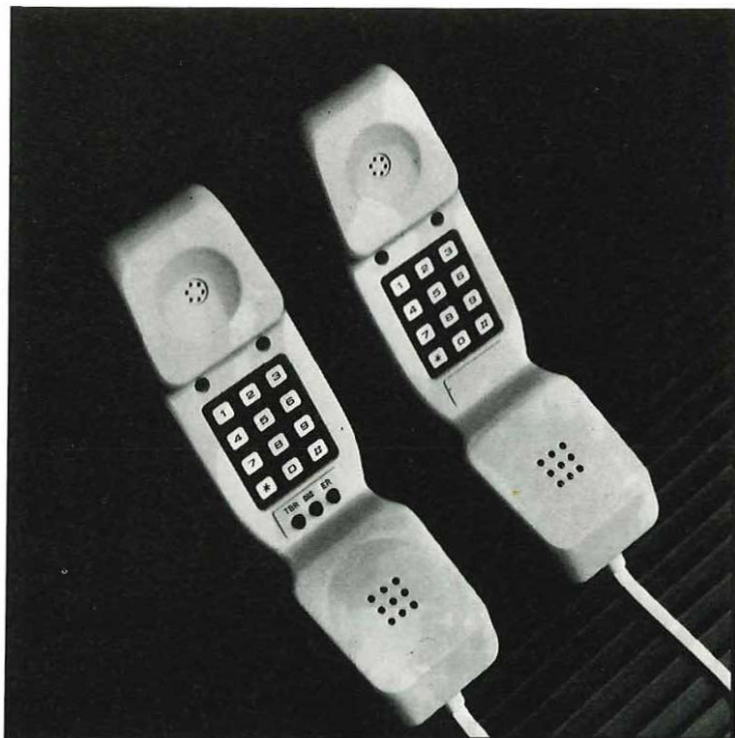
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BT bites back...new cable more than a match for 'Jaws'

Roger Smith

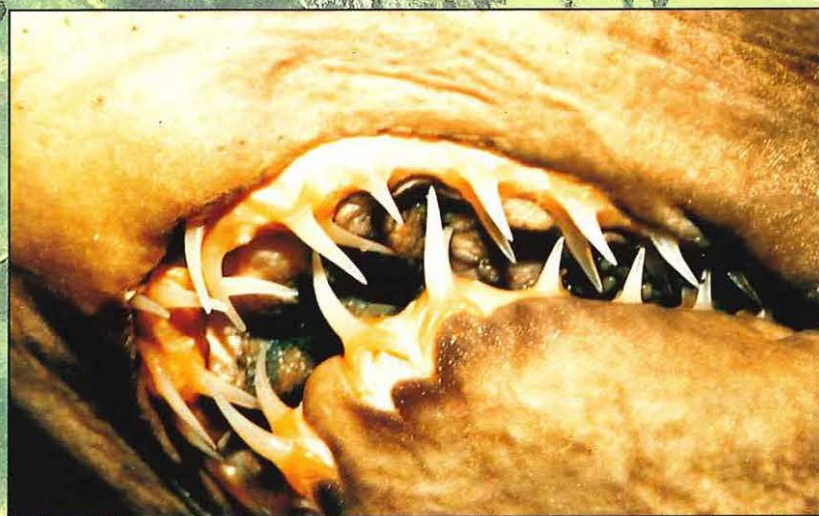
Jaws has joined the opponents of Trans-Atlantic telephone cables following the cynics who felt that such cables would be under-used and those who believed that satellites would make them obsolete. This article deals first with the sharks and then looks at the future of optical fibre submarine systems.

Whilst the enemy in terms of cable integrity for many years has been the fishermen who catch the fish, now the fish themselves have started attacking the cable. AT&T reported in February 1986 that three faults had occurred on the Canary Islands optical fibre system called Optican, between depths of 1,000 and 1,500m, over a three month period.

Investigation of these faults revealed that the damage was due to sharks' teeth which had penetrated the insulation layer of cable and caused the current supplying power to the submerged repeaters to short-circuit. Altogether 46 sharks' teeth were recovered from the cable in the repair operations and two shark species were identified as being responsible for the fault, predominantly the Crocodile Shark which lives in the Pacific as well as selected areas of the Atlantic. It is known to operate between 30 and 2,000m and does not normally scavenge off the sea bed.

Coaxial cables laid in the area of the Canary Islands have not suffered any damage due to this cause so an investigation was undertaken to establish why the sharks have suddenly taken to biting optical cables. Three major factors were identified:

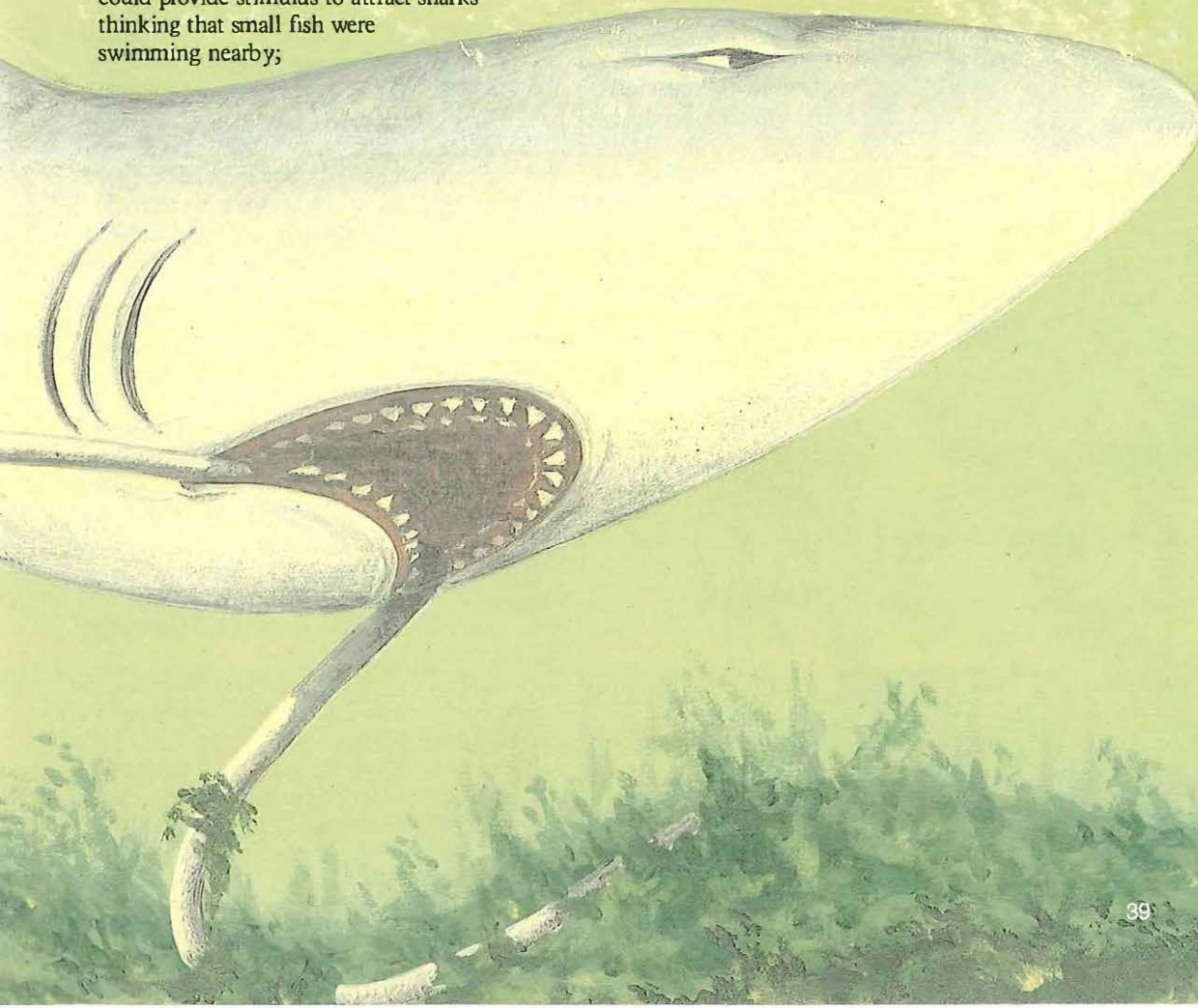
Below: fearsome visage of the crocodile shark. Picture from AT&T.





Left: British Telecom's Plough will be used to bury sections of the TAT 8 cable beneath the sea bed.

- the sea bed in the area of the Canaries is of volcanic rock heavily scoured by strong currents and it is very easy for the cable to be suspended between rocks on the sea bed. In this event the cable can vibrate due to the effect of the currents which, it is suggested, could provide stimulus to attract sharks thinking that small fish were swimming nearby;
- electrical stimulus on the cable could have attracted sharks;
- a high density of sharks in the area due to the water temperature and feeding material available in the steeply shelving coast. ▷



Opposite page: map showing the cable route 'spaghetti' under the Atlantic with the planned TAT 8 and TAT 9 which hopefully won't be on the menu for sharks.

Extensive research and testing programmes have taken place to ascertain the relevance of these factors.

Whilst it has been proven that sharks do react to an electric field, practical experience with pieces of cable carrying similar electric currents have not indicated any positive effect. It is believed that their electrical antennae only come into play very close to the prey they are stalking.

Sharks of the type that have caused the damage tend to be confined to depths of 30 to 2,000m and are not common in the more northerly latitudes.

As a result of the research it is thought that the strongest factor is that suspensions existed in the cable on the sea bed.

British Telecom International (BTI) and its partners have, therefore, decided upon changes to cable design as a protection against sharks. Generally this is in the form of a metallic screen over the existing cable covered by a layer of high-density polyethylene designed to give hungry sharks toothache.

This enhanced cable design will be taken to a depth of 2,600m on TAT-8 the first Trans-Atlantic optical fibre to be completed next year which gives adequate margin of safety against damage by sharks.

Great care will be taken in the laying of the TAT-8 system to avoid any suspensions occurring. The cost of these extra precautions on TAT-8 is small, amounting to about 0.5 per cent of the total system cost.

The fact that TAT-8 is being built at all would surprise the pundits who, in 1956, said that the first Trans-Atlantic telephone cable (TAT-1) would not fill its 36 circuits because there could never be that number of people wanting to talk between the UK and the USA at one time! However, the existence of a clear, dependable facility created demand and in

the next few years TAT-2 (to France) and TAT-3 followed. In addition circuit multiplying equipment (TASI) was also introduced to get more circuits out of the available carriers on the cables.

The development of the analogue era continued despite the introduction of high quality satellite circuits as an alternative, providing, until recently, an analogue but more flexible routing across the Atlantic. This trend resulted in the last analogue/coaxial Trans-Atlantic cable being laid in 1983 between Lands End in Cornwall and Tuckerton in the USA. This cable, TAT-7, uses a frequency band width of 30MHz to provide a capacity of 4,200 circuits.

Even before the TAT-7 system was installed, British Telecom, together with its partners in America and France, were planning the next series of Trans-Atlantic systems utilizing optical fibre technology systems providing a transparent digital service.

Economies

The increasing demand for circuits, coupled with the desire to achieve economies of scale had led to increases in capacity of each family of analogue systems over the years, and the next step beyond TAT-7 was sought. In the late 1970's all the system manufacturers as well as the major cable owners, including British Telecom International, had identified that the new technology of optical fibre communication systems was the most likely avenue of achieving these goals for future submarine cable systems.

In addition to economies of scale, the new technology offered all digital operations and a break away from the previous trend of increasing cable size and closer repeater spacing necessary to carry more circuits.

An important feature of optical fibre technology was that it allowed systems to have more than one landing point, therefore avoiding the cost and political sensitivity of routing via another country.

In this case the system was designed to have the Trans-Atlantic cable from the USA split into two paths each having one Trans-Atlantic fibre landing in the UK and France respectively. A UK-France fibre pair provides symmetry in the cable design.

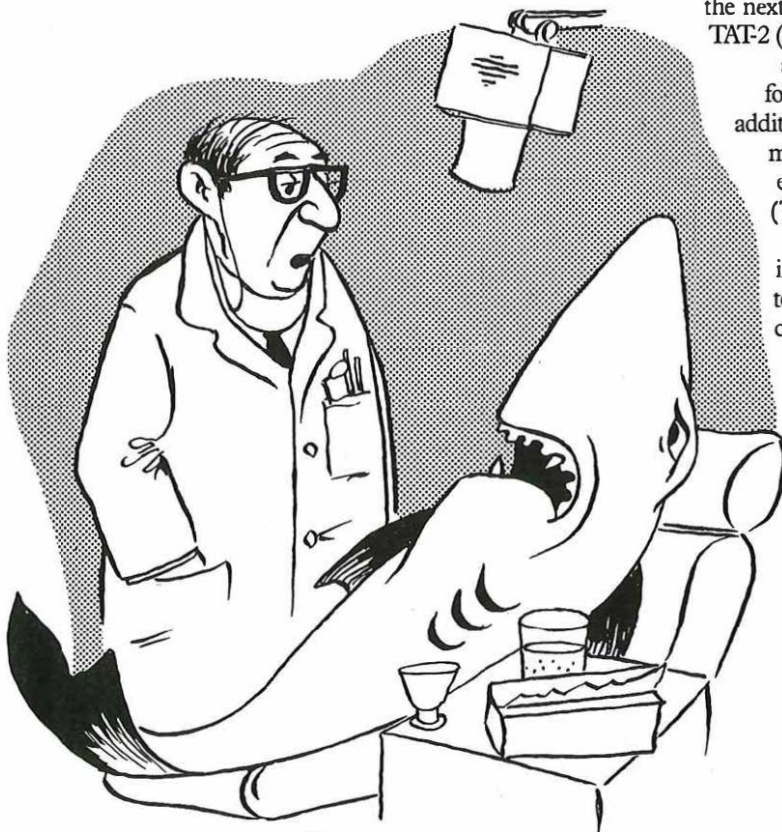
This configuration was accepted and contracts were placed in 1983 for a system of some 6,600km carrying two pairs of fibres across the Atlantic each of which carries 280Mbit/s, equivalent to 3,780 x 64Kbit/s circuits. This capacity can be further enhanced by modern digital speech multiplication techniques to give up to five times more circuits per fibre pair.

A particular feature of the construction agreement was that the provision of system equipment would be shared between the three major suppliers in the Atlantic zone, namely AT&T from USA, Submarcom from France and STC from UK.

All three manufacturers participated in a programme to ensure that their systems were compatible and this was successfully completed in February this year.

In addition, all suppliers have been life-testing the different components used in the system in order to assess failure mechanisms and lifetimes commensurate with the overall design requirement of the system which is to give a 25 year life with no more than three repairs due to equipment failure over the whole system.

"You're overdoing the fibre in your diet."



Great care was taken in selecting a route across the Atlantic which would give protection against the well-known enemies of trawlers and anchors; give maximum separation to other submarine cables, and also to find a convenient place for installation of the branching repeater where the two legs from the UK and France would be combined.

It was decided to bury all the cables on the continental shelves. In particular the Plough developed for BTI Marine Services through BT Research Laboratories (BTRL) would be used on the UK shelf. The Plough has a number of potential advantages over the American and French equivalents and intensive trials have been carried out to prove the capability of the Plough to bury the cable up to 60cm beneath the sea bed down to a sea depth of 950m. All the trials were successful.

The route from the UK to the branching unit has been surveyed by BTI using the latest navigational aids and sea bed survey methods. Typically, sidescan sonar techniques and the use of the de-trenching grapnel over the route to enable sea bed conditions to be ascertained and the appropriate method of protection selected. In the main this is by burial but in areas of the sea bed where it would be difficult to use the machine, sections of double-armoured cable have been chosen.

Particular care was given to selection of a site for the branching repeater which, it was decided, needed to be installed at a depth of around 2,000m. Unfortunately, the sea bed shelves very quickly between 100m and 4,000m and a convenient site with gently sloping access was difficult to find. However, a position was found called the Meriadec Terrace which is a small plateau around which the continental shelf quickly slopes down to the Abyssal Plain.

Each of the manufacturers have laid cable and repeaters to test out their various designs. In the STC case, this involved laying a loop of cable and a repeater in Loch Fyne in Scotland.

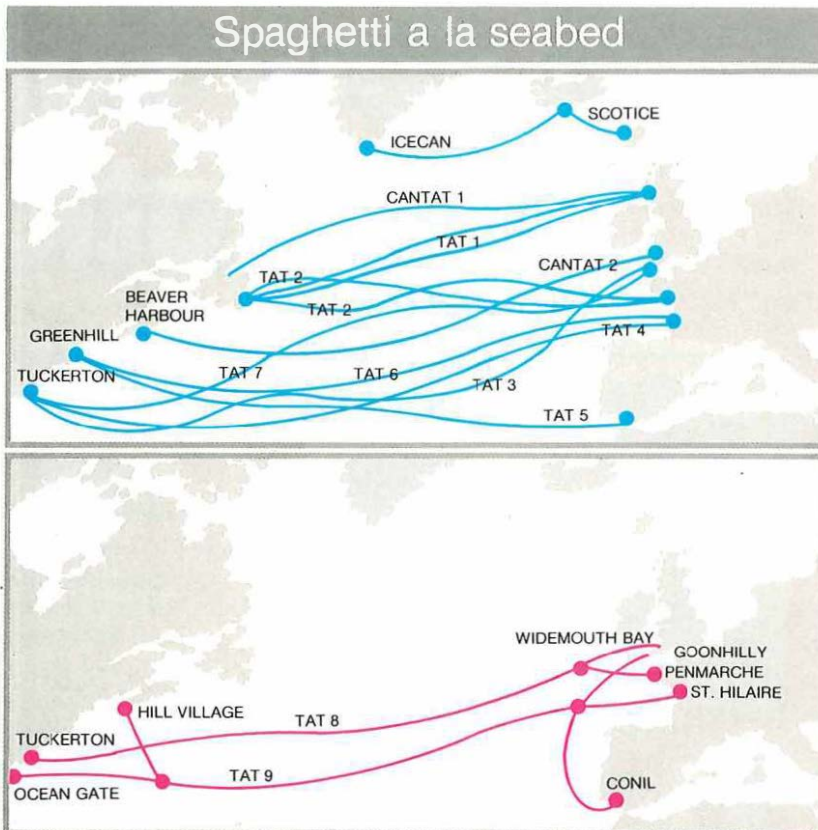
For AT&T, after initial cable laying trials they decided to install a system with the Spanish Company Telefonica, which would subsequently be taken into commercial use linking two islands in the Canaries group, namely Gran Canaria and Tenerife. This cable was installed in September 1985.

Protection

This was followed by the first commercial international system, UK-Belgium 5 which was laid in April 1986 between Broadstairs in the UK and Ostend in Belgium. This system was provided by STC and provides the same capacity per fibre pair and uses much of the same technology as TAT-8.

Future optical systems are being planned for provision across the Atlantic. In particular TAT-9 is currently the subject of negotiation between the partner administrations and companies that will share in its construction.

Particular features of the TAT-9 system are not only its larger capacity; each fibre pair will carry twice the capacity of TAT-8, but also the fact that it is likely to employ new technology using a 1.5 micron optical system which will need less repeaters than the present 1.3 micron technology as used in TAT-8.



Additionally, it is proposed that the network will be more complex than for TAT-8 with five landing points in all. On the western side, USA and Canada and on the eastern side, the UK, France and Spain. The flexibility between these different landing points will be assisted by the provision of branching units comprising submerged multiplex equipment giving a degree of flexibility of traffic capacity in the event of changing traffic forecasts and restoration requirements etc.

The TAT-9 system is planned for completion in October 1991 and design work on the systems and the submerged multiplexers has already started. Future research into ultra-low-loss fibres and optical amplifiers suggests that the development of this technology is far from finished and that there will be optical fibre submarine systems across the Atlantic for many years to come. ■

Below: broken shark's teeth removed from the Optican cable compared with an American 10 cent coin. Picture from AT & T.

Mr R Smith is submarine system planning and projects manager with British Telecom International.



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Telefault T-50 and Telefault XT are intended for local line testing on modern multi-pair telecommunications cables. The longer range XT also features an RS232C output available for interface with the 'Teleprint' hard copy printer.

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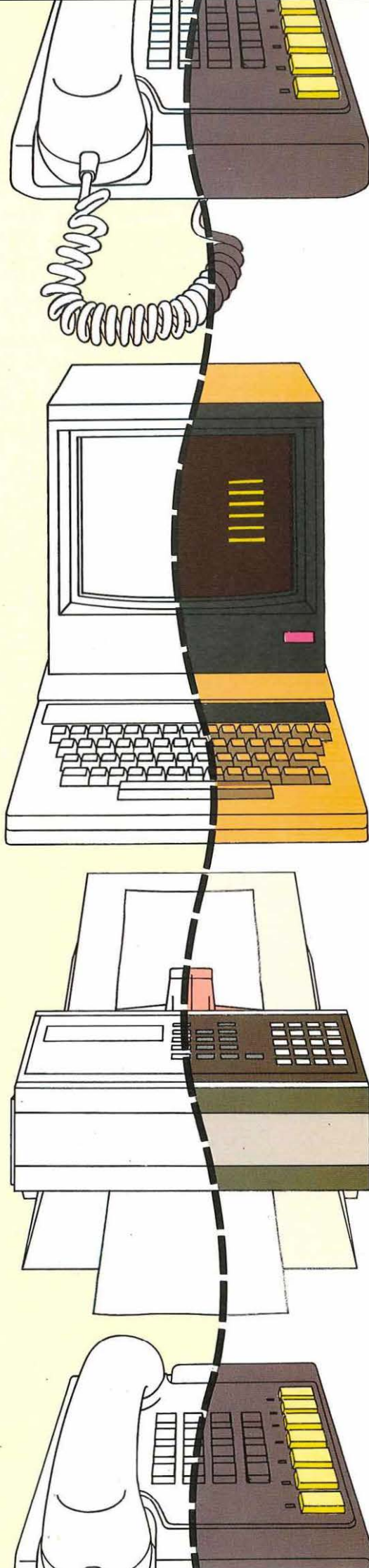
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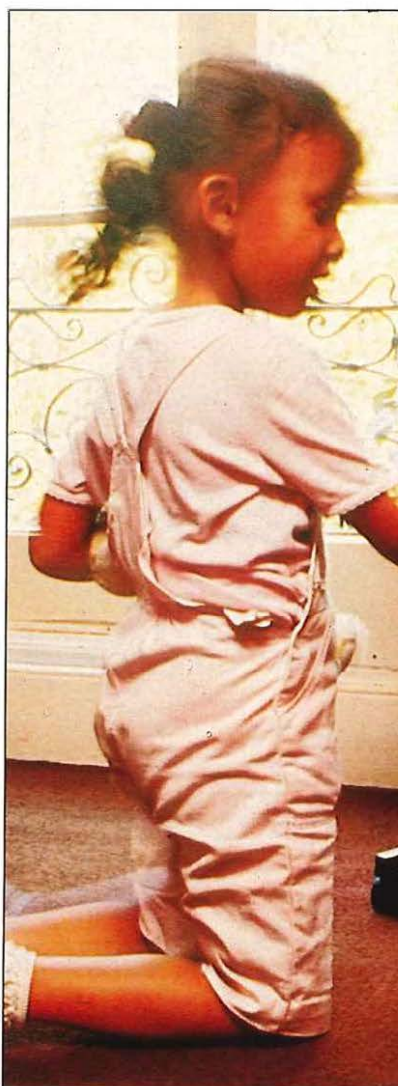
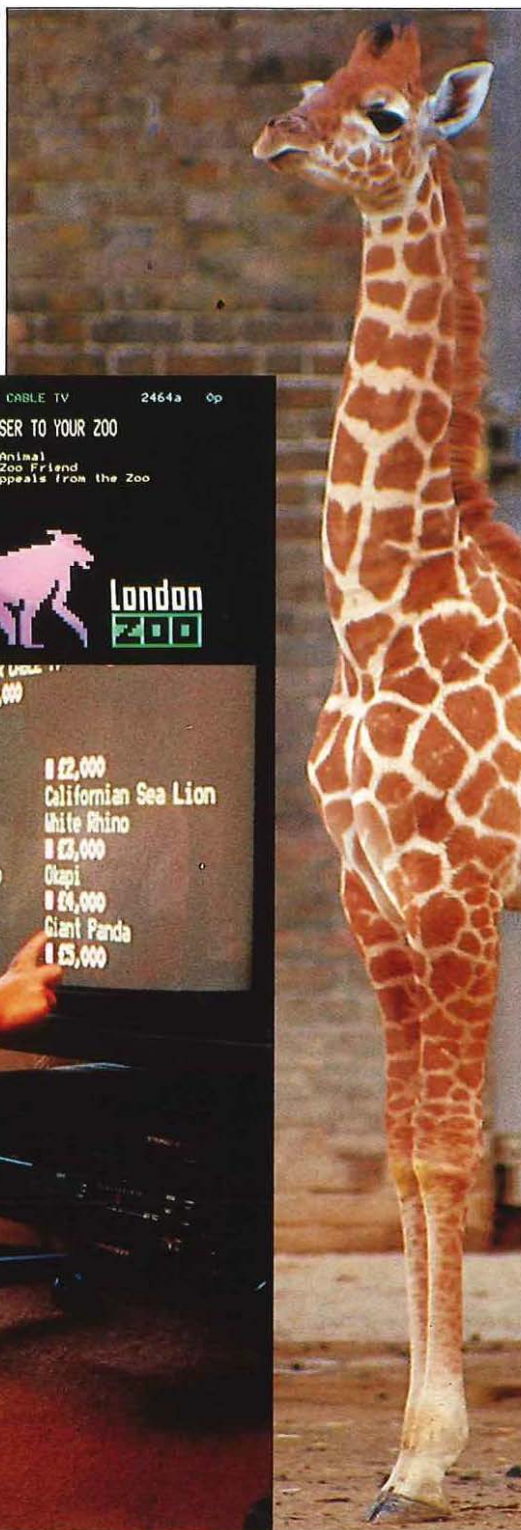
Lords, lions and languages -the world at your fingertips

John Powter

Westminster Cable's live wire to the zoo enables animals lovers to:

- look at a zoo diary covering events and special days
- catch up on zoo gossip including recent births and arrivals and the latest news on lions, lizards and the rest of the animal kingdom
- adopt an animal, become a zoo friend or just read about the latest appeal
- learn about opening times, prices and facilities.

People living within the boundaries of the City of Westminster can enjoy the benefits of the most advanced local communications system in the world, developed at British Telecom Research Laboratories, Martlesham Heath, near Ipswich, installed by BT's West End District. This article looks at some of the services on offer.



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2 Become a Zoo Friend
3 Special Appeals from the Zoo
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The Westminster system uses the latest fibre optic technology coupled to sophisticated control and video switching mechanisms installed in street cabinets.

The company responsible for marketing the product is Westminster Cable Company, which has been awarded the franchise to supply cable television to the Westminster area. Westminster Cable is an independent company, but has a significant British Telecom shareholding. The technology has been a considerable investment for BT - in terms of both development and installation costs indicating a serious commitment to the project.

The modern city could not exist without mains services - heating, lighting, telephones, sewerage and water. But these services did not occur overnight. There may have been resistance to the introduction of these amenities but these days nobody could exist without them. The installation of an advanced local cable TV system can be seen as the equivalent to the provision of a major new public utility and the City of Westminster is in the vanguard.

Local cable TV systems are seen by the public as simply delivery systems for cheap entertainment. And there is often opposition by local community groups to their installation.

But Westminster viewers can receive a wide variety of educational and entertaining programmes - 20 channels, some of which operate 24 hours a day. In addition to the four normal off air channels (BBC1, BBC2, ITV and Channel 4) the customer can have access to an arts channel; Lifestyle, aimed mainly at the housewife and live continuous coverage of the proceedings in the House of Lords.

Super Channel is a general entertainment channel which shows reruns of some of the most popular British TV series; TV5 is a French language channel showing a selection from the French broadcasters, including news every night and World News Channel displays text directly received from Reuters as well as two hours of programming from the USA aimed at Europe. The Arabic Channel provides entertainment for the many Arabs living in

and visiting Westminster, including half an hour of live news brought in each evening from Dubai by satellite. Bravo is a channel for those interested in classic movies and the Cable News Network provides a continuous news service.

Others include Premiere offering 20 new films a month; a Children's Channel; Screen Sport and Music Box for pop fans.

Customers also have access to an interactive text service from their ordinary TV set which includes a complete programme guide, community information, local news, information from the London Zoo, the London Fire Brigade and an up to the minute weather forecast. There are also home shopping services which enable viewers to order a meal from a menu displayed on screen and have it delivered to the door.

It is this sort of interactive service which sets Westminster apart from most other cable TV systems. With no extra equipment in the home, the domestic television has become an information terminal. The network will soon be connected to Prestel and other text based information systems and there is also the capability to display Photovideotex - photographic images stored in a computer. And, of course, the video library, which is described in another article on page 72.

But the network is capable of much more. It is possible to bring a video picture back from the customer, opening up the possibilities of video telephony. The network could be connected to the videoconferencing system, allowing businesses within Westminster cheap and easy access.

Those who live and work within the franchise area will be in a privileged position. No longer will their communications be constrained by the limitations of the existing telephone network and soon there will be a wideband pipe to everybody. It has taken 90 years for the telephone to penetrate nearly every home - how long will it take until pictures accompany speech? ▷

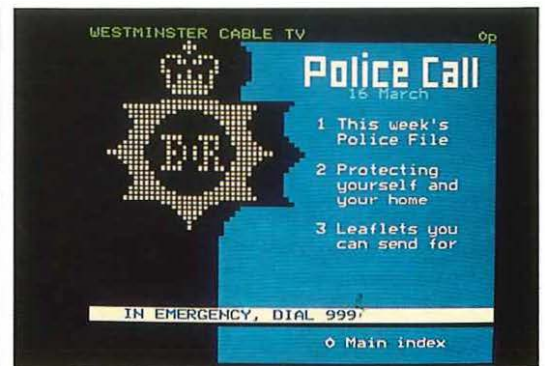
Below: the area served by Westminster Cable.



Left: Westminster Cable's control room.



Above: channel 'menu' displayed on the customer's TV set.



Examples of what the service offers — a complete weather forecast, 'cable nosh', a guide to home cooking and . . . just in case there is an accident in the kitchen . . . where to go for help. *Customer choice pictures by Westminster Cable Company.*



Mr J Powter is BT's Broadband Services development manager.

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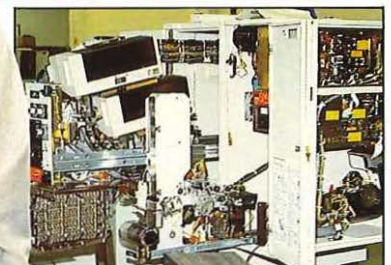
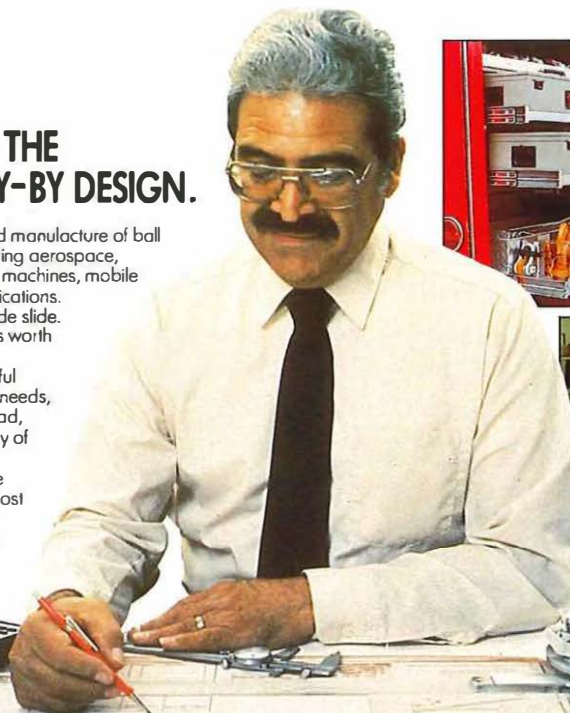
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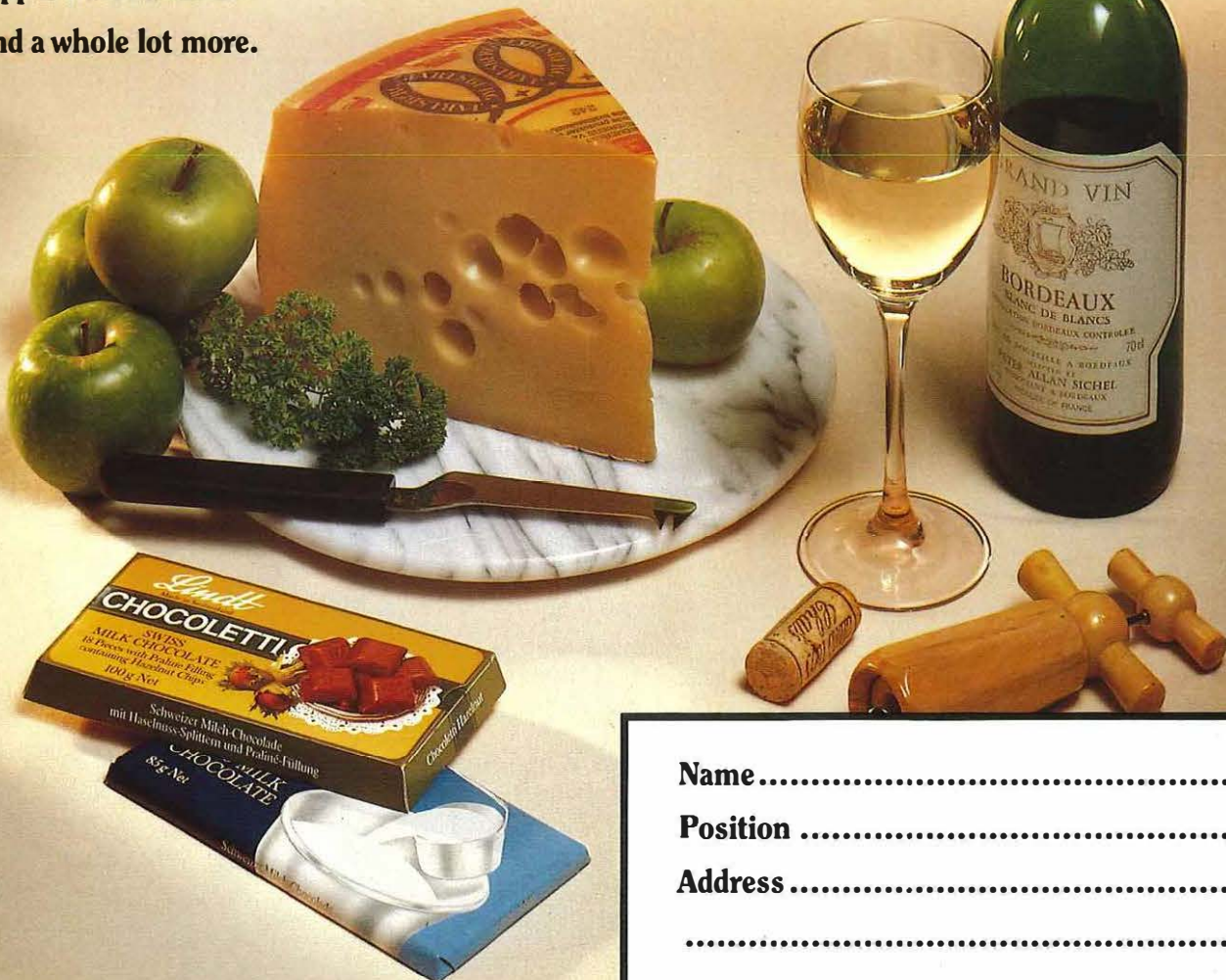
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British Telecom's successful reputation as a defence contractor continues to grow with a record £130 million order to build a digital communications network, known as Project BOXER, for the RAF. In the last issue *British Telecom Journal* looked at Operation Fastnet for the Army and future articles are planned to illustrate BT's achievements in the important and highly competitive defence arena.

Project Boxer takes off

Derrick Roach

The multi-role Tornado is the RAF's front-line attack aircraft.

The Ministry of Defence's decision to award the £130 million Project BOXER contract to British Telecom is the culmination of lengthy negotiation which followed an earlier Project Definition Study contract which BT secured against strong competition from a number of established UK communications companies and organisations.

The latest contract is to design and undertake the construction of Project BOXER which, together with a sister project, UNITER, in which BT also has some involvement, will form the RAF's Fixed Telecommunication System in the UK. The network will also serve Royal Navy, NATO and other defence users.

BOXER will provide secure and fully protected telecommunications links to more than 200 sites throughout the United Kingdom and is the single biggest defence contract ever won by BT who is appointed prime contractor. The contract which



will take about eight years to complete, calls for the maximum use of competitive tendering for the supply of equipment and other subcontract work. STC plc have been appointed sub-contractor for long-haul optical fibre installations.

A dedicated project team has been set up within BT Government Services Division to undertake the project and provide the many thousands of kilometres of fibre optic and microwave radio communication links, which are the major elements of the network.

One of the major roles of the Royal Air Force is the air defence of the United Kingdom and in the execution of this task it employs a wide variety of resources ranging from fixed ground radar installations, airborne early warning (AEW) aircraft through to the front line attack aircraft of which the multi-role Tornado is a supreme example.

Such aircraft are highly complex costing over £10 million each but require sophisticated ground-based command and control systems in order to achieve their overall maximum effectiveness. All these elements of the air defence system need to be linked by a comprehensive and efficient communications system.

In looking at requirements for this communications infrastructure the RAF evolved their concept of a defence owned network to be based on the then emerging digital technology. The network would be similar to those entering civilian service, but with two additional key features to meet military needs: security and survivability.

In military terms, security is the protection of information from unauthorised access and survivability is the ability of the network to



withstand hostile attack whether physical or electronic.

The integration of all these factors into a single network was seen to be essential in achieving the degree of resilience needed to ensure vital operational traffic would be carried even under conditions of severe stress. Thus ▷

Above: project manager Derrick Roach (standing) and members of his team use a computerised drawing board to speed up the planning of the RAF Boxer communications network.





the concept of a secure survivable integrated network (SSIN) was evolved.

The realisation of the SSIN came with the two projects, UNITER and BOXER. UNITER, which provides switching and some basic interconnecting links based on BT MegaStream bearers is being deployed now.

This is a two-tier, common services switched network with access switches at all nodes serving the local community and all on-site services. A small number of these will also function as trunk switches. The ability to reconfigure the network to suit the traffic demands or to overcome areas of severe damage, provides one level of resilience.

BOXER is the defence owned bearer element, which being deployed as a heavily meshed network employing a variety of types of transmission will provide a further degree of resilience. All elements of the network are protected against physical and electronic attack or interference.

The purely representative network illustrated on this page demonstrates the complementary deployment of defence and civil bearers which gives the necessary survivability. The BOXER network of high, medium and low capacity digital bearers has been designed by BT Government Services during the Project Definition Study and is closely configured to the RAF's operational requirements extending into the next decade.

At the outset it was recognised that it would be necessary to dedicate resources to the task and the BOXER Project Office was set up. Initially, a small team of individual specialists was brought together to respond to the invitation to tender and later, with the successful award of the contract, to undertake the definition study.

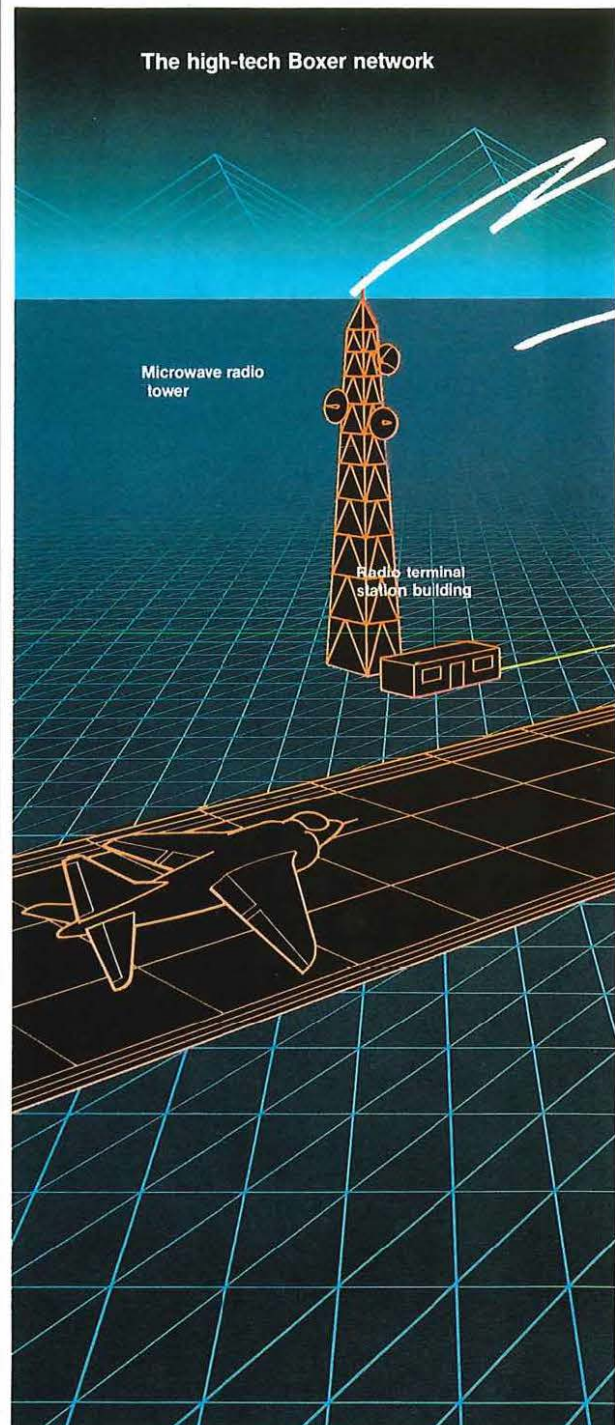
The team was later augmented by several out stationed, two-man planning teams to carry out

Above: interference-proof buildings house the Boxer equipment and although weighing eight tons when empty they can be easily flown to the remotest spots.

field surveys. With the original team still engaged on the project, ensuring overall continuity, the staff has already expanded in readiness for the main thrust of implementation. It is now to be built up to its full complement as the project rolls out.

The central team will carry out all the planning, surveying and overall project management work and will procure the equipment and services required by sub-contract - invitations to tender are already issued. The team will also coordinate the activities of client and supporting agencies throughout the implementation programme.

UK Communications district staff will provide support in the field, this time with emphasis on the works side and outstationed works management teams at convenient locations across the country to control civil works, radio tower construction,



antenna and waveguide installation, testing and commissioning.

A new design of transportable building screened against electromagnetic interference has been developed jointly by the Project Office and the manufacturer. The buildings have enabled the major equipment installation work to be carried out at a new centralised installation facility set-up for the purpose at BT Fulcrum where all installation, testing and proving of systems can be carried out under factory conditions.

Weighing more than eight tons, the buildings will be transported to site - often in inaccessible places such as radio stations on mountain tops - where they can be commissioned and brought into operation with the minimum of delay. At the peak of production the factory will be turning out

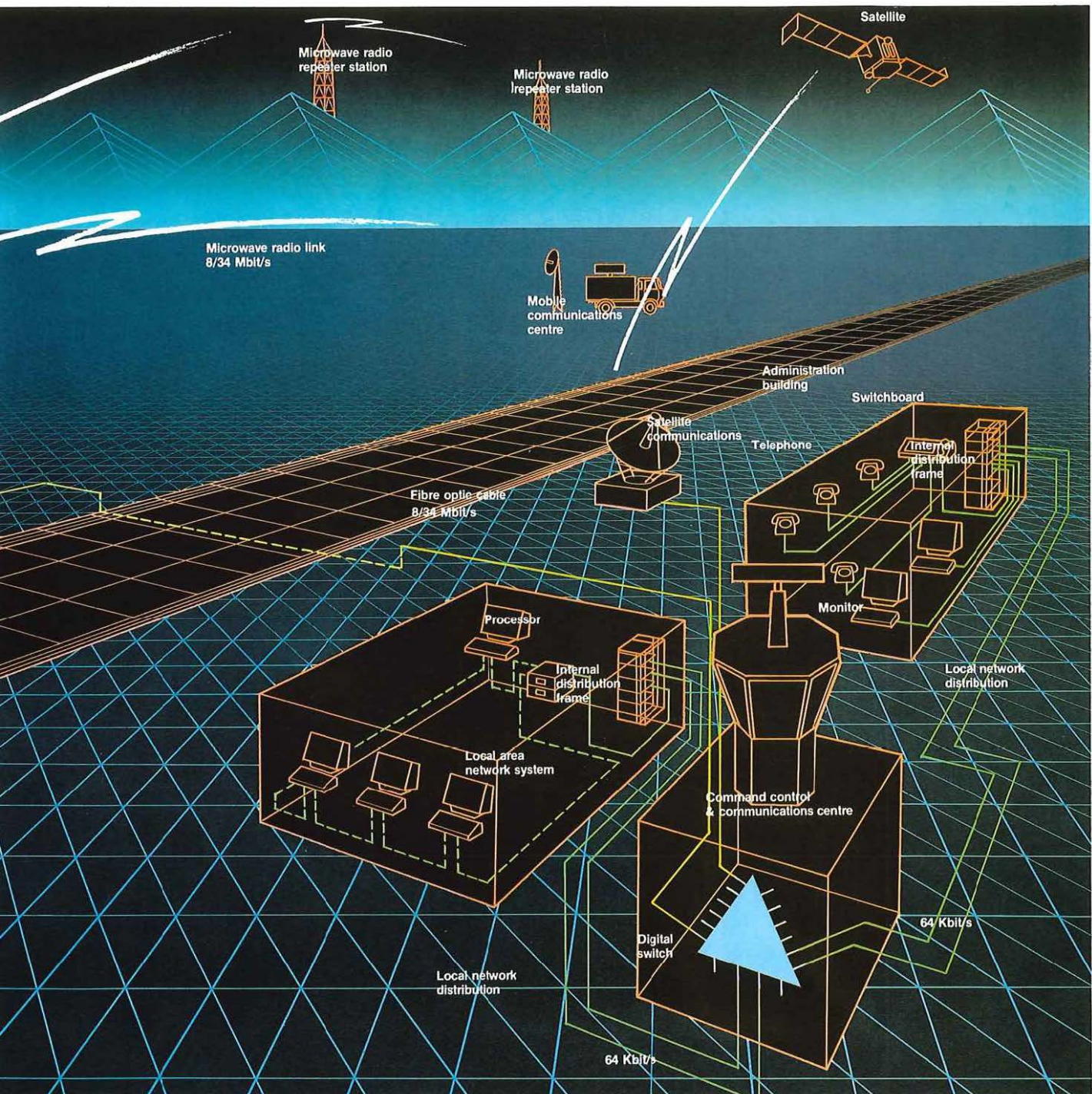
completed units at the rate of one per week.

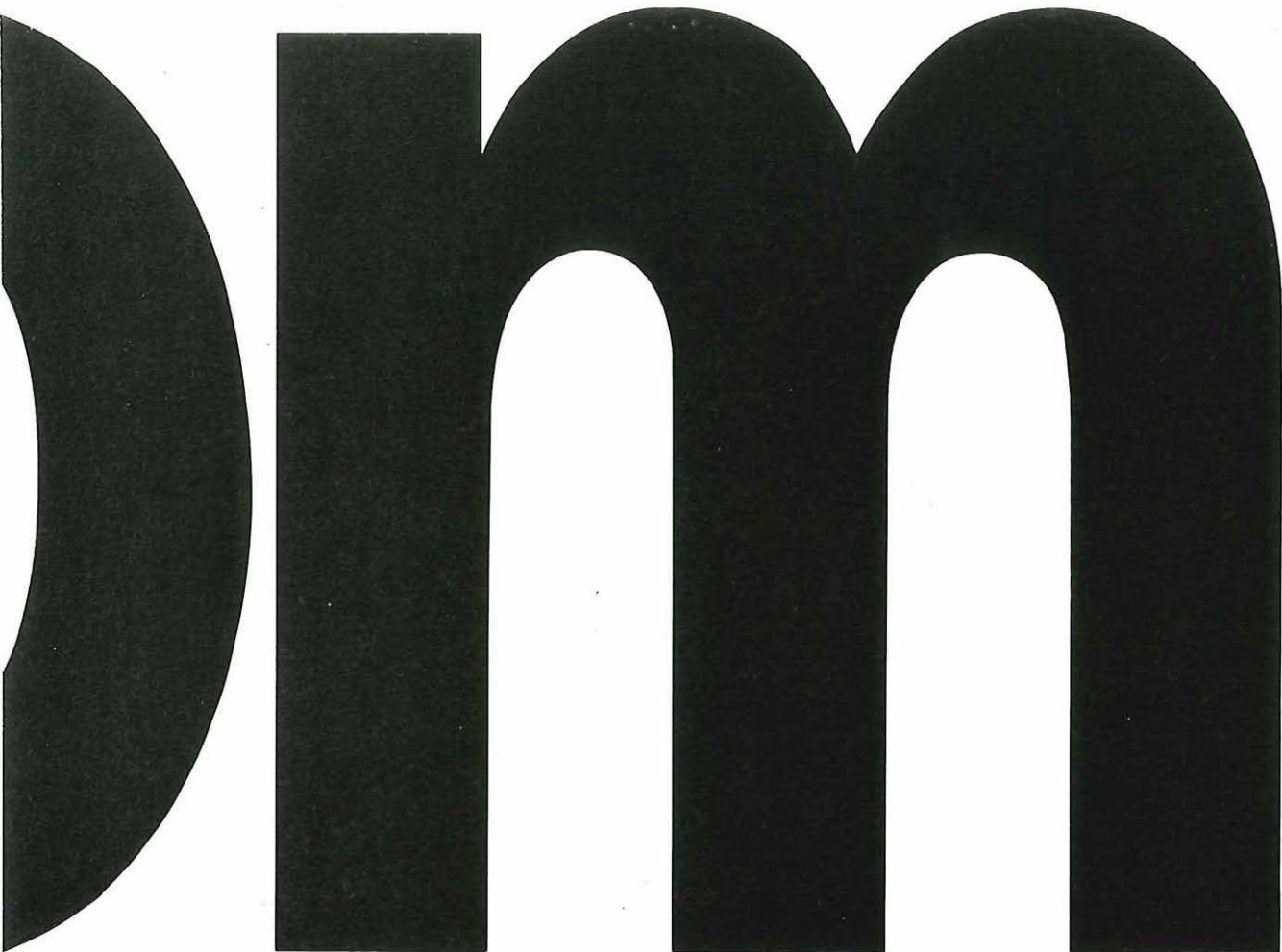
Consistent with the overall approach to the project all the latest computer based facilities are employed - for internal office communications; external communications to the client sub-contractors and field staff; for network design and planning, frequency management and project control.

Further major contracts are foreseen drawing on BT's unrivalled experience in the provision of large networks. In the military sphere alone the defence budget for electronics and communications amounts to some £750 million per annum of which some £300 million may be expected to cover fixed communications networks. In the civil field, de-regulation of telecommunications in UK could well lead to an increase in the number of privately owned networks. ■

Below: the RAF will be flying high with their own network control from the ground to satellites in space.

Mr D G C Roach is head of British Telecom's Government Services Special Projects Section.





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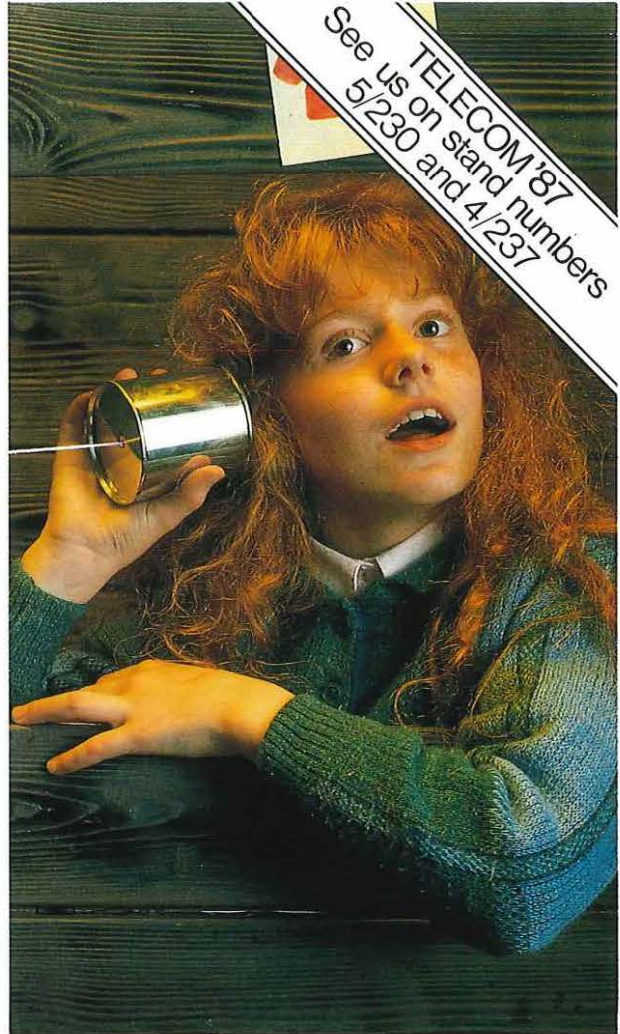
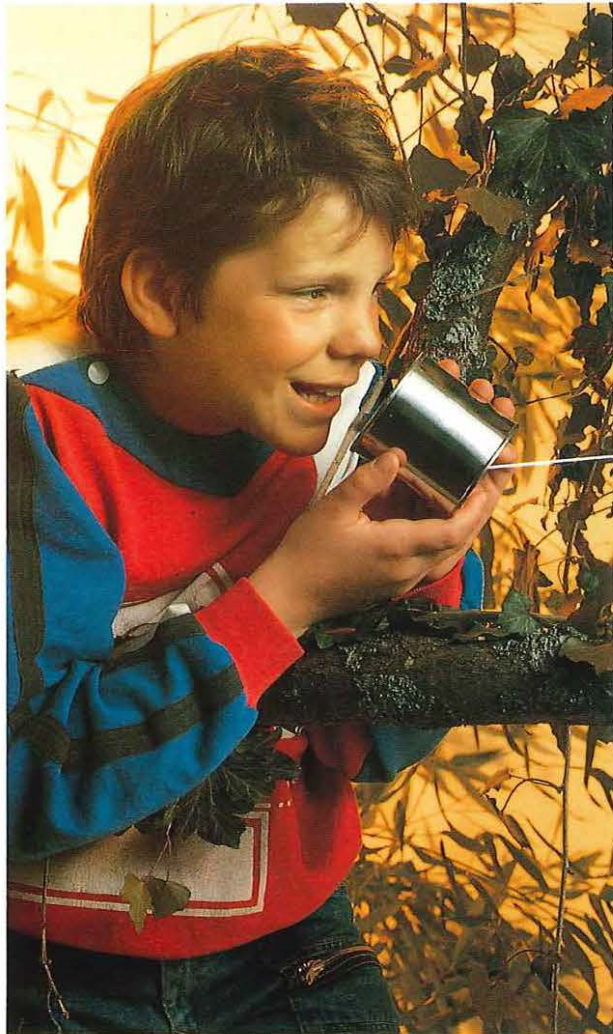
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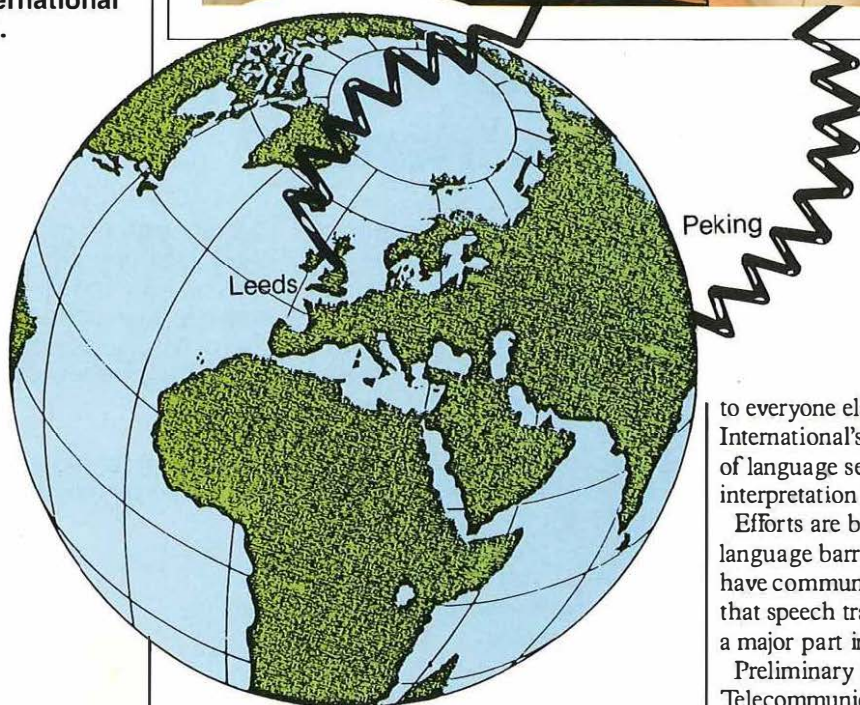
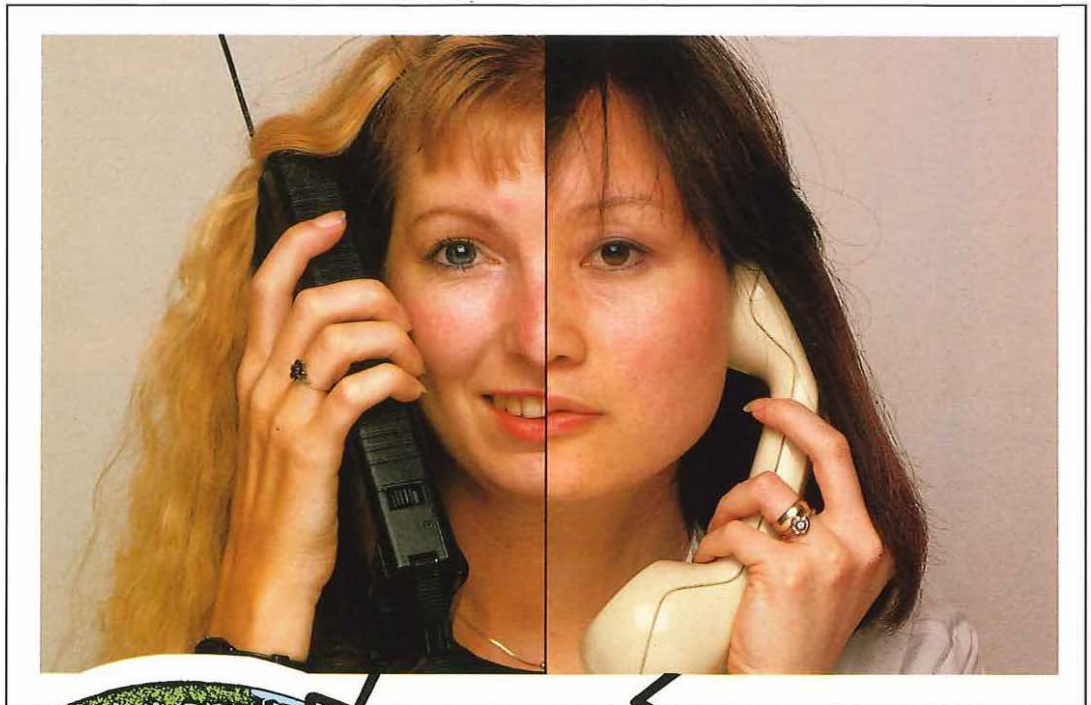


It's the real thing- computers teach the world to speak

Fred Stentiford

Minds in harmony whether it's Chinese or English.

Language barriers present the greatest discouragement to international telecommunications. British Telecom is working on an effective automatic speech translation system which would stimulate considerable traffic by allowing more people of all nationalities to make personal use of the international networks.



Early in 1986, British Telecom Enterprises Network Nine Conference Call Service teamed up with Interlingua TTI, a translation agency, to offer a simultaneous translation service in 76 languages in which the interpreter and the speakers can all talk and listen

to everyone else. In addition, British Telecom International's Bureau Service also offers a variety of language services including simultaneous interpretation in six European languages.

Efforts are being made worldwide to overcome language barriers and the Japanese, for example, have communications problems to such an extent that speech translation is ultimately expected to play a major part in future Japanese telecommunications.

Preliminary research at the Advanced Telecommunications Research Institute at Osaka is costing around £10 million a year and prototype equipment is not planned for many years.

Several other research groups including that at Carnegie-Mellon University in America are also working on the problems of translating conversational discourse.

Research into the automatic computer translation

Keying into knowledge

A set of over 400 business letter phrases having a vocabulary of over 1,000 words were analysed and keywords extracted in several languages. The 15 best keywords in performance order in English, French and German were:

English	French	German
the	de	wir
of	vous	sie
our	à	mit
yours	votre	die
in	en	in
for	notre	uns
shall	par	ihre
we	je	ihnen
you	les	ein

English	French	German
to	pour	und
a	nous	für
have	nos	ihr
are	des	nicht
this	monsieur	empfehlen
no	que	der
and	le	wird

Rather surprisingly, the words bearing the most information turn out to be the commonest words in each language. Unfortunately, these words are also amongst the shortest and are consequently the most difficult for speech recognisers to handle. However, using 100 such keywords all but four of the 400 English phrases are distinguished by three keywords or more. This provides significant protection from phrase confusions arising from possible recognition errors.

of text was started in British Telecom's Technology Executive in 1984, but, more recently, advances have been made in the field of speech translation.

Three technologies are required to produce a speech translator – a speech recognition device to tell the computer what was said; a speech synthesis device to enunciate the translation, and the translator itself. Unfortunately these technologies cannot reproduce the corresponding human abilities to carry out the same tasks. Speech recognition is especially prone to error so that similar sounding words with completely different meanings can be mistaken for one another. In some cases, context and also alter meaning considerably.

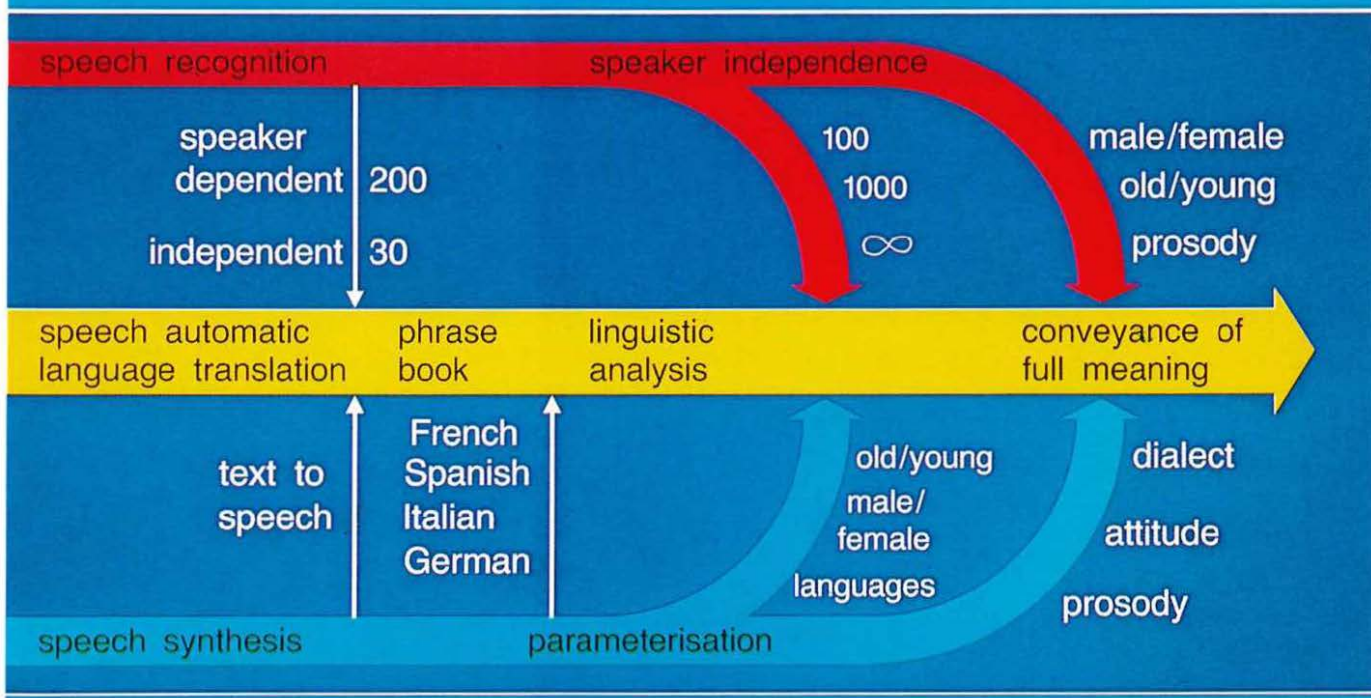
Understanding outputs let alone translating them can be a difficult task. Research has indicated that if the domain of discourse is restricted, the number

of distinct messages is also limited and can be listed in a large phrasebook.

Secondly, it has been found that much of the information contained in a message exists in only a handful of keywords which can be automatically selected for any given phrasebook. This means that the speech recogniser can be instructed to recognise only a few words and is, therefore, more likely to get them right. Furthermore, several keywords must be in error before phrases are confused and this provides the system with some immunity not only to recognition errors but also the the variability of the speaker's mode of expression.

Existing textual automatic translation systems are normally used as an aid for human translators who can pre-edit and post-edit material to remove inaccuracies. A user who has no knowledge of the ▷

SPEECH TRANSLATION RESEARCH



target language is reluctant to employ such systems because he would have no assurance that the translation still held the intended meaning.

A phrasebook, however, is prepared by expert linguists and the translation of any phrase can always be guaranteed to be accurate. Such a system, however, is only useful if the desired messages are present in the phrasebook and can be accessed quickly.

Flexibility

Some flexibility is clearly required in a phrasebook to cope with names, dates, times, places and other sub-phrases. Separate phrases for each combination would be totally impractical. Spoken names, for instance, often cannot be recognised but neither do they need to be translated. The vocabulary for dates, times and places could amount to several hundred words and would certainly introduce extra recognition confusions and ambiguities.

Researchers at British Telecom's Martlesham Heath laboratories near Ipswich have designed and built a prototype two-way speech translation system between English and French based on these ideas.

It consists of two Merlin 5200 personal computers connected through an RS232 link and containing commercially available speech recognition and synthesis hardware.

An English speaker pronounces a phrase into one Merlin machine which is then repeated back to the speaker by an English synthesiser for confirmation. Once this is done, phrase codes are transmitted to the second Merlin computer which synthesises the French translation. A symmetric operation can then be carried out in the French-to-English direction.

Speaker-dependent isolated-word technology is

used, so input speech is far from fluent. The recogniser, therefore, must be trained to the voice of each speaker if an acceptable performance is to be obtained.

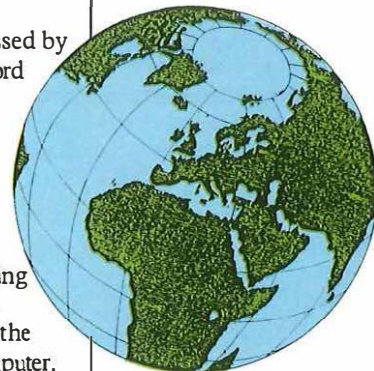
Phrase parameters, such as dates, are processed by first identifying the basic phrase using keyword recognition. The position of the date in the phrase can then usually be deduced, and a second recognition scan is carried out over a recording of the original utterance, but this time only recognising 'date' words.

This manoeuvre effectively increases the vocabulary of the recogniser without degrading performance. Names are located in the same manner but no recognition is attempted and the actual speech is transmitted to the other computer. The spoken name is then embedded in the synthesised translation.

It is planned to exhibit this prototype system operating in English, French and Spanish in Geneva at TELECOM '87. Other languages including Italian, German and Swedish are in preparation.

In the future, speech recognition devices will become speaker independent and will handle continuous speech with larger vocabularies. Recognition of intonation, stress and prosody will reveal additional levels of meaning which we all use in our day-to-day speech and may wish to be translated.

Synthesisers will produce more natural sounding speech which can be matched to the voice of the original speaker. These developments should yield translation aids which will find application in areas as diverse as holiday booking, channel tunnel messaging and immigration control. ■



Dr F Stentiford is head of the recognition theory and automatic language translation group, BTRL, Martlesham.

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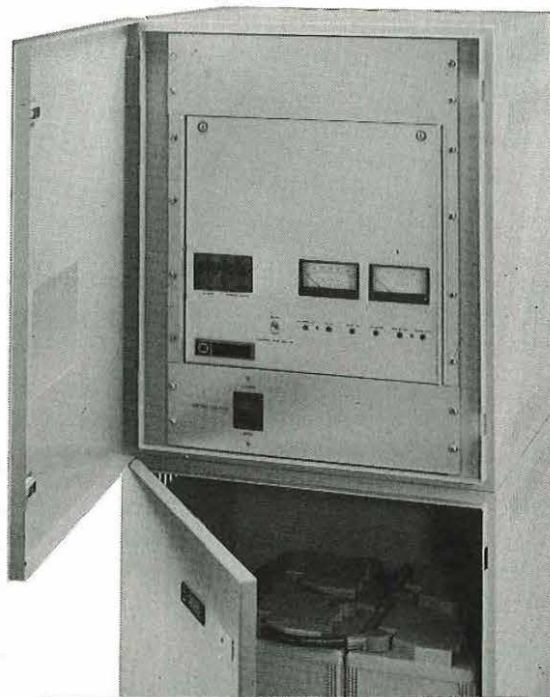
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Going Dutch on privatisation

Charles Markus



Privatisation plans are the subject of heated debate in the Dutch Houses of Parliament in The Hague.

With the focus on international affairs highlighted by the Telecom '87 exhibition in Geneva, *British Telecom Journal* looks at plans to privatise the Dutch PTT in the near future. The political debate in Holland continues and its outcome is of great interest to BT which looks forward to a continuing and strengthening partnership between the two privatised companies in the 1990's.

Dutch Prime Minister Mr Ruud Lubbers is firmly behind plans for privatisation.

For some years Dutch politicians have been talking about opening up the markets in the Netherlands to competition and about setting in motion changes very like those experienced in British Telecom.

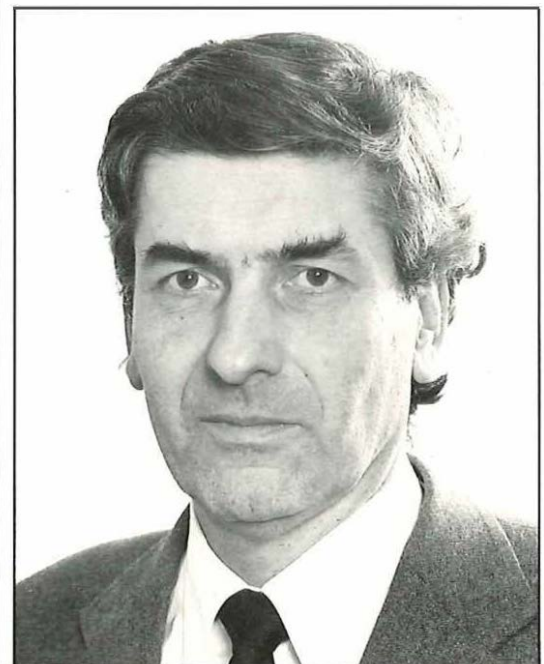
The debate on the future of the Dutch PTT goes back to 1981. The Swarttouw Committee was set up in July of last year to see what changes were needed in the role of the PTT and in March 1982 the Committee reported. The debate raged for some time until, in January 1984, the Government at last reacted.

It was disappointing to many in the PTT and to those who favoured liberalisation of the markets that the Government, many believed, ducked the issue. While it is said it agreed broadly the recommendations of the Committee, it launched a further detailed study into the PTT's future. In this lengthy process of debate on change another half year passed until, in June 1984, the Steenbergen Committee was established.

It took until the end of 1986 for the Lubbers Government to decide what to do about the Steenbergen Committee's report which again recommended change. The Lubbers Government, reinforced by its success in the Dutch General Election has now boldly pressed ahead with reform to secure a new set up of telecommunications in the Netherlands for 1989!

The legislation planned would be a remarkable landmark replacing the 1904 Telegraph and Telephone Act on which the Dutch PTT monopoly of telecommunications and its structure as a Civil Service Department are currently based.

The Dutch PTT would, indeed, become a privatised company although what the Dutch mean by privatisation is rather different than in the UK. The form of the Dutch Telecom company is planned to be a NV (Naamloze Vennootschap) – initials which are familiar to a number of us who are aware of similar companies established, such as Alcatel NV. But the shareholding would be rather strange for those who think of a privatised company as owned by the private, not the public sector.



In the Netherlands, the Dutch Telecom NV is planned to be 100 per cent Government owned, at least in the first stage. The Government control of the NV may well extend to control of the prices of many of its activities and setting, in advance, the dividend to be paid to itself.

Where the company should look much more like a private company is in its accounts which will no longer be directed towards the need of providing cash books in a Government Department. The PTT is expected to be divided into a monopoly network unit and a separate competitive entrepreneurial unit.

The company should be much more commercially orientated in its management and its investment plans should not be controlled in the same way as before by the Government. It will be marketing its services and products in competition with others and plans include liberalisation of the Customer Premises Equipment and Value Added Services markets.

Inspired

But before this change takes place, one last politically inspired move is under way. The Dutch Government has been intent for some time on transferring the PTT HQ to Groningen in, what is for the Dutch, the economically somewhat depressed North East of the country. The National Telecom Headquarters is due to move by 1st July 1988. This has been very controversial and hotly contested by the staff but, nonetheless, it seems there is determination for it to go ahead. The likelihood is that their equivalent of BT's Secretary's Office will move and that Board meetings will be held symbolically in Groningen.

It would also be wrong to view the political debate as concluded. Much can happen between now and 1989! The new law is still at the draft stage, yet to be taken through the Dutch Parliament, yet to be implemented. But the political will for change is there at the moment.

There is also another related political issue which is followed with great interest by the Dutch PTT. Professor Zegfeld's Local Communications Infrastructure Commission recently recommended installation of one integrated network in the Netherlands. This would enable the Dutch PTT to take control of the very widespread local Cable TV networks which they do not currently control.

The report has been greeted by silence. Behind the scenes, reaction has been somewhat hostile and it may be that the absence of public comment reflects a hope that it will simply die!

The changes in prospect in the Netherlands are of particular interest to British Telecom. The Netherlands has long been an important partner in British Telecom's international business and has a pivotal role in European telecommunications.

BT has long admired the well run, efficient, profitable PTT network. Its profits per employee are among the highest in the EEC, the cost of service one of the lowest, the quality of service reckoned to be first class. The network is one of the most modern in the EEC and its return on assets employed is second only to BT in the Community.

But the home market is a small one and one which

depends very much on international trade. Some 43 per cent of telecommunications equipment is currently imported. The business is now growing very slowly and the rate of investment rather modest. So the Dutch are keen on giving a boost to their market through liberalisation.

BT wishes the Dutch PTT well in their exciting adventure and looks forward to a continuing partnership in an open and truly common EEC market for telecommunications in the 1990s. ■

Below: Rotterdam's famous 605 foot Euromast tower is the hub of the Dutch telecommunications network.

Dr C L Markus is head of British Telecom's European office.



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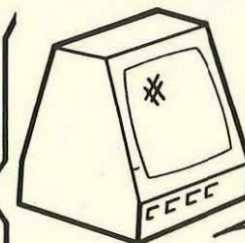


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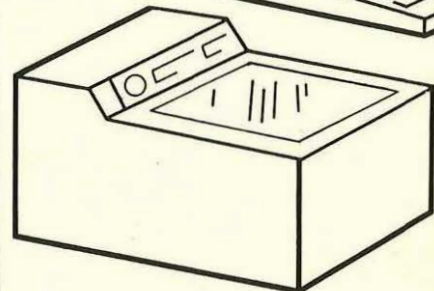
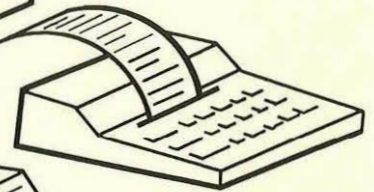
Apollo at work

Possible output devices



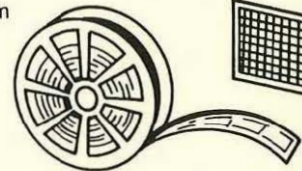
Video/graphic display

Alphanumeric
printer

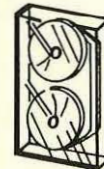


Facsimile
printer

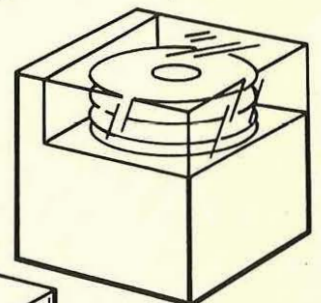
Micro film



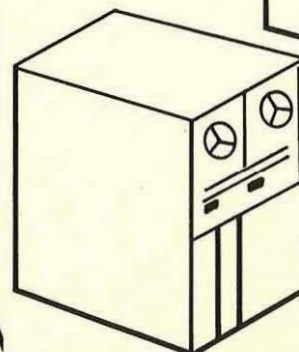
Micro
fiche



Magnetic
tape



Magnetic
disc



Computer

The concept of sending documents through space is an exciting one with far-reaching commercial benefits. This two-part feature looks at the European Apollo project - aimed at using satellites for such things as high-speed data distribution and bulk document delivery - and British Telecom International's work on 'mini Apollo,' demonstrated earlier this year and seen as a forerunner of the service for some customers.

The Apollo project is the result of collaboration between the European Space Agency, some European PTT's and the European Community, and aims to provide facilities for high speed data distribution and document delivery by electronic means, via satellite, on a demand assignment basis.

Originally the system was designed to transfer electronic records of documents, such as digital facsimile images, from documentation centres or libraries to remote users making the service fast, reliable and of high quality.

However, to efficiently use the system capacity, and to attract more users, the design has been broadened to be applicable to a wide range of applications requiring the transmission of long data messages including bulk delivery of text documents, remote printing, electronic mail, computer file transfer and image data transfer.

The Apollo system has some novel features aimed at making the use of the system economic while enabling its users to take full advantage of the capabilities of the high speed satellite link.

For example, the space segment capacity is shared in use between active transmit earth stations. Each of these earth stations can be connected to a number of source data stations to make efficient and economic use of the facilities provided by the transmitting earth station and the allocated satellite capacity.

The transmissions can be made to a very large number of receiving points including small low cost receive-only terminals, about 1.5 to 2m in diameter, located on or near users' premises. The data distribution is unidirectional over the satellite link and the link quality has been dimensioned to minimise the need for re-transmissions.

An addressing scheme has been adopted which will allow data to be restricted to individual receivers, to selected groups, or broadcast to all receivers. The satellite access scheme, in conjunction with the concentration and distribution functions of the equipment, permits the transmission of data in an on-demand mode with dynamically variable capacity allotted to data sources, and allows for changes in data throughput to meet varying user requirements.

A key feature of the system is the use of protocols to ensure efficient flow of data through the network. There are seven levels of protocols relating to Open Systems Interconnect which have been agreed worldwide by the International Standards Organisation. Although higher level protocols (ISO level 4 and above) handle the end-to-end (source to sink) delivery of information, within the network protocols up to ISO level 3 are used. The source and sink data terminals can interface to the data station controllers (DSC) via public data networks or leased lines.

The on-demand access to the satellite, and the establishment of a satellite link when there is data to be sent, is governed by the satellite access controller (SAC) operating in accordance with the access protocol (SAP). The SAC transmits a reservation burst to notify all other transmit earth stations that its transmit DSC has data to send and that it therefore wants to reserve capacity in the queue for the shared satellite channel.

Hand-over of access to the shared channel from one station to another is achieved by the following station in the queue detecting when the preceding station is about to end its transmission, and then transmitting its burst with sufficient guard time to avoid overlap.

The hand-over is akin to the token passing procedure used in local area networks. As the lengths of the transmitted bursts, and the number of stations transmitting, will vary, the cycle length is variable, and in order to avoid inefficient, or excessive use of the capacity by one source, there are limits on the data burst lengths.

The transmitting earth stations will access the EUTEI.SAT I SMS system at a transmission rate for the sequential access system of approximately 3.3Mbit/s: this facilitates an information data rate of 1.536Mbit/s. For reception, either these same stations can be used or small receive only stations, down to 1.5m antenna diameter, can be used.

The high speed satellite link for the data distribution is operated in a unidirectional mode, the data transfer between the DSC's is connectionless. Information ordering, acknowledgements and other messages from the sink to source data terminals are transmitted through the terrestrial network. Within Europe the use of low speed terrestrial links will not be a problem, but for worldwide use of the system a

separate low bit rate return channel via the satellite is proposed.

The data entry is basically a personal computer with an interface to the satellite transmission system, sufficient storage, and interfaces to the application dependent input/output devices. The diagram of a receive sink terminal shows examples of possible output devices. The interface to the satellite transmission link can be at various rates depending on the application.

Currently international document transfer via facsimile uses low speed links which are sometimes unreliable, and the received quality is often poor in certain countries. The transmission of an A4 page of text can take more than a minute, and if the text is to be sent to more than one recipient the time multiplies. With the Apollo system a complete document could be sent in a minute to any number of recipients simultaneously and in a reliable manner.

The prototype hardware and software for the Apollo system are currently being produced in industry and the first tests will commence later this year. System trials will begin in 1988. ■

Mini Apollo leads the way

The 'mini Apollo' system was demonstrated by BTI at the British Library earlier this year. The system has been developed as part of a programme by BTI, with help from the Martlesham Heath research laboratories to:

- demonstrate the feasibility of the Apollo system for high speed unidirectional transmission of facsimile and data files;
- develop and demonstrate the software and hardware for low cost data source and sink terminals;
- demonstrate to potential customers the marketability of the Apollo system in terms of quality, speed, and cost.

▷ The 'mini Apollo' terminal.



Unlike the Apollo system there are no data station controllers (DSC) to concentrate and distribute the traffic from many data sources and sinks connected to shared user earth stations, and there are no satellite access controllers (SAC) to instigate automated on-demand sharing of the satellite capacity.

To simplify the system the information data rate is 64Kbit/s, compared with 1.5Mbit/s for Apollo, and the sharing of the satellite capacity by users is arranged by pre-booking on a fixed time slot basis.

The data source and sink terminals consist of IBM-PC's, with Group 3 facsimile equipment for the off-line scanning and printing of documents. The software developed at BTRL, and held within the PC's, includes:

- human interface menus to select particular actions such as scanning, printing, filing, addressing;
- fast file transfer to initiate and control the data transfer over the unidirectional transmission link;
- document display to view the received document on a VDU at different resolutions;
- peripheral control to operate the scanning and printing equipment.

The interface to the transmission link is via an X21 communications card, which has been based on a similar card produced for use over the ISDN. This card, and its associated software carries out some of the functions of the DSC in the Apollo system.

A selective addressing scheme has been developed, and each card can be pre-assigned or re-assigned a unique address or addresses to ensure that data transmitted is only received by one or more

authorised recipients, by one or more selected closed user groups, or by a broadcast audience.

In an operational system, the data sources would be linked to the transmit earth station by leased data circuits or the public data network, with access to the satellite channel pre-booked on a fixed time slot basis.

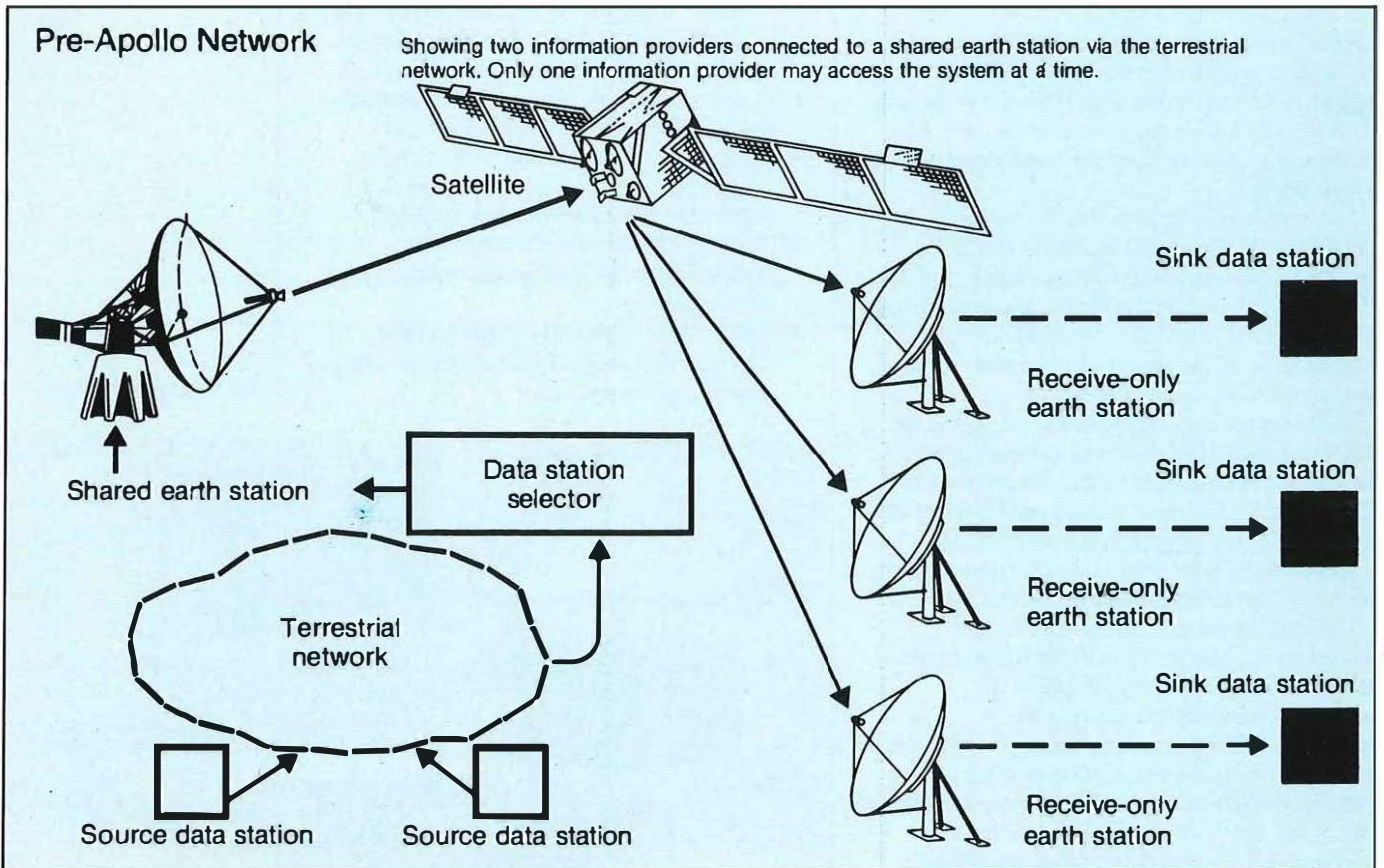
Several data sources can be connected to the same earth station equipment with the sharing controlled by a 'data station selector' which can be operated manually or by a timer.

For a European system the transmission would be based on the EUTELSAT business system, SMS, with reception possible at small receive-only terminals with antenna diameters ranging from 1.5 to 2m in diameter, located on or near users' premises. Documents would be ordered from the data sources such as libraries, using existing means such as telex, post or Packet Switch Stream (PSS), to ensure the satellite channel data throughput is kept high.

Having completed the tests, and evaluated the results from the early system demonstrations, 'mini-Apollo' is now being refined to facilitate a service offering later this year. This will be well in advance of the Apollo trials and will be targeted at those customers who have a need for telecommunications capacity at a known time, on a regular basis, and at a fixed data throughput rate.

Such customers who have shown interest include the British Library Document Supply Centre, the European Space Agency Documentation Department, the Commission of European Communities Information Distribution Department, and the European Centre for Medium Range Weather Forecasts. ■

Mr R J Kernot is Head of British Telecom's Eutelsat Communication Systems Group.





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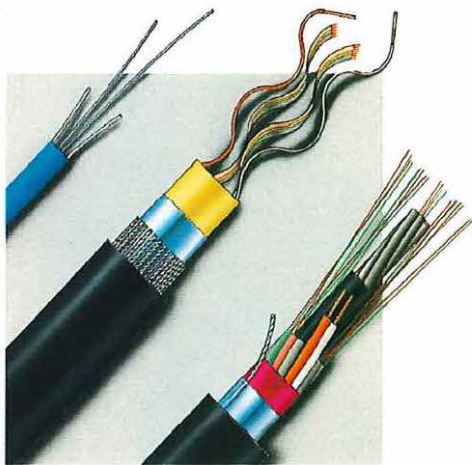
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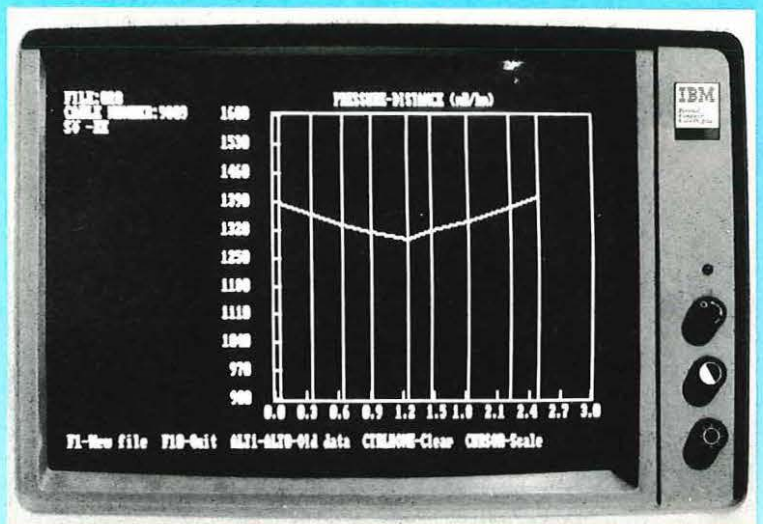
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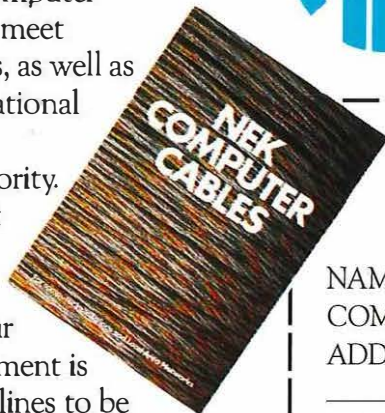
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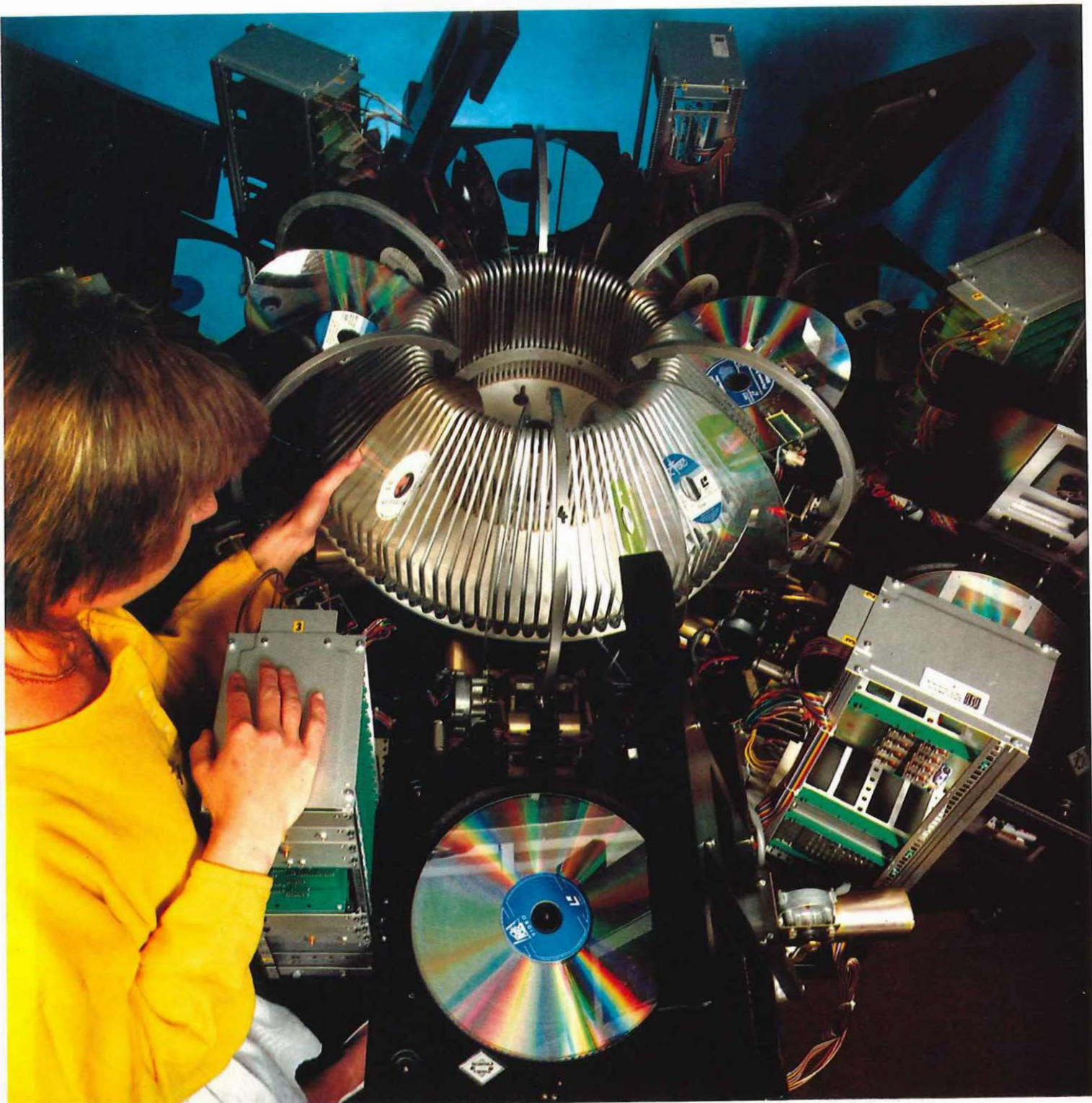


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The video disc handler.

Video 'juke box' brings a library into your lounge

Gordon Hathaway



To most people, cable TV means a wider choice of programmes. But to customers of the Westminster Cable Company in London the choice will soon be wider than usual because British Telecom has installed a special network incorporating a video library enabling the viewer to break out from the stream of pre-scheduled programmes and to choose what to watch, and when.

The Westminster video library is not just an on-demand film service – it is able to support a wide range of interactive services and the cost of the service is competitive with video tape rental in spite of the high initial capital cost because of the effective time-sharing of the equipment by customers.

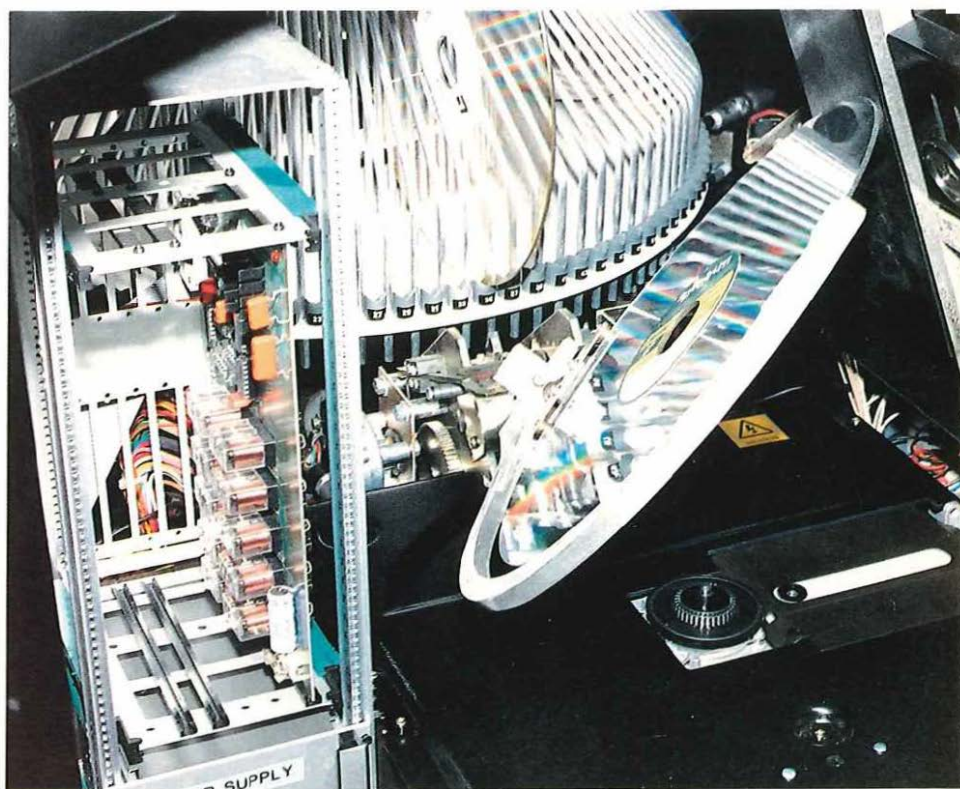
When a customer presses the 'library' button on the keypad, he is first asked for a programme choice. The library computer then allocates a free video disc player on a disc handler containing a free copy of the requested disc. From this point the customer has a video source allocated (and switched) exclusively for the duration of the session.

The customer's keystrokes are sent over the network directly to the source for full control of the programme on a 'one-to-one' basis. There are buttons on the keypad to allow the programme to be played normally or to stop and search backwards or forwards. There are also buttons for slow motion and stepping of still frames in both directions.

This fully 'interactive' control is intended for discs containing instructional material – such as how to play games like tennis, how to mend the car or cultivate the garden, or as a practical replacement for evening classes for many subjects. Even Open University courses could benefit from additional material in this form. Other programmes requiring full control would include encyclopaedia, documentaries, collections of maps, catalogues of art collections and maybe pop videos.

There is also a wide range of feature films available, though these are usually recorded in a way which squeezes more on to the disc but does not allow still frame, stepping or slow motion facilities. However, it is still possible to pause the programme – to answer the telephone for example – and to repeat favourite parts.

A special 'facilities' button on the keypad switches the customer to a menu offering many more



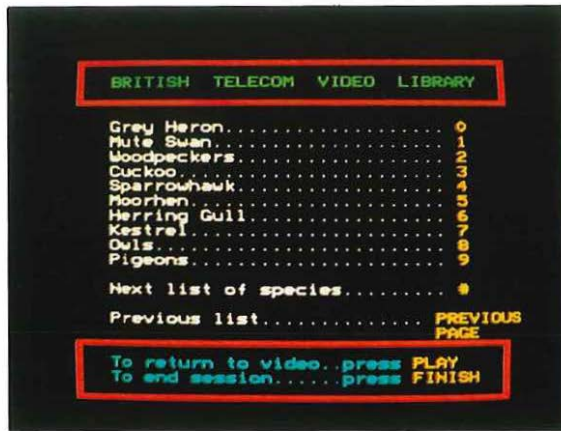
options. These include control of the left and right audio channels and control of an on-screen index display of chapter and picture numbers. There are facilities to search to any point of the disc using the chapter and picture numbers and to change the disc side being played.

On discs where the facility is thought useful, it is possible for the library operator to offer the customer the ability to jump with a single key stroke to a chosen part of the video programme. This is achieved through the use of on-screen menus. On the BBC video disc 'British Garden Birds', for ▷

Top: the customer's keypad opens up a world of pop videos, art, gardening and even car maintenance.

Above: a disc being loaded automatically on to the player.

Right: BBC video disc 'British Garden Birds' can be selected at the press of a button.



a computer control system and a video switch to connect the customer to the selected player.

The Westminster cable T.V. system is the first in the world to offer such an advanced fully interactive video library where customers can obtain all the benefits of the Laservision video disc format and a wide choice of programmes from the comfort of their armchairs.

A short trial of the system has already been conducted to demonstrate the capabilities to potential customers. This was well received and a larger marketing trial is being planned for the near future. Once service starts it is anticipated that demand will soon outstrip the relatively small initial installation and expansion will then be required.

In a full system, it would be possible to offer 1,000 titles with several copies of the more popular ones.

The interactive nature of the library lends itself to catalogue viewing for home shopping. Such a video disc based catalogue could include not only several thousand colour pictures but also moving sequences for demonstrating such things as tools and equipment or fashion shows for clothes. The special facilities menus could provide single key searching as an index to the catalogue.

It is even possible to enhance the system by the addition of data links to the catalogue company so that the customer can not only make his or her choice but also place an order for the chosen articles.

Schools

As well as the potential for normal domestic use the video library has a significant role to play in the educational field. When combined with the power of a dedicated computer, special video disc programmes can be used for self study in a variety of subjects. In this application the video disc usually contains several separate teaching sequences. At the end of each sequence the user is tested on his knowledge before moving on to the next part of the lesson.

Interactive video for education is already used within British Telecom as well as many other companies and is now being tested in schools. The company is pleased to be able to take part in this trial and work on the installation of the necessary equipment and cabling of the schools is now at an advanced stage.

The benefit to the schools is that they will have improved access to the programmes without having to buy several more sets of equipment. The key cost benefit is, as with the domestic case, due to the effective sharing of the equipment.

One day, everyone may have access to these 'on demand' services with far-reaching effects for the traditional broadcast and cable channels. For the present, such widescale application is not practical because of the vast amount of equipment required for simultaneous access by a large group of people.

But technology moves fast and once solid state memory reaches the necessary levels of integration to replace the discs, players and other mechanical parts of the system, some of the present constraints will vanish. When this happens, the experience gained from the current system will be invaluable in providing an even better service in the future. ■

example, it would be possible to choose to view any of the different birds featured simply by selection from these menus.

Development of the library started a few years ago with much initial thought being put into the various ways of providing such a service and the first decision to be made was the choice of video format to be used.

VHS and Beta tape formats and VHD, CED and Laservision disc formats were considered and the latter had the obvious advantages of providing the best quality and being the most robust of the formats. The Laservision format was also the most technically advanced and offered the most features including an excellent still frame facility.

Robotic

The demise of CED and lack of consumer material for VHD have proved this to have been a wise choice. Early ideas for manual loading of the discs were rapidly ruled out as being much too labour-intensive. Feasibility studies set up with a number of outside contractors offered a variety of solutions for automatic disc handling ranging from complex robotic systems to juke-box type disc handlers which offered the lowest development cost, proven technology, simple maintenance and best flexibility.

The video library, therefore, consists of Laservision video disc players mounted on automatic disc handlers. Each disc handler has six players and can load any of the 102 discs in its carousel on to any player. The initial installation uses 12 handlers in four stacks of three and is capable of serving up to 6,000 customers. There is



Above: you can even buy a sofa from your armchair!

Mr G Hathaway is head of Interactive Video Services Group, BT Research Laboratories, Martlesham Heath.

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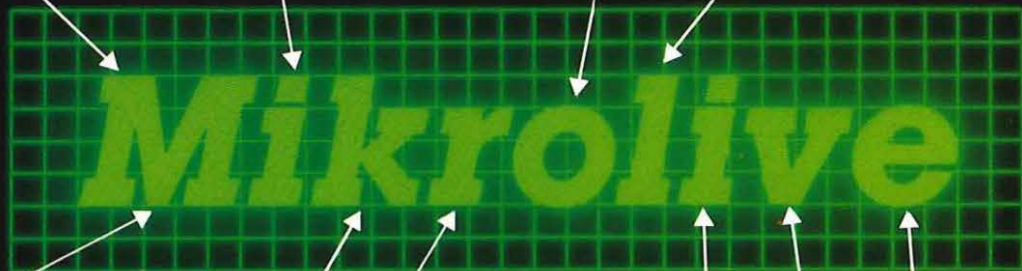
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British Telecom's Prestel service has enabled people to order goods from the comfort of their armchairs for some time. But a new development allows shoppers to pay for the goods they want or to browse through a mail order company's stock room — all without leaving home.

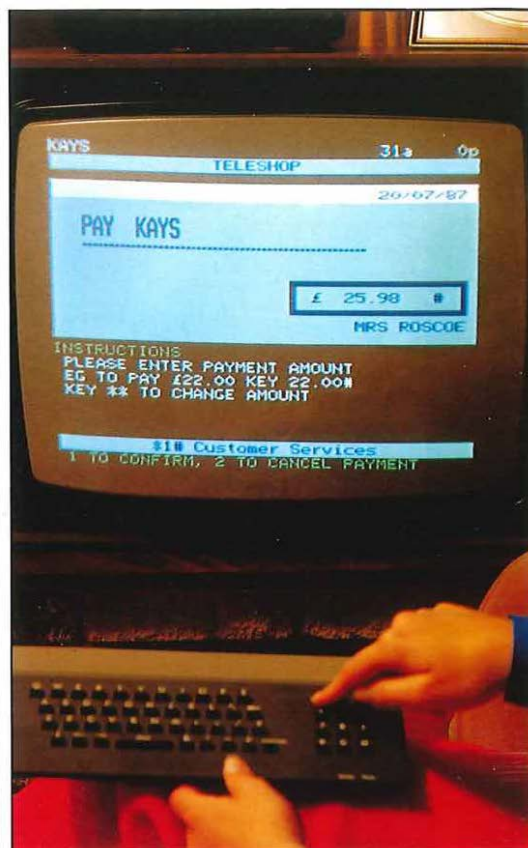
Armchair shopping delivers the goods



Jane Young

Below: halfway through her shopping spree from the settee — a quick flip through the catalogue containing 35,000 items and this housewife will tap in the rest of her order.

Right: payment couldn't be simpler with a TV 'chequebook' — a first for any videotex service.



With Prestel Teleshopping it is possible to order almost anything from fridges to toys, fashion to hi-fi and from carpets to lawn mowers. Another big step forward has now been made by Kays, the mail order company, with the introduction of a direct customer link into the company's stock levels.

The link gives up to the minute information about stock availability and delivery times and if an item is not available, the customer will be offered an alternative if something similar is in stock. A computerised mail facility is available to shoppers and the new system also allows goods to be paid for directly from a bank account — the UK's first Electronic Funds Transfer at Point of Sale (EFTPOS) system relating to the home.

To use Teleshopping, a customer needs to join Prestel and to purchase some equipment; either an adaptor for a TV set, or a modem with software to convert a micro. Using a link called Gateway, Prestel connects directly to the Kays computer. The user looks through a catalogue and keys in the codes of the items of interest. The computer responds by listing the details of the product. For instance, code AB1234 may be identified as a blue striped dress and the customer is asked to specify the required size and the quantity needed. If the size is not available the computer prompts by listing the choices and asking for a re-selection. It then advises how long delivery will be and if an item is out of stock, it will suggest a close alternative.

All along the ordering process, there are opportunities to cancel or amend orders, so nothing is final until confirmation has been keyed in. Once an order has been sent, it is selected from the shelves at the warehouse and is despatched to the customer's front door.



Left: at the other end of the line, the ordered goods are wrapped before despatch.

But there is still plenty of scope for further Teleshopping developments. It is already possible to transmit photovideotex pictures down a phone line although, for a full page picture, it may take about two minutes to build up on the screen. As phone systems become more sophisticated, this delay can be cut down to seconds, giving the capability for full colour 'window shopping' in a not so distant timescale.

The Kays service is only one of a number of teleshopping services offered by British Telecom's Value Added Business Services division. Products from both Littlewoods and Grattan are available on Prestel and the list is growing.

Opportunities

According to VABS, retail expenditure has continued to decline over the last 10 years as a proportion of total consumer expenditure. In the UK this proportion is 40 per cent and in the USA as low as 30 per cent. These shifts in consumer behaviour present VABS with a number of home shopping opportunities, using all the technologies at its disposal.

British Telecom has a whole variety of technologies available - booklets and brochures, incoming and outgoing telephone calls, voice activated services, videotex and cable TV networks. Any combination could be used to generate the remote ordering habit.

Person to person telephone calls are a routine sales technique; cable TV systems are a visually attractive sales medium; videotex offers price comparison, consumer information, and easy input of long shopping lists and by offering direct access to customers, it also offers retailers considerable operating cost savings.

In order to provide retailers and suppliers with a central point of contact British Telecom has set up a Home Shopping Unit. This unit (staffed by people operating in different BT divisions) will be a centre of home shopping expertise in the technologies and the growing number of applications which will be built up around them. ■

Below: the shopping spree's over — all without leaving home.

Ms J Young is Retail Services Manager with BT Value Added Business Services.





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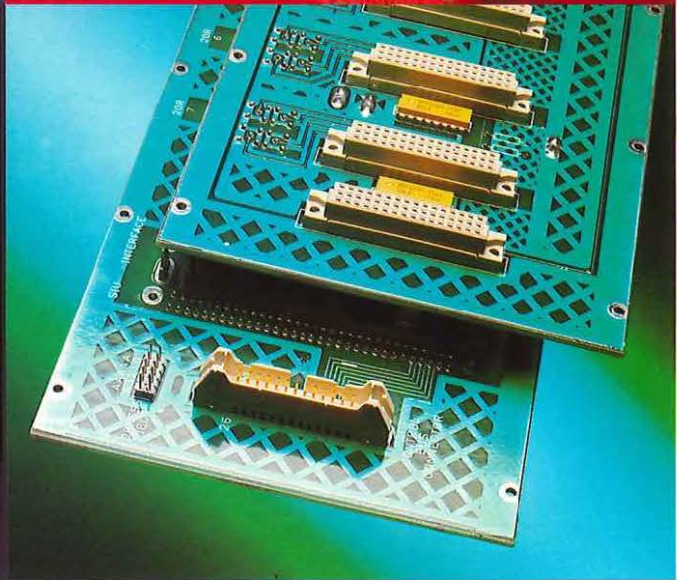
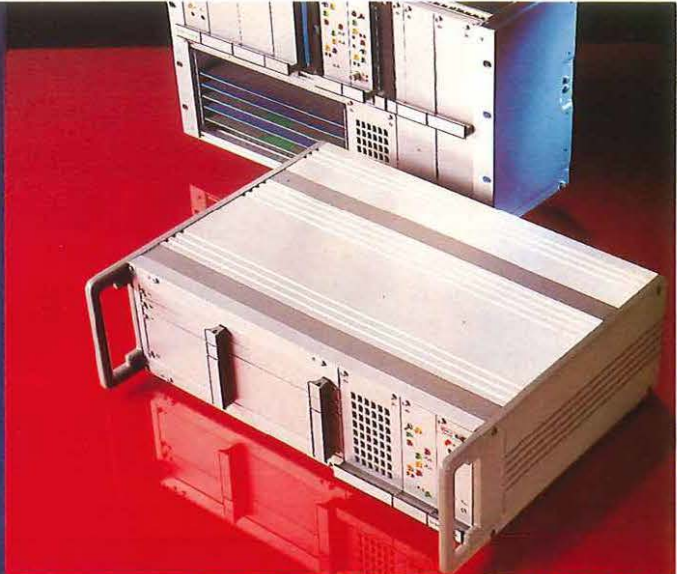
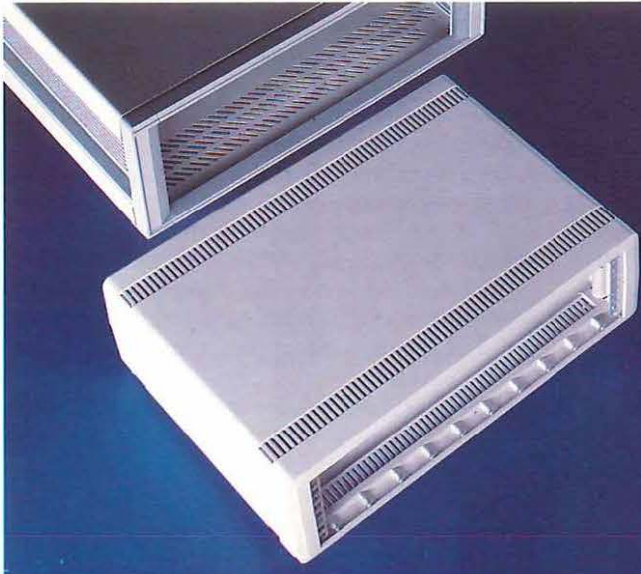
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LEADERS IN ELECTRONIC PACKAGING TECHNOLOGY

This year, 1987, could be considered as something of a watershed for British Telecom because it is only now that the company's range of activities is coming together with one common objective - to give a high-quality service to customers. To this end, a nationwide network of Service Centres has been created and this article looks at the first purpose-built centre in Reading, part of BT's Thamesway District.

Bespoke service for business customers

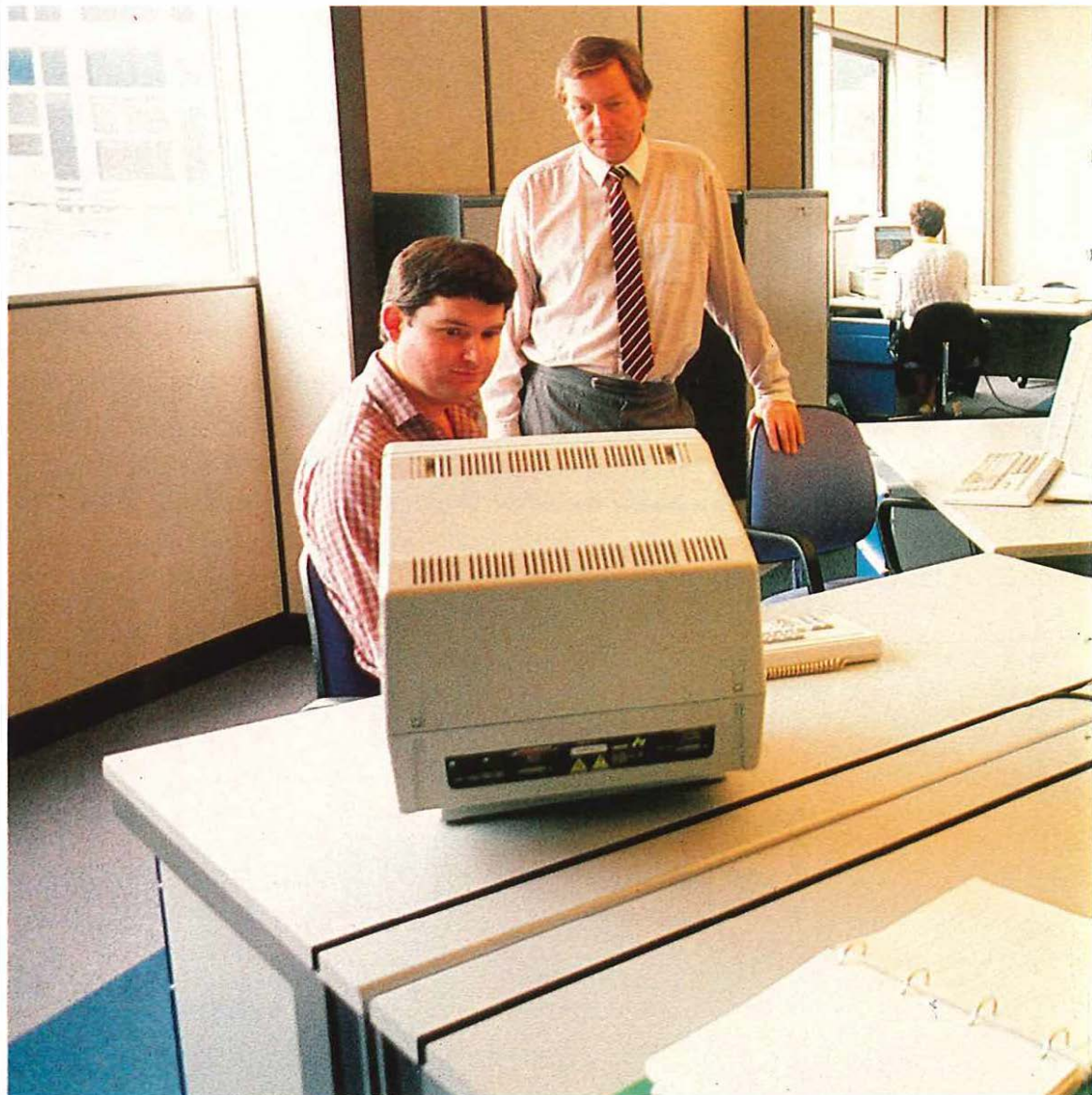
Dick Roberts

The British Telecom brand, standing for quality service to customers, provides a message which Thamesway District has taken to heart. The District which delivers service to the core of the Thames Valley silicon corridor is in no doubt about the challenge that faces BT in the new competitive environment.

The new District ServiceCentre in Basingstoke Road, Reading, will provide the basis of the Thamesway answer to this challenge. Indeed, the whole story of the development of the Service Centre illustrates this commitment.

In December 1986, the British Telecom Board gave full approval to a major new national project - the development of a network of strategically located ServiceCentres, which should have the responsibility for providing quality service to the company's major customers. Together with a multi million pound investment, a project team was established at Headquarters under the leadership of Charles Williams, to oversee implementation nationally.

In Thamesway, the District Board decided to house the new ServiceCentre within a brand new purpose-built building, which would also provide a home for the District's new business maintenance ▷



Private services maintenance manager, Bob Gregory (standing) with staff at the Reading Service Centre who have the latest computer equipment at their fingertips.



Above: systems support manager Mick Cant checking the Touchline communications system.

The customer reception area at the new purpose-built ServiceCentre in Basingstoke Road, Reading.



control. The building that was chosen was provided by Terrapin as a purpose-built operational centre, based on a standard system built construction.

In itself, this decision represented the breaking of new ground both for the District and British Telecom. For the first time an operational control was to be provided in a purpose-built building, to a specification set by the District Accommodation staff, and not in a converted office or telephone exchange.

At the same time, the District set up a dedicated team to drive through the project. Bob Gregory was appointed the Project Manager and he has had operational responsibility for ensuring the success of the project within the very tight timescales.

Building work started on 19 January and took exactly five months to complete. In itself, this was a major achievement and the success of this first phase was entirely due to the tremendous effort and hard work of every member of the project team. Indeed, the project has been a good example of teamwork both between headquarters and District covering estates management, construction, engineering, planning and computing staff. The final result was a two storey high-tech construction, which both externally and internally provides a statement of British Telecom's commitment to its customers.

From the start, it was felt that if the district was to fulfil the challenge set by the ServiceCentre project, then the centre in itself should provide an environment in which staff would be proud to work and which the District would be proud to show off to its customers.

It is a well known fact that the mechanics of the modern business are all too often exposed by the surroundings in which that business operates.

The centre will be staffed by a dedicated team who will be responsible for providing service to 24 of British Telecom's largest national customers. The aim is that all the elements of service to those customers, such as maintenance and provision

enquiries nationally, will eventually be provided through the centre.

In addition, the District is centralising its business maintenance operation in the same building so that all private circuit maintenance and PABX maintenance will be concentrated within the centre. For the first time, District expertise in voice and data will be brought together under the same roof and this will enable the District to provide a much more effective approach to the management of large customer networks.

Quality

The centre will also benefit from the latest technology both for its communications and for its computer facilities. Indeed, a measure of the quality of those facilities is that the centre will be a customer of both Hewlett Packard and DEC.

The staff in the centre will be using a City Business Touchline System, the same system that is being used in the dealer room in the City of London. This system, which uses a touch sensitive screen, will also give the staff access to a DEC Vax 8500 computer which will provide the basic administrative system on which the centre will operate.

Staff will also have access to an array of computing support systems which will assist them in dealing with the centre's customers. These include, Customer Service Systems (CSS); RATES (the remote access test system for private circuits); CAMSS (the remote access test system for private circuit maintenance); a Datel Test Centre; Scripto (a system which will enable remote access with PABXs), and eventually the Vanderhof Line Test system, which will enable the staff to remotely test exchange lines.

The staff within the control will, therefore, be operating with the very best equipment that British Telecom can provide within a purpose-built environment which befits such a high-tech operation.

The ServiceCentre will also be linked into a national network of 28 strategically located centres. This interworking will enable the monitoring of the whole operation nationally in order to ensure that the business meets that commitment to service nationally.

An integral part of the whole operation is the determination of the business to develop a much better relationship with BT's major customers. The aim of the staff and the centre in Thameswey is to ensure that the customer gets such a quality service that British Telecom is the only place to be considered for any communication requirement. In order to achieve this the District is setting out to get five basic requirements right:

- ease of access;
- personalised service;
- effective delivery;
- uniform quality of service;
- regular feedback and information.

The ServiceCentres must be centres of excellence – flagships for British Telecom. The challenge facing each District is enormous, but the company is committed to meeting that challenge as part of the continuing commitment to improve the level of service to customers. ■

Mr R Roberts is business customer support manager for British Telecom's Thameswey District.

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(Of course, this process in no way interferes with any conversation or the transmission of data taking place on the cable.)

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.....

Traditionally, British Telecom provided its customers with a single, basic level of maintenance service, the stated aim of which was to attend to faults by the end of the next working day with the exception of a free emergency service for customers such as hospitals, police, fire and ambulance stations, telex, data lines and certain private circuits. An improved service – ServiceCare – has been introduced to give customers four options which, between them, aim to provide faster speed of response and extended coverage.

In 1985, a large scale market research exercise revealed widespread customer dissatisfaction with BT's maintenance service. This was particularly marked amongst large business customers who wanted a response time for tackling faults of between two and four hours.

Amongst smaller business and residential customers, flexibility was as important as speed. Both sectors indicated they wished something more positive than an 'aim to respond' with a large proportion prepared to pay for the privilege, and all wanted to be kept informed of what the company was doing to remedy the fault. It was from this that ServiceCare was born covering four levels of service, each with a descriptive name, offering a guarantee to respond:

- Standard Care – the current maintenance service, included in the tariff, operating between 8am and 5pm Monday to Friday (Public and Bank Holidays excepted), with the aim that faults reported on one working day will be dealt with by the end of the next;
- Prompt Care – operating between 8am and 5pm Monday to Saturday (Public and Bank Holidays excepted) and which includes a guarantee to respond within four working hours and to keep the customer informed of progress;
- Total Care – the most comprehensive option which operates 24 hours a day, 365 days a year, to provide a guaranteed four hour response and a promise to keep the customer informed;
- Custom Care – specially tailored service to meet the needs of very large customers.

But there also needed to be a clear definition of the word 'response', which could be properly understood by both customers and staff. The process begins with accepting and recording the cause of the customer's complaint and obtaining a telephone number and named person to whom progress can be reported. This is followed by undertaking an initial diagnosis to isolate the cause and site of the fault and the mobilisation of an appropriately skilled engineer who could be agency staff in the case of external plant or exchange maintenance, or a field maintenance engineer – the latter within the quoted response time.

Throughout the exercise the customer should be informed of progress and advised when the fault is cleared.

In order to cater for these ideas it was necessary to make a number of changes. One of the first essentials was to introduce a maintenance contract condition to cover the guaranteed response; to spell out the definition and to inform the customer of his need to provide a contact number. This is supplied to the customer in an appendix associated with the normal contract document.

District sales, maintenance and installation procedures required only minor modification but there was a need to build-in an escalation procedure for Repair Service Control (RSC) staff. This was to provide a formalised means of advising managers of cases which were likely to miss response times, so that timely remedial action could be taken.

On the road



All aspects of the scheme were all tested in a pilot marketing exercise in three Districts. Central Midlands District was the first, assisted by staff from Marketing Solutions Ltd – a marketing consultancy which had been employed to provide specialist advice during the tests and the subsequent national roll-out.

Unusual

Central Midlands was followed by Anglican Coastal District where the unusual step was taken of basing part of the HQ ServiceCare team alongside District staff. This action proved to be of enormous benefit to both sides, improving communication, speeding the development of workable procedures and overcoming practical difficulties.

The third pilot District was West End, the inclusion of which was essential in order to bring a London dimension to the test results.

The first pilot began in April and the exercise was formally concluded in September 1986. Market research was undertaken during, and at the conclusion of the pilots, to assess customer reaction to the promotional literature, contracts, quality of service provided and reasons for buying.

The results were encouraging with positive

to service quality

Bernard Adams



responses on all aspects. This coupled with the success of the sales staff in selling the service - more than 150 orders were taken with an average additional annual rental of £1,600 each - provided convincing evidence that a national roll-out should proceed.

During September to December 1986, the launch team visited every District and obtained a commitment to the launch of ServiceCare with a result that all were able to offer the product by June this year. This was made possible by the back-up documentation produced to assist in planning the launch, a substantial amount of training material (including interactive and linear videos). Regular contact with the launch team was also essential to the success of the exercise.

Currently, ServiceCare is available only on exchange lines and customer premises equipment (switches, their extensions and other associated ancillary apparatus). However, by April 1988 it should be available across the complete BT product/service range with the exception of Cellphones and Radio Pagers.

Condition 10 of the BT Licence requires the company to replace the emergency 'E-List' with a priority fault repair service and all customers currently on the E-List are being contacted and

informed about the change. During this conversion programme the opportunity is being taken to sell ServiceCare as an alternative, stating the additional benefits, including guaranteed response and advice of progress. British Telecom has agreed with OFTEL that the conversion process will have been completed by 1st June and only from that date will customers begin paying for the level of service chosen.

OFTEL defines the categories and individuals eligible to receive priority in fault repair and these include fire, police, and ambulance authorities, hospitals and doctors. Any faults they report will be handled before others renting a similar premium level of ServiceCare.

A few customers will continue to receive a free emergency treatment and these are those with circuits over which BT delivers 999 calls to the emergency services, and those chronically sick and disabled customers who are particularly dependent on the phone.

There is little doubt that ServiceCare is a new and dynamic product whose options will change with the company's ability to improve response times. It also provides a new revenue opportunity for British Telecom whilst more closely meeting the needs of customers. ■

Mr B Adams is product manager for ServiceCare.

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When we started out to develop this system, we recognised that all its advanced technology had to be focussed to satisfy one simple need – flexibility – simply because the successful telecommunications system of today will only be the one that can

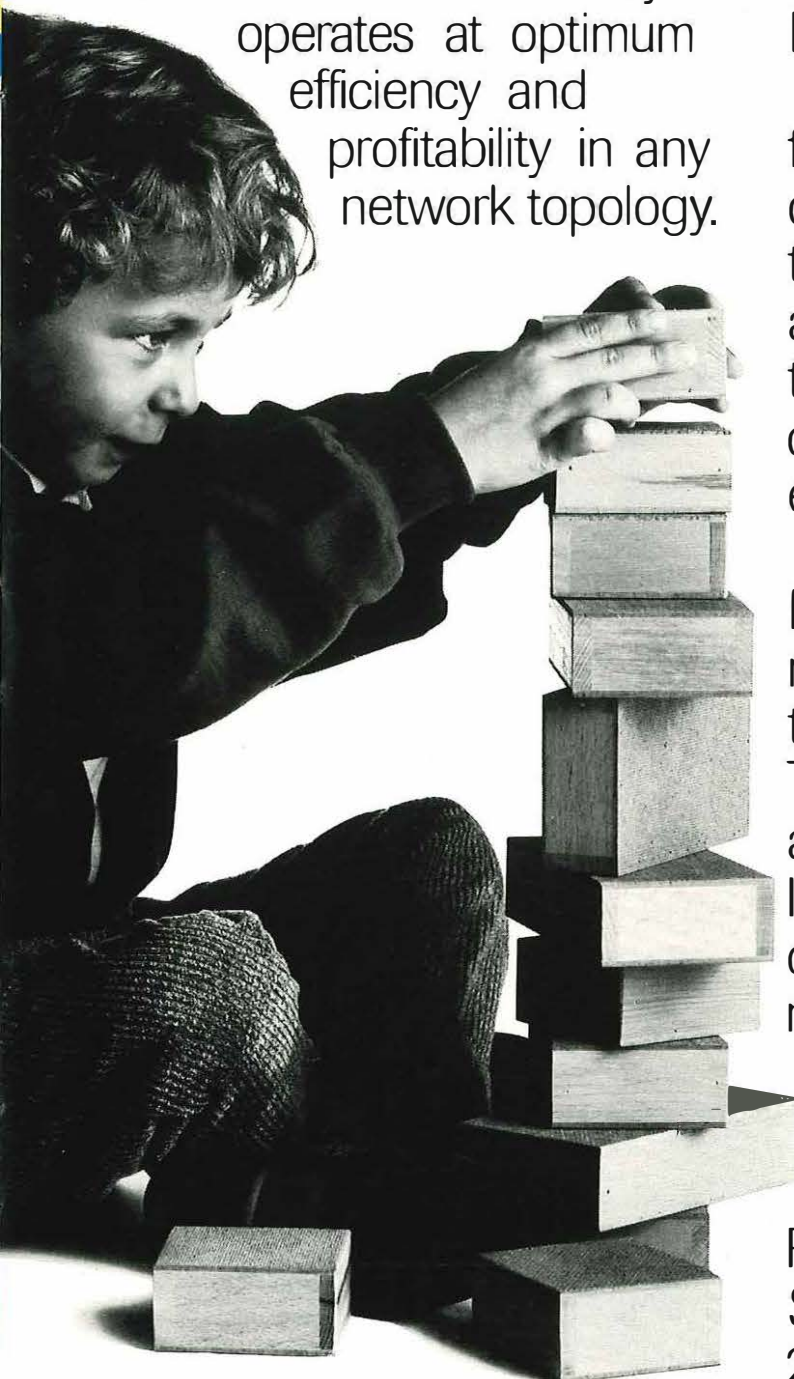
also meet the demands of tomorrow.

The Network Machine is designed to grow with the needs of any administration – no matter how vast, or complex. It achieves this through the effective application of micro-processor technology.

It can expand or reconfigure to meet the changing needs of any given administration at any point in time. It does so economically, too. These changes can be achieved without replacing the system – but by adding or taking away from it.

Nothing could be easier.

No matter what type of function it serves: local, tandem, transit, national or international, the Network Machine always operates at optimum efficiency and profitability in any network topology.



It can also look after the needs of business as well as those of the private individual, with such services like freephone dialing and the powerful combination of ISDN and CENTREX.

In fact, it offers more features than any other system currently available. So much so that it's difficult to imagine any advanced telecommunications task that the Network Machine cannot perform, reliably and cost-effectively.

The 5ESS-PRX Network Machine is designed to meet the needs of all types of administrations. And AT&T and Philips Telecommunications is qualified and experienced to act as a reliable partner in the formulation of a national telecommunications network.

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Not only good housekeeping, but also an exclusive modular design gives easy test access to cable pairs without opening connectors or interrupting circuits.

Easier to work with and very reliable, it's no wonder the MS² Cross Connect System is becoming the big name in British Telecom's cabinet reshuffle.

For more details, talk to Scott Heycock, Telcomm Products Group on Bracknell (0344) 58306. 3M United Kingdom PLC, Bracknell, Berkshire RG12 1JU.

MS² Cross Connect System.



3M Telcomm Products
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3M and MS² are trade marks.



High-tech race

British Telecom outside broadcast engineers came to the rescue in an emergency during the first-ever live broadcast of the rugged International Snowdon Race.

One of the runners in this gruelling 10 mile race - from Llanberis to the summit of Snowdon (3,560 feet) and back - collapsed with hypothermia at the Halfway station. The only means of communication down to the organisers was via BT.

A British Telecom engineer radioed to his support vehicle in Llanberis. The message was relayed to the organisers who sent an RAF helicopter to lift the sick competitor off the mountain to safety.

To televise the race nine camera positions were used, six of these required BT links involving 17 microwave hops,

manned by 12 BT engineers. Teledu-r-Tir Glas, who televised the event, had cameras situated at four positions on the mountain and on the summit.

Cameras and microwave equipment (pictured being set up) were taken to the summit by the Snowdon mountain railway.

A unique feature was the use of a motorbike and helicopter to provide camera coverage of the race and the Llanberis fête.

BT's microwave links on the motorbike and helicopter enabled live transmission of the race to reach S4C viewers in Wales.

The motorbike covered the start of the race and the signal from the motorbike camera was picked up in the helicopter for onward transmission to the BT OB vehicle and the Barcud scanner van.

where it will link into the Channel Islands' own microwave system.

The agreement to strengthen communications between the Channel Islands and the British mainland was signed this summer in Paris.

The Channel Islands are now linked to the UK by three cables with a total capacity equivalent to 3,240

simultaneous phone calls, and by standby microwave radio between the Isle of Wight and Alderney which can carry 960 calls simultaneously.

The microwave link - abnormally long at 120 km (75m) is affected by weather conditions while existing cables can be damaged by shipping.

The new digital submarine cable, with 12 optical fibres, should be in service by early 1989.

It will operate initially at 140 Mbit/s with two fibre pairs equipped to provide capacity for approximately 4,000 simultaneous calls.

Spy proof!

Secrecy at all costs! British Telecom's intriguing high security data encryption unit, the Lektor, is a device which protects information against eavesdroppers.

It means that authorised users can exchange meaningful data over the communications link - without being overheard.

The old way of relaying coded messages meant a key had to be chosen and sent to authorised users by a trusted courier. That wasn't entirely a safety proof.

The beauty of the Lektor is that it uses a public key algorithm to obtain 'one-time session' keys. The keys are different for each communication session.

No sensitive information is held inside the unit. Anything secret is kept in a removable 'user token' issued with a personal identity number to authorised users.

Blood cells

Blood bank teams which work over a wide area of London and the home counties North of the Thames now have a new communications system. This allows them to keep in immediate touch with their Edgware headquarters in case of emergency.

The North London Blood Transfusion Service has taken delivery of four mobile phones from Cell Link, a British Telecom Mobile Communications dealer, for use in their donor sessions.

Teams of up to ten or twelve blood bank staff visit many hundreds of different premises a year to collect donations. The buildings range from local church halls to large offices and, in the past, the teams have often been difficult to contact.

Designer paging

Designer-styling hides another first for British Telecom in paging technology.

The new-look pagers, called Series 1200, operate to a signalling system - the fastest in the world, and is more than double the speed of BTMC's current paging range. Paging signals

are currently transmitted at 512 baud (bits per second). Series 1200 will receive signals at 1200 baud. This will reduce the time it takes for a pager to be alerted - creating space on the airways for more users.

British Telecom operates the world's largest, and the UK's only, national paging service, with about 400,000 users on its network. Demand for paging services is on the increase.

The Series 1200 pagers will initially be available in the London area only. Gradually they will be introduced throughout the UK, eventually replacing the current range.

Home service

The RAC, in conjunction with British Telecom Mobile Communications (BTMC) will now be able to offer 'phone home' facilities, when drivers break down.

More than 250 of the RAC's rescue vehicles on major routes are being fitted with mobile phones. And all members who are rescued by these vehicles will be offered a free phone call.

This new communications lifeline for stranded motorists was launched in London with the help of fluffy blonde comedy actress Sandra Dickinson, helped by RAC patrolman Andy MacPherson.

What a fix!

BT Property is used to dealing with a varied diet of buildings - from offices and shops to the odd Martello Tower and a former Roman Amphitheatre. Even so BTP's 1,000 ft quay at Western Docks, Southampton, was rather unusual.

Under a 1972 lease BT paid £118,000 a year. So the proposed increase last year to £2.6m was quite a shock!

The quay houses BT's marine cable fleet which lays and maintains the cable for our international telephone links.

Sandra Vine, of BT's Southampton depot worked closely with BTP to unearth and analyse all the statistical details of BTP's occupation since 1972.

Armed with evidence gleaned from research and visits to quays at ports in the South West and North East 'battle'▷

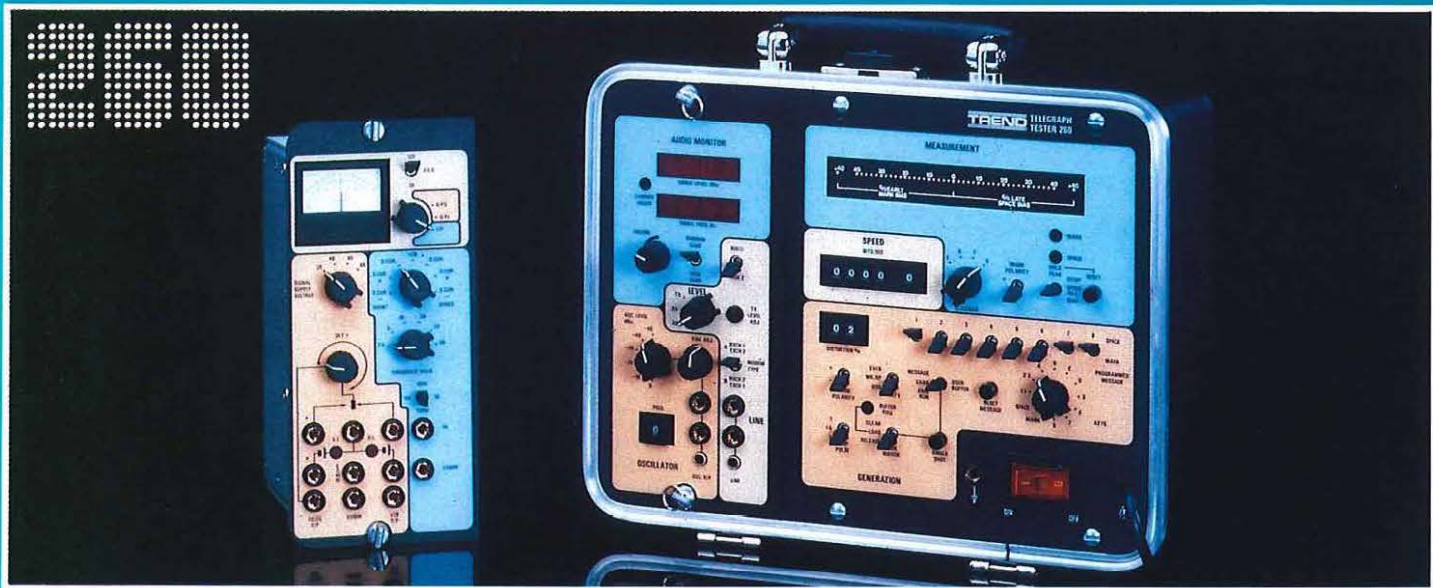
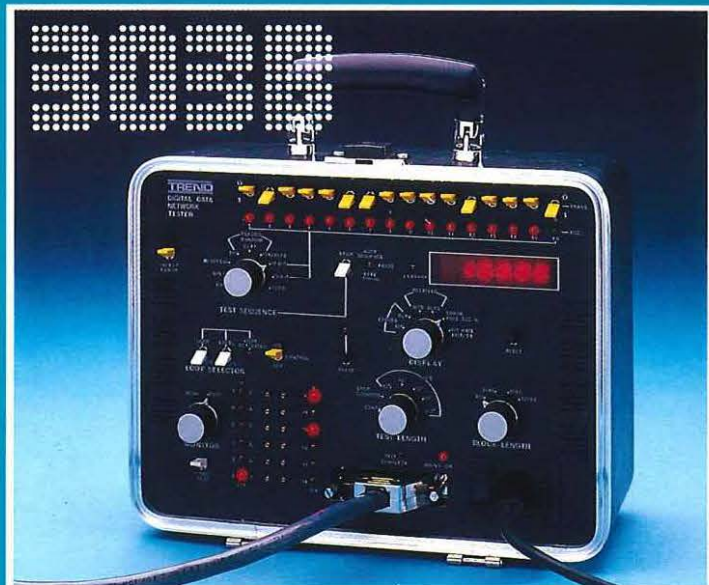
Jersey link-up

There is to be a new digital route across France to boost existing direct cable and microwave links between the Channel Islands and the UK.

The route will go by microwave from Dover to Boulogne, across Normandy by microwave and cable to Barneville and then by microwave to Jersey,

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Trend puts matchless micro-processor technology and software capability up front. And backs you up with unrivalled customer support and training. That's why installers and operators in over 50 countries consider Trend test equipment the natural partner to their communications investment.

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TREND TELECOMMUNICATIONS LIMITED

The best of British

The role of telecommunications in the technical, economic and social development of today's world is a fascinating one. Great strides are being made by other UK manufacturers as well as by British Telecom. Here is a selection of the rest of the best of British innovations on show at PALEXPO...

Plessey's brainy little portable payphone can sit in secure areas such as shops, bars, restaurants, flats - where vandalism is unlikely - or positioned on the office desk.

The colourful modern design will blend well with most styles of room and colour schemes. A 16-digit liquid crystal display and space for instructions guide both the user in using it and the owner in setting up the unit.

The payphone features include 12-button keypad, last number re-dial, abbreviated dialling, payphone/owner modes, and validation of four different types of coin, DTMF or decadic dialling options.

The wall-mounted PP6006 or the PP6007 (wall-mounted or portable) can detect combinations of 50/60 Hz and 12/16 KHz meter pulses for exchange driven call charging. Or a line reversal detector, press-on answer button and auto B party answer detection circuit is available which, with a flexible internal software tariff structure, allows a stand-alone operation on an ordinary subscriber line.

Live wire

Ericsson introduce a significant new enhancement to their core product, the AXE digital switch - used for every type of network, from small rural exchanges to the biggest international ones.

It is a Centrex facility for the new Business Group Services sub-system. Visitors will be able to sample the subscriber services on the latest, 'live' AXE exchange.

A new MD110 digital PABX is unveiled - a small-scale voice and data exchange for businesses with from 40 to 160 extensions, incorporating all the features of its bigger brother. It will be shown in a working office environment, using optical fibre links.

Hide it

Amphenol's innovative Undercarpet Cable system, offers a safe and unobtrusive solution to the problem of routing electrical power, telecom and data lines in the modern electronics office.

Designed and developed by the company's industrial technology division at Romsey, Hants., its modular approach makes it flexible and easy to instal. Flat cables and terminations implement a network of one-per-desk pedestals conveying

power, telecommunications and data signals.

It fits into existing offices, removing the need for locating desks and equipment near supply sockets, and allowing a more flexible approach to office layout. Services can be routed to floor level at the building stage in new offices and distributed to individual desks at the furnishing stage.

High pro!

Thorn EMI's INMOS T800, the world's highest performance microprocessor, displays its wide applications to telecommunications and communications network control.

The INMOS IMS T800 can sustain 1.5 Megaflops using its integral 64-bit floating point unit. Applications include high performance microprocessor systems, workstation clusters, telecommunication system management and creation of fault-tolerant communication systems.

INMOS will also show working examples of other VLSI circuits and how they can be used in telecommunications and broadcasting.

See all, hear all

GEC Video Systems videoconferencing, multipoint control unit (MCU) was the key element in the world's first digital, five-way, international videoconference held in May between experts in London, Paris, Amsterdam, Bonn and Washington.

The MCU automatically detects who is speaking, mixes the audio and switches the video in up to five separate locations that can be in different countries. Additional MCUs can be connected into the system to increase the capacity.

The IRIS Videophone - the world's first true video telephone for either

News scene cont'd

- with the landlord - Associated British Ports, began.

Their argument was based on what it would cost to provide the quay - a seductive argument. The facts and figures BTP and BTI had compiled, however, were hammered home. After some arduous negotiations ABP agreed to a rent less than a tenth of their original demand.

As the rent is fixed for 14 years over £33 million was saved - well worth the effort!

Appointments

Mr. Colin Browne, Director of Corporate Relations for British Telecom, has been appointed to the main council of the Incorporated Society of British Advertisers.

A Graduate of Trinity College, Dublin, where he gained an Honours degree in modern languages and literature, Mr. Browne, 41, was born and educated in Northern Ireland.

ON THE LINE

STC Group's ARSCC(A) is the result of a collaboration between ICL and BT London, initiated more than two years ago, to build a new generation repair service administration system. BT London designed the system which runs on ICL System 25s and PC Quattros or DRS 300 to drive the terminals and line test equipment.

ARSCC(A) is fully integrated with line test systems for automatic testing and full selective routing, currently integrating directly with BT Fulcrum's Gateway H or Teradyne's 4TEL line test systems.

There are now five RSCs operational on ARSCC(A) in BT London's Western District, the rest of the District goes live this year.

Western London District expect to see significant improvements in RSC performance and the quality



of customer service. Because of this there is already considerable BT District and international interest in the system.

BT and ICL have already initiated joint marketing campaigns in many countries including Eastern Europe, Central Africa and the Gulf States.

ISDN or switched 56-64kbps digital networks - makes cost effective, desk-to-desk, business video communications a reality.

British Telecom has developed both products which are being manufactured and marketed by GEC.

Satellite courier

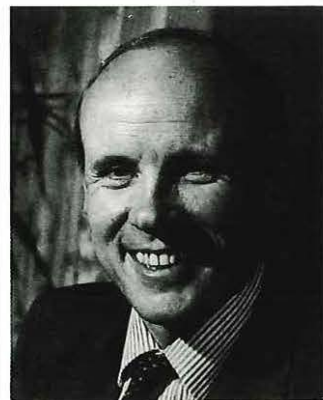
DHL, the world's largest international express delivery company, launches a new Satellite Express Service that is unique in the air express industry. It will soon permit fast, overnight delivery of high-quality document copies to major business centres on every continent.

The new service, a network of electronic image transfer systems linked around the world by satellite,

already operates in Europe, North America, Asia, and the Middle East - and will soon be available for Africa and Latin America.

This sophisticated system is simple to use. For example, an insurance company HQ in Brussels may want to send document copies to its affiliates in Chicago, Bahrain and Hong Kong.

The office orders the document (whether drawings, photographs or text) picked up by a DHL courier who then rushes it to the DHL Satellite Express Service operations centre in Brussels, where a special operator transmits it by satellite to similar operations centres in the three destination cities. There other DHL couriers rush the copies to the waiting customer. ■



with which he is still associated.

Mr. Jonathan Rickford, 42, has been appointed Solicitor to British Telecom, succeeding Mr. Philip Ashcroft, who has retired.

An Oxford graduate, Mr. Rickford taught law at the University of California and the London School of Economics before joining the Government legal service in 1972. Most recently he has been Solicitor to the Department of Trade and Industry.

Mr. Ashcroft, recruited from the Department of Energy as Deputy Solicitor in 1980, became BT's first solicitor in 1981 when the new corporation was created.

Quids in

When a Lloyds Bank computer broke down a hardware replacement was needed urgently.

North American Van Lines (NAVL) of Feltham Industrial Centre, Middlesex, was able to contact one of their drivers and instruct him to ▷

TOUGH, RELIABLE and BRITISH!

Smith Cases are tough, reliable and made in Britain.

Probably British Telecom's largest supplier of approved sales and service kits, we manufacture cases for well in excess of 50 systems — from the basic to more specialist

applications. Our cases are purpose built for each system.

We are willing to design and manufacture to order, and many other systems are under development at present — enquiries welcomed.



BRITISH STANDARD

Our cases have been supplied to British Telecom districts which have been successful in obtaining BSS750.

All cases are fitted with earthing facilities where appropriate.

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get the replacement equipment to the bank.

The firm had recently signed a contract for five British Telecom Callphones from Call Link, a Hillingdon-based BT Mobile Communications dealer.

Never too far

Long-distance lorry drivers will soon have the boss on their back bumper - while they are on the road. Especially those on long hauls across Europe, the Middle East and Africa.

British Telecom's world-first satellite radiopaging service trials will be targeted on long-distance lorry drivers before the end of the year. This is yet another international extension to the existing BTMC radiopaging service in the UK.

Messages will be routed via BTI's

satellite earth station at Goonhilly Downs, Cornwall, to an INMARSAT satellite. The signal the satellite sends back to earth will be received by a small "patch" antenna mounted flush with the roof of the lorry cab. A message Master pager in the cab will display the message, and a printer on the dashboard shelf will provide a paper copy.

Never too high

Final countdown for British Telecom's Skyphone is the award of a £2.6 million contract for equipment which will automatically connect airline passengers' telephone calls to customers on the ground.

The contract, with E B Communications (GB) Ltd, means that British Telecom International (BTI) has now finally bought all the

major equipment and software needed for Skyphone.

Trials of the new service, with calls connected by the operator, will begin next April on three British Airways 747 airliners, allowing passengers to make international telephone calls during flight.

The new contract is a first for BTI. For the equipment is the first designed to meet the full INMARSAT aeronautical standards for ground earth stations. It will be installed at BTI's satellite earth station at Goonhilly Downs in Cornwall.

Other contracts

BICC Cables has won a £6.5 million contract to supply over 41,300 kilometres of optical fibre cable for British Telecom's junction network - which links main trunk and local

exchanges serving installations over a 30 kilometre radius.

Tri-Test have received an order from British Telecom for more universal board test adaptors. These will be for BT's in-house Factron 7730 functional board test systems - to be used in the fault diagnosis of PCBS in a wide variety of equipment.

Vanderhoff Communications have been awarded a £1.6 million order by British Telecom for addressable transducers and ancillary equipment, as part of its automatic cable pressurisation monitoring system (ACPMS). BT has designed the transducers for installation at cable joints and other points - to monitor underwater cable for leaks and to prompt remedial action. ■

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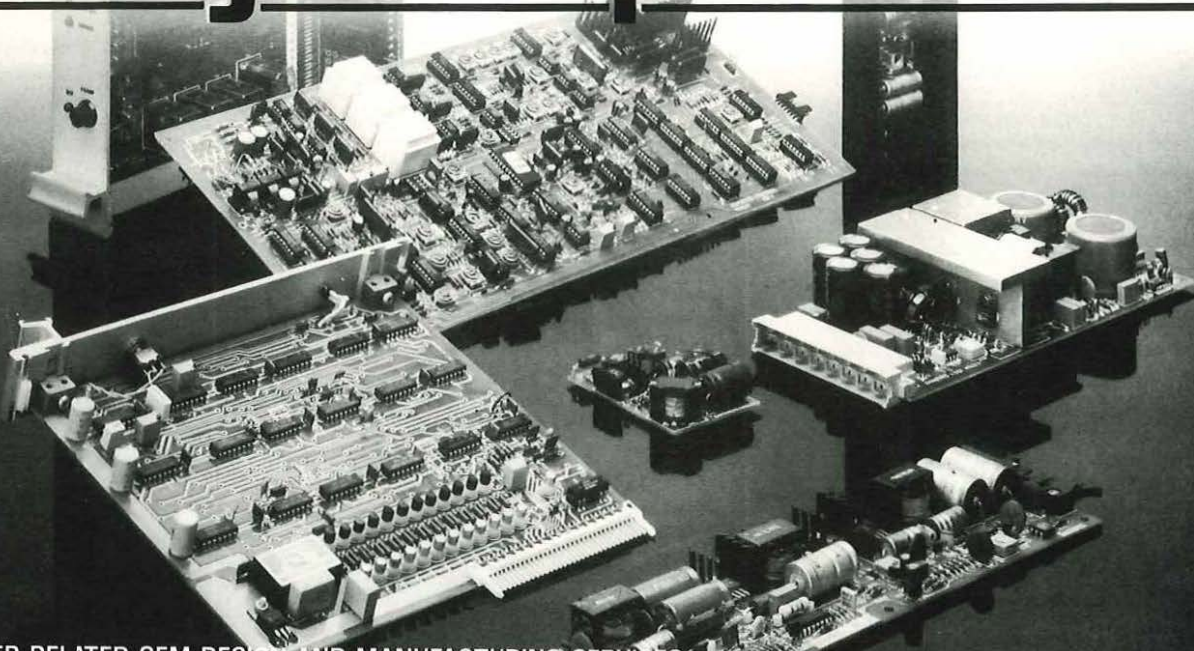
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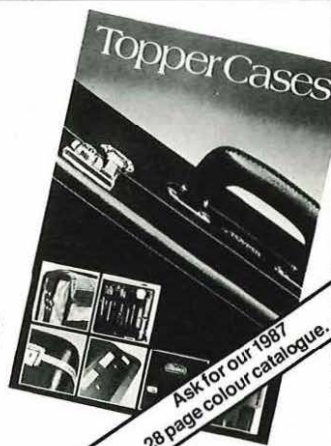
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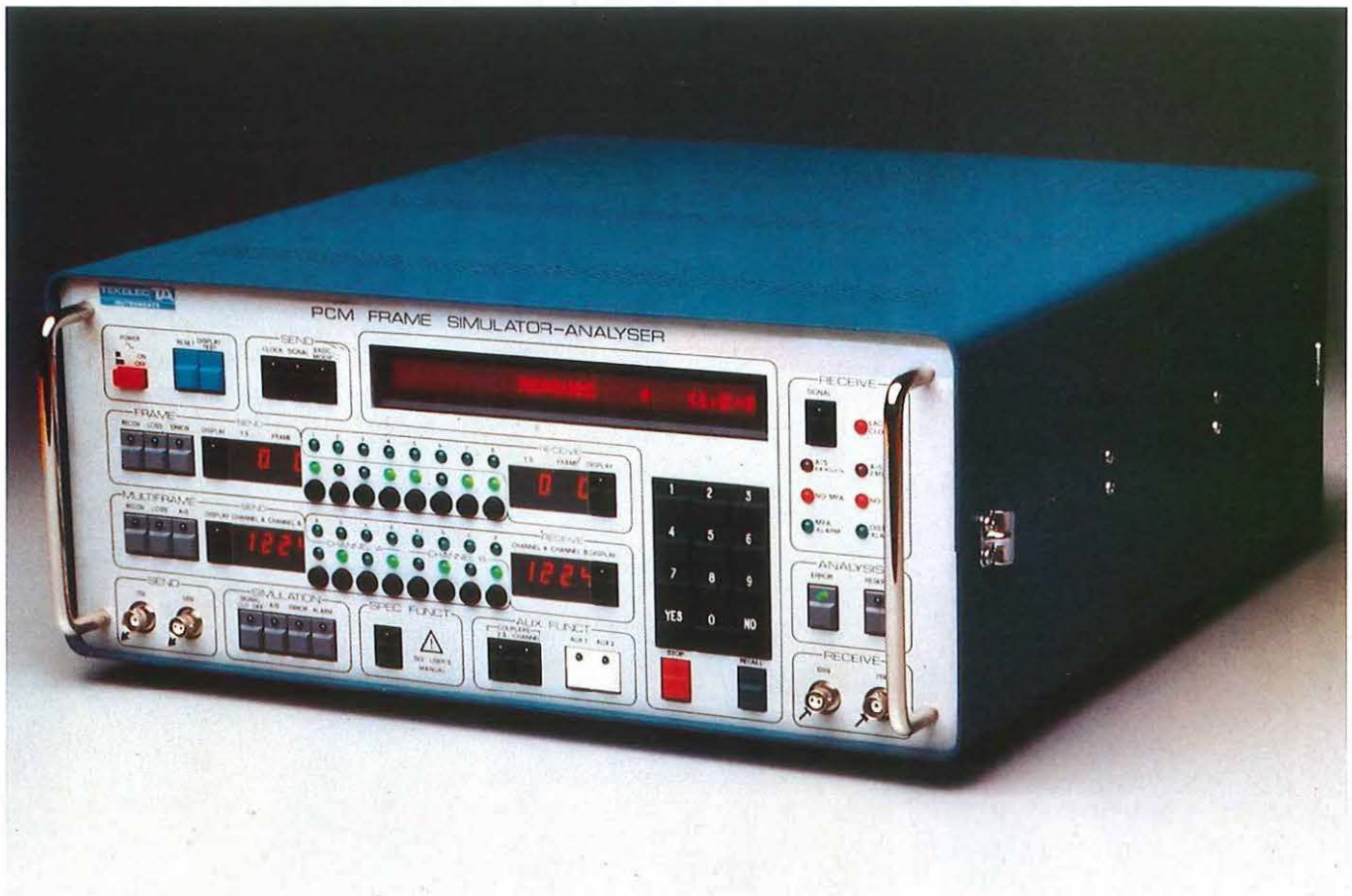


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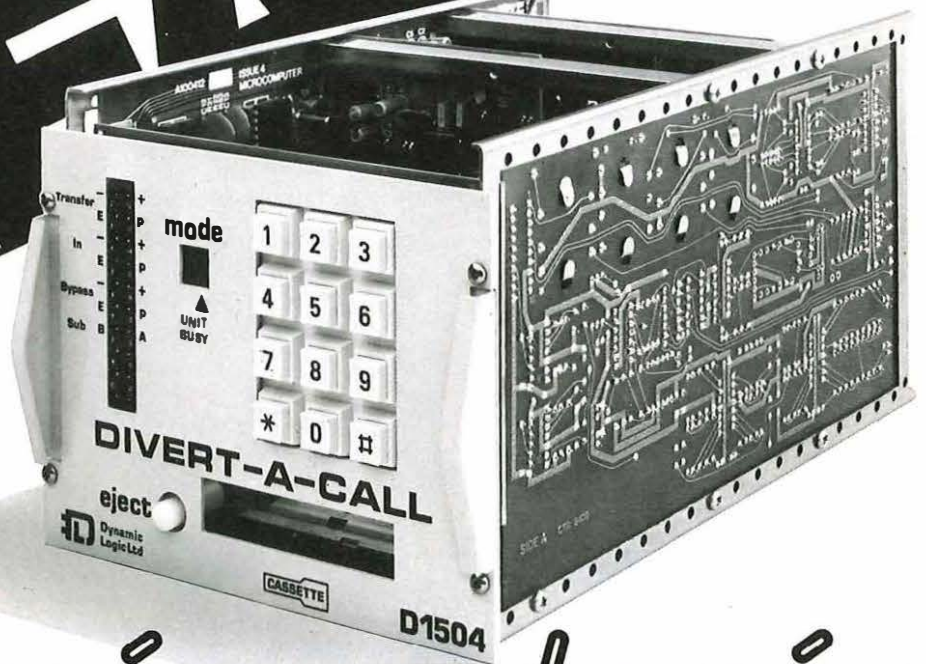
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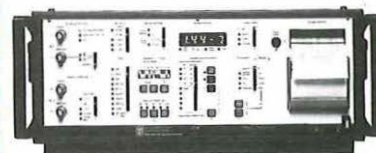
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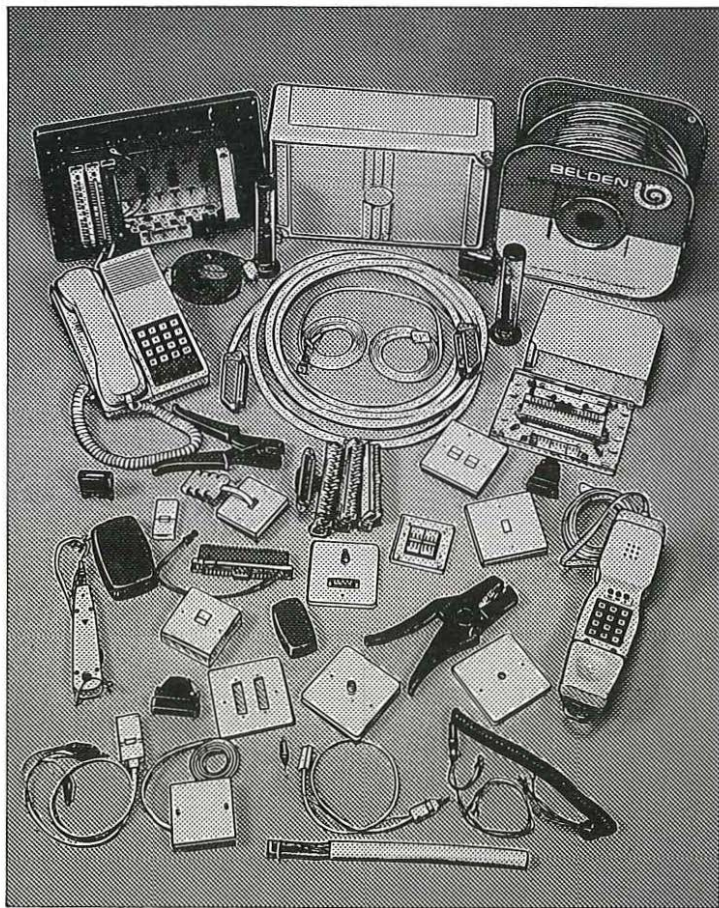
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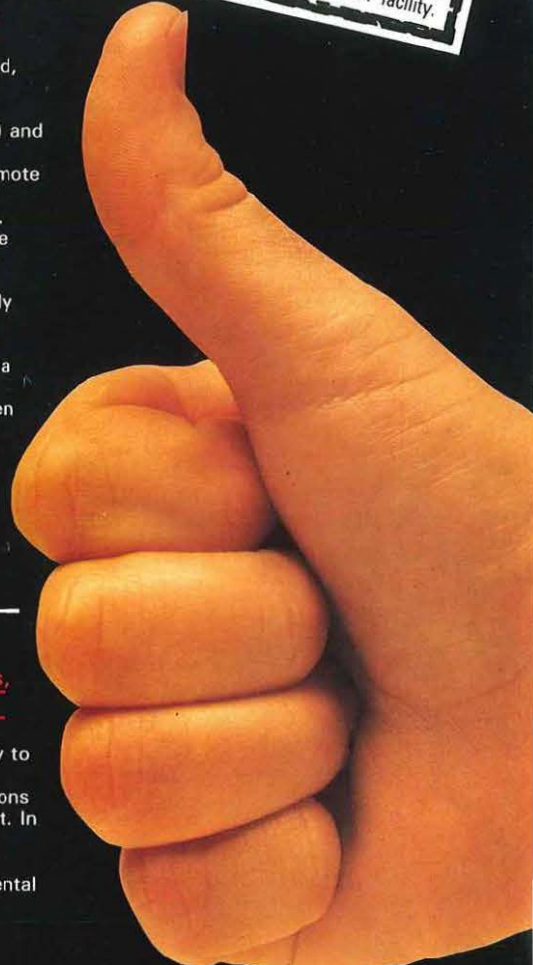
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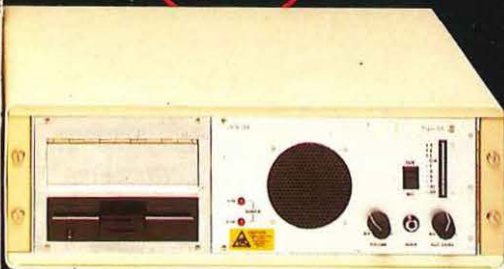
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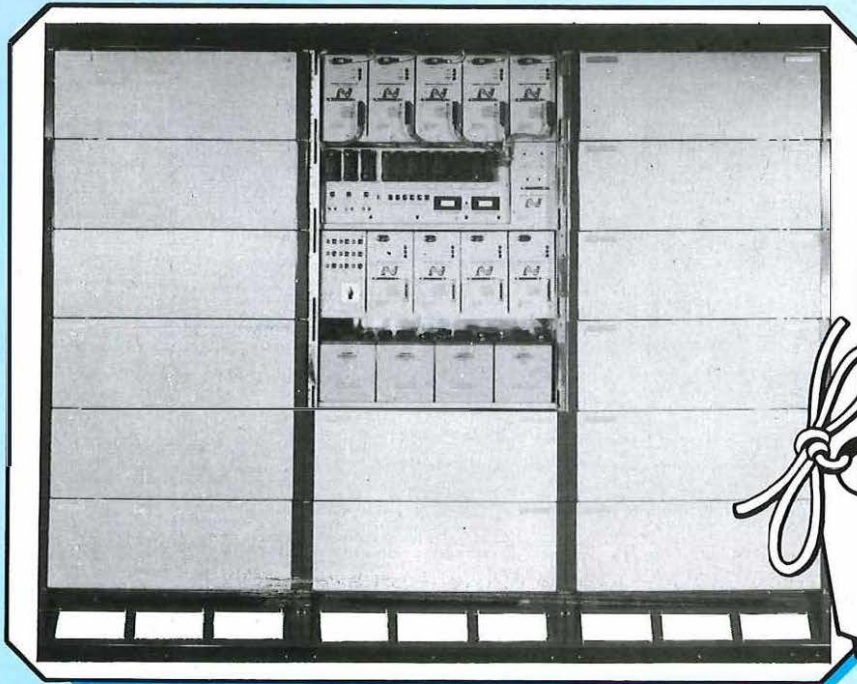


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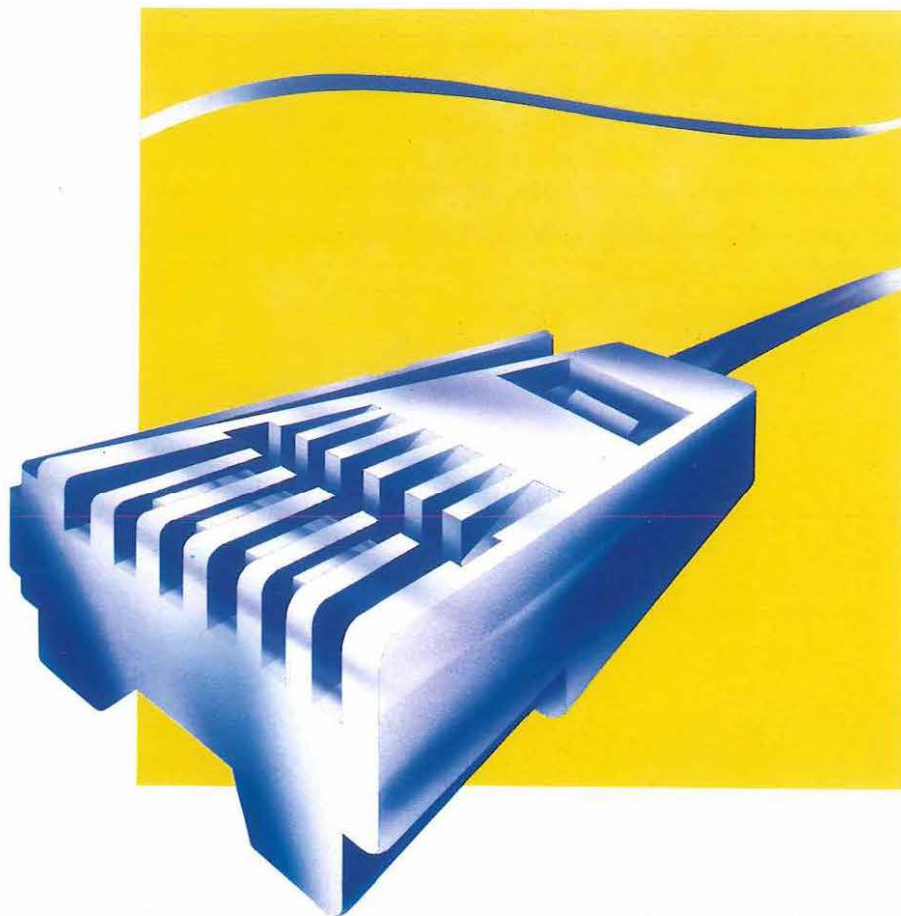
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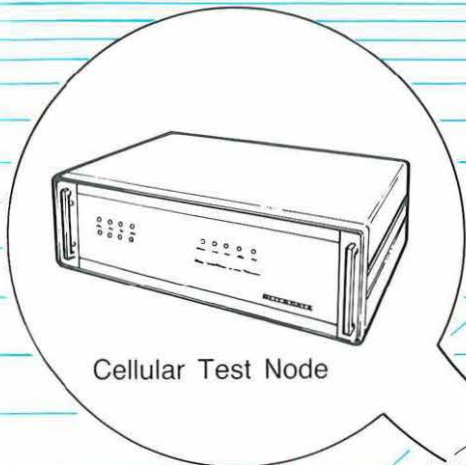
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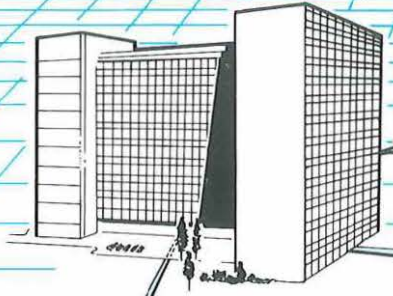
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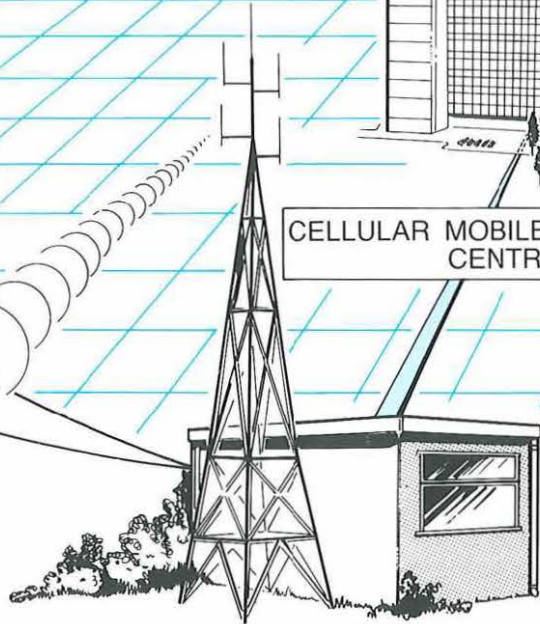
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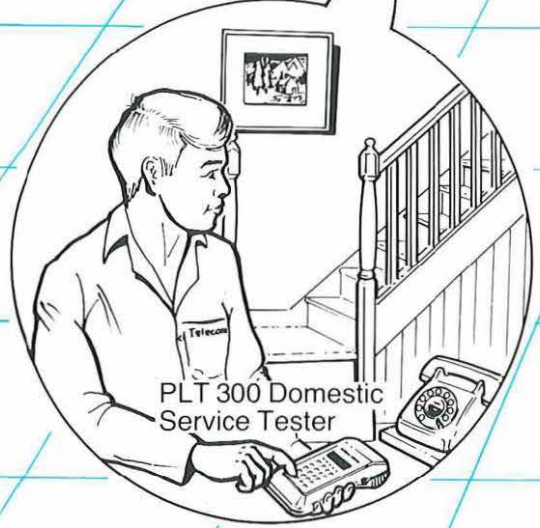
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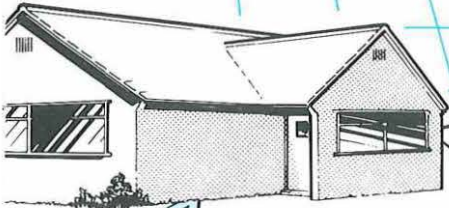
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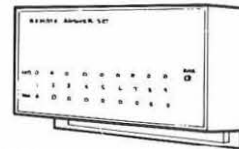
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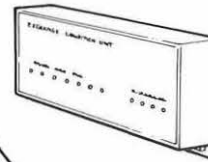


REMOTE EXCHANGE
(UNMANNED)

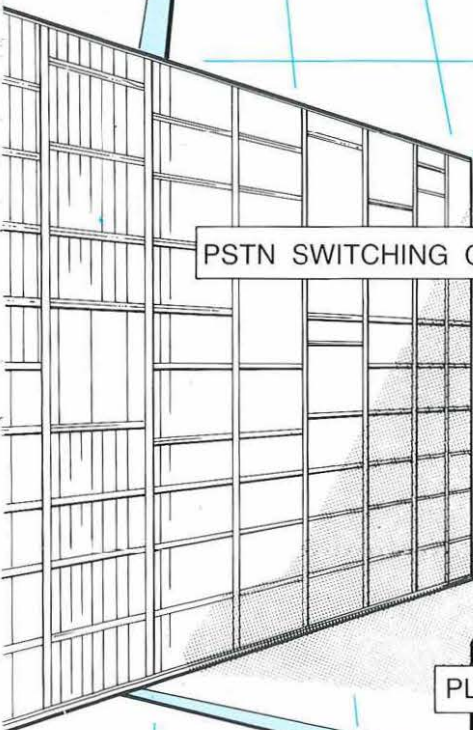
EXCHANGE CONDITION
MONITORS



Remote
Answer
Set



Exchange
Condition
Unit



PSTN SWITCHING CENTRE

PLT 100 with Access Unit

EXCHANGE CONDITION
CONTROL STATION



PLT 100 Handheld
Test Callsender

ROTADATA

Telecommunications Division

The Rotadata Telecommunication Division was formed to meet the demands for the company's expertise in specialised electronic and computer based data collection, analysis and display systems. This expertise, acquired through projects for the turbomachinery industry, has been applied to the manufacture of specialist test and measurement systems for a variety of telecommunications, microcomputer and other industries.

Rotadata telecommunication products use the latest microprocessor-based technology to ensure optimum performance with a high degree of reliability and ease of use. The Rotadata Automatic Network Analyser (ANA) for example was outright winner of British Telecom's "New Ideas" competition and has been proven in service, improving the quality of network service. Proof of ANA's success is that the unit has been adopted for national installation. Rotadata's aim is to introduce similar systems into telephone networks throughout the world.

The following are brief descriptions of products in the Rotadata's integrated approach to PSTN monitoring. Return coupon for further information on any or all these products.

- PLT100 - a true hand held Test Callsender for MF or LD working, integral printer and real-time clock for time tagged results.
- PLT Access Unit - plug in PLT100 for distributed access across multiple exchange connections.
- PLT300 - domestic service tester for end-to-end transmission testing.
- Mac Printer - specifically for printing call failure details for all MAC monitored units.
- ANA MK2 - high performance version of this successful network analyser for MF or LD callsending.
- ANA Intelligent Access Unit - combines objective measurement with distributed line access to multiple exchange connections.
- Remote Answer Set - originates and answers calls for two way transmission testing.
- Exchange Condition Monitor System - provides surveillance of exchange alarm conditions in manned and unmanned switches.
- Cellular Network Performance Analyser - for TACS system measuring all parameters in Mobile to Land, Land to Mobile and Mobile to Mobile calls.

Certain products contain technology used under Licence from the following:-

British Telecommunications plc.,

Telecom-Securicor Cellular Radio Limited.

Tick boxes and return for further information

- | | |
|--|--|
| <input type="checkbox"/> PLT100 | <input type="checkbox"/> ANA MK2 |
| <input type="checkbox"/> PLT Access Unit | <input type="checkbox"/> ANA Access Unit |
| <input type="checkbox"/> PLT 300 | <input type="checkbox"/> Remote Answer Set |
| <input type="checkbox"/> Mac Printer | |
| <input type="checkbox"/> Exchange Condition Monitor | |
| <input type="checkbox"/> Cellular Network Performance Analyser | |

Name Position

Address

ROTADATA

Telecommunication Products

Rotadata Limited, Telecommunications Division,
Liversage Street, Derby DE1 2LD U.K.

Telephone 0332-48008

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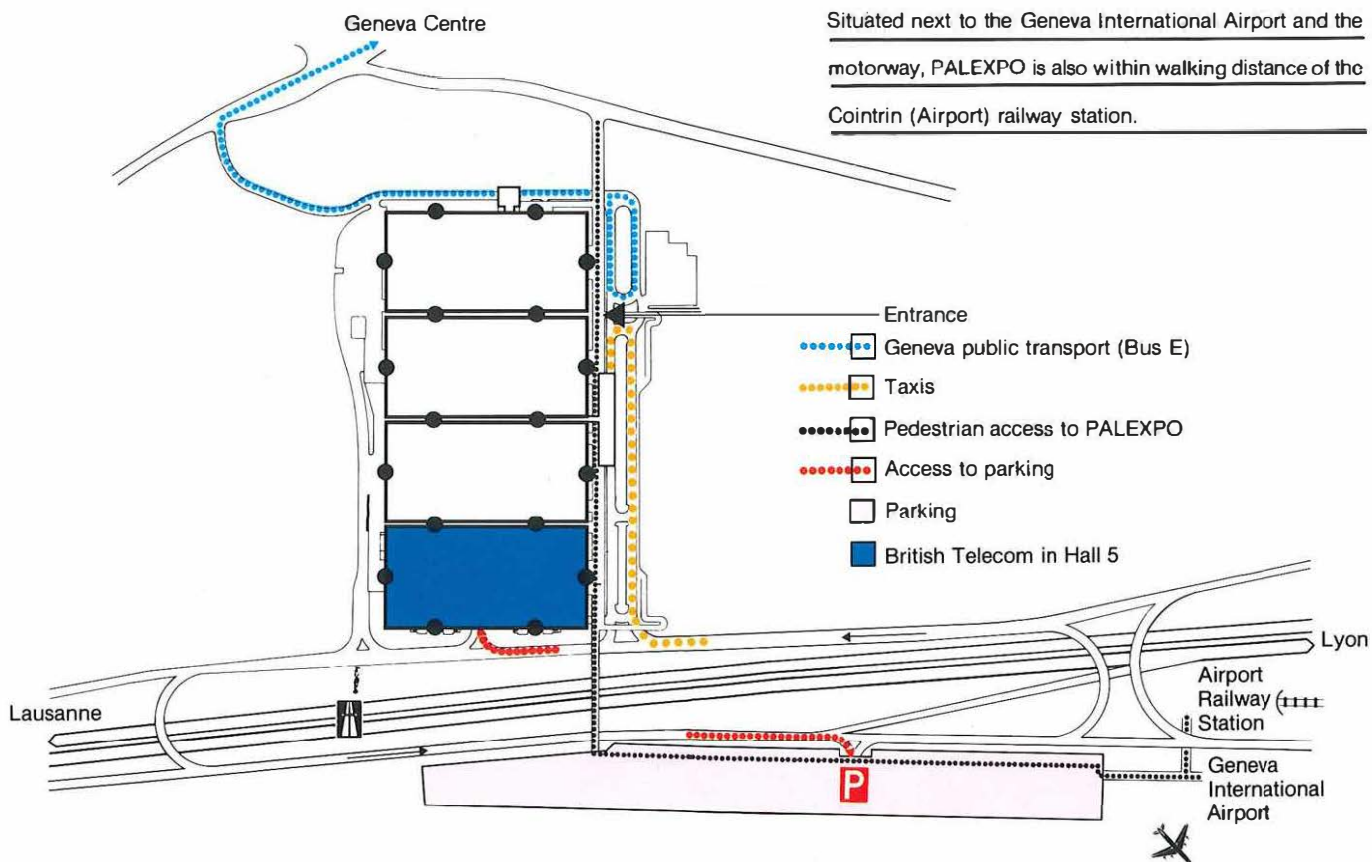


AT GENEVA

— A BUSINESSMAN'S GUIDE BY BRITISH TELECOM JOURNAL

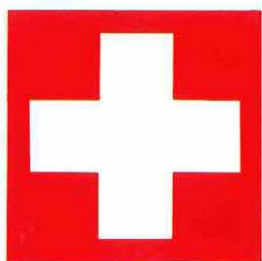


PALEXPO plan

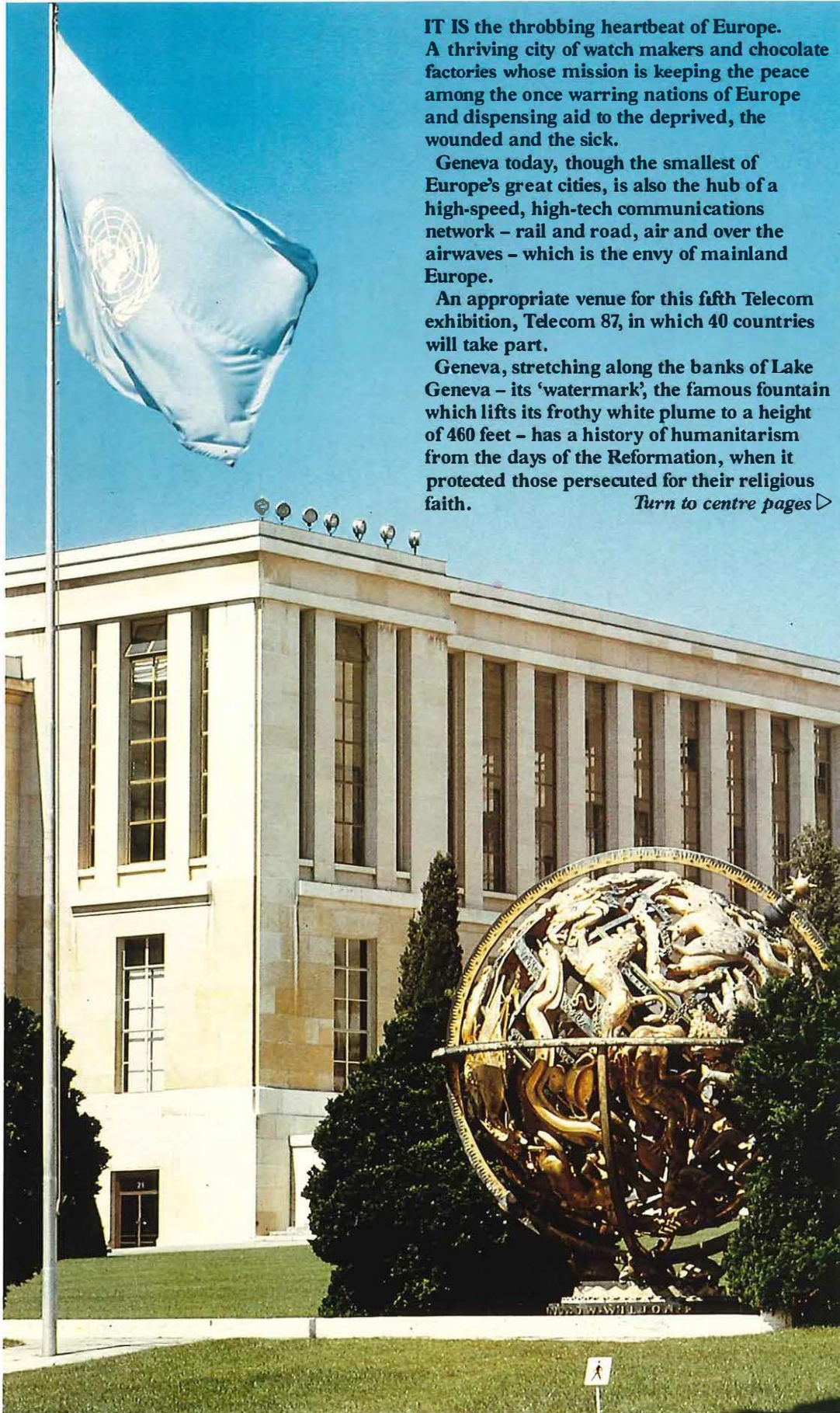


Meeting facilities

Theatre style	Air conditioning	Simultaneous interpretation	Restaurant	Number of beds
Lecture room style	Stage	Catering available	Dancing	Parking
Banquet style	Microphone	Secretarial services	Information desk	● available
Cocktail	Film projection	Exhibition (sq m)	Open air exhibition (sq m)	○ on request
				— not available



What makes a high-tech city tick



IT IS the throbbing heartbeat of Europe. A thriving city of watch makers and chocolate factories whose mission is keeping the peace among the once warring nations of Europe and dispensing aid to the deprived, the wounded and the sick.

Geneva today, though the smallest of Europe's great cities, is also the hub of a high-speed, high-tech communications network – rail and road, air and over the airwaves – which is the envy of mainland Europe.

An appropriate venue for this fifth Telecom exhibition, Telecom 87, in which 40 countries will take part.

Geneva, stretching along the banks of Lake Geneva – its 'watermark', the famous fountain which lifts its frothy white plume to a height of 460 feet – has a history of humanitarianism from the days of the Reformation, when it protected those persecuted for their religious faith.

Turn to centre pages ▷



BT flies the flag for Britain

Telecommunications play a vital and fascinating role in today's high-tech world. What would we do without the amazing micro-chip? This week as 750 people from 40 different countries gather in Geneva to participate, appropriately, in the Communications Age: Networks and Services for a World of Nations, Telecom, 87, exhibition, it will be obvious that we are a thousand light years ahead of the micro-chip.

Today, one of the most incredible scientific developments is fibre optics which influences all our lives.

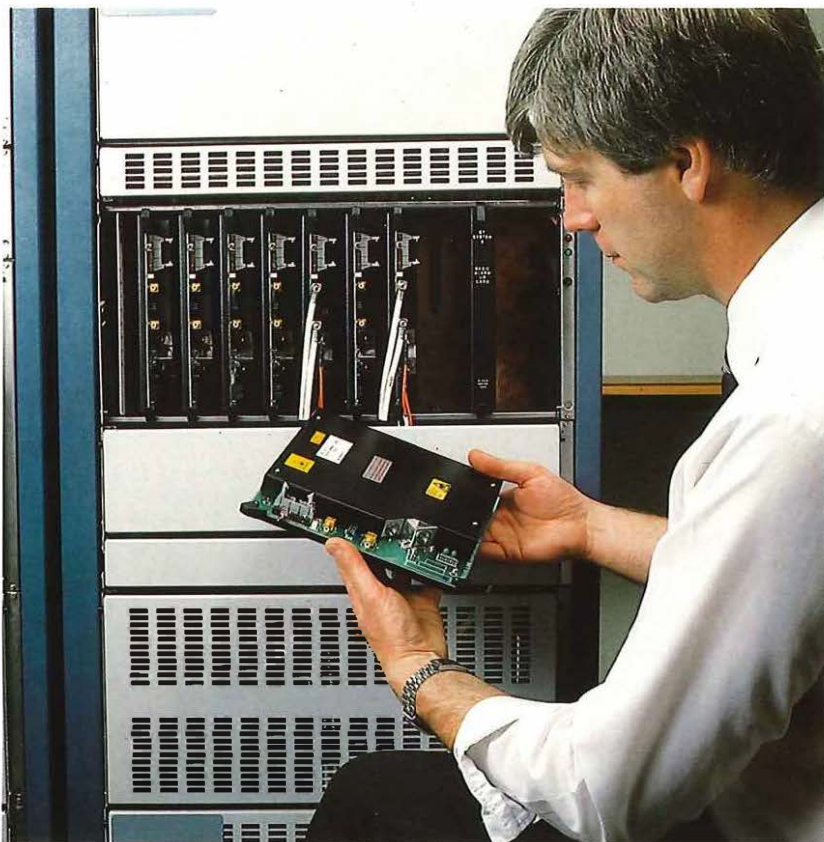
All eyes will be on British Telecom which developed the world's very first computer. BT will be flying the flag with its latest range of exciting international products and services; Information technology and telephone terminal equipment and consultancy training and management services. Some of these are described in the following pages.

Other British exhibitors are listed on the inside back cover. ▷

Line system is leading light

BT SYSTEM 2, a new optical fibre digital line system for short-haul, 2 Mbit/s transmission, gives unsurpassed performance at very low cost. It is ideal for a wide variety of data transmission functions, including telephone network local line access, inter and intra office communications computer to computer links, and local area networking.

Picture: checking one of the eight Line Terminating Units used in BT System 2.



Each BT System 2 line system comprises two Line Terminating Units (LTUs), interconnected by a pair of optical fibres, one for each direction of transmission. By adopting the CCITT-specified HDB3 interface code for transmission over the optical path, a 2 Mbit/s signal achieves the desired system requirements of signal transparency, adequate timing information and error monitoring.

The BT System 2 line transmission system can operate over both singlemode and multimode graded index, optical fibre pairs, without the need for optical attenuators. Singlemode transmission caters for distances up to five kilometres with 9/125 optical fibre, while multimode operates up to ten kilometres with 50/125 optical fibre.

BT System 2 is packaged in a TEP-IE equipment shelf which can accommodate eight separate LTUs, together with an alarm interface card and an optional shelf interconnection card. Each LTU has its own power supply for improved failsafe operation, with the DC power supply distributed via the shelf backplane. The shelf backplane design is specially constructed to help overcome the operational problems associated with radio frequency interference susceptibility. BT System 2 meets BS6527 Class B for the emission of spurious signals.

LTU status is checked 1,000 times per second, and ten separate alarm lights, each with lamplock facility indicate visually such conditions as power off, signal failure and for end fault. Transmission performance monitoring can also be provided by replacing the alarm interface card with a central network monitoring interface.

Advanced end-to-end supervisory features provided by BT System 2 include alarm extension, remote loop back, and user-definable end-to-end flags.

Each LTU, manufactured to the highest standards, is protected by a metal housing to ensure EMC and ESD protection both during manufacture and in service. ■

Primex for prime private networks

PRIMEX is one of the world's leading international private network services, exploiting both British Telecom's expertise and the UK's geographical position as a natural telecommunications 'hub'.

A new network management centre, dedicated to the needs of private customers and due to open in September, will symbolise Primex's success since the launch of the service in the 1970s.

Primex enables customers to hub over 100 international private networks in the UK. These range, according to customers' varying needs, from complex integrated networks carrying fax, data and voice between several international nodes, to simple point to point messaging networks.

It offers a complete package - transmission facilities and a wide choice of high-quality equipment, including voice, data, and message multiplexing, as well as processing and switching equipment. Customers house their switching equipment on purpose-built BTI premises, taking

advantage of: 24-hour maintenance, centralised fault-reporting with an immediate response to any problem, on-site spares and a guaranteed power supply.

BTI's Business Communications Service is, in essence, an extension of Primex. It acts as a single point of contact, aiming to provide, and if required, to manage a total communications package tailor-made from scratch, for individual customers' needs.

All a customer has to do is explain his network needs and BCS will then organise it, leaving the customer free to get on with his own business.

BCS acts as a single point of contact for a project, dealing with equipment vendors, carriers and others involved in creating a particular network. The service handles everything from the initial network studies, system design and specification, implementation, testing and commissioning the network to managing it once it is up and running. ■



Reaching out to remote areas

PROVIDING modern telecommunications services to small communities in remote areas is one of P & T's most challenging tasks. Many small capacity electromechanical exchanges, often in isolated or sparsely populated areas, exist in telephone networks throughout the world and as they become obsolete and uneconomical to maintain there is a growing need to replace them with up-to-the minute technology.

A solution to this problem is provided by digitally switched stored-program control exchange UXD5 which offers advanced technology replacement. This allows an administration to introduce new facilities efficiently and economically as policy dictates and includes a range of features usually only available on larger systems.

The UXD5 is fully compatible with existing electromechanical and analogue - electronic systems, and can also be integrated into developing digital networks. The flexibility of software enables system programming to be carried out, or revised easily, to meet the widest variety of network systems. Charging and signalling options are typical areas catered for by software variants.

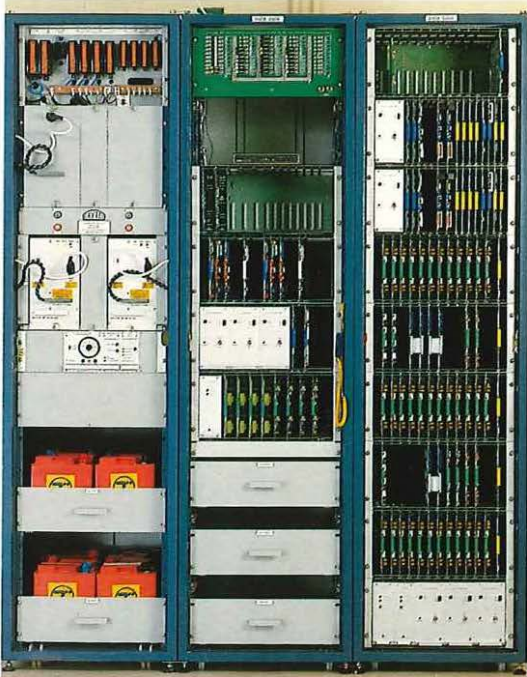
Through the MMI (man-machine-interface) it is simple to carry out fault interrogation, interactive testing, data base amendment and to retrieve billing data from remote locations, in addition to local access. Many management and traffic statistics are also available for examination. The remote control and testing facilities from a maintenance centre significantly reduces manpower costs.

Compact switching cabinets containing slide-in equipment units with plug-and-socket connections ensure quick and easy installation requiring a minimum of floor space. Cost-effective expansion of the system is achieved by using slide-in-units to cater for further rural development.

The UXD5 has proved a great success in developing third world countries such as Kenya, Malawi, Kiribati, Brunei and the Solomon Islands. Equipment used not only replaces existing electromechanical apparatus but also manual magneto systems and, in some cases, provides service where none previously existed.

In these countries a need for rural communications stems from the now universal acceptance that an adequate rural telecommunications infrastructure is an essential means of reducing the migration of population from the country to cities. ■

Photographs show (below and below left) a UXD5 exchange and the man-machine-interface MMI.



E-mail goes for GOLD 400

INTERNATIONAL standards for electronic mail products and services - known by the shorthand X.400 - have opened the way for a worldwide messaging community to blossom. Private systems and public services based on X.400 now combine to create astonishing new possibilities that, in a few years, will be taken for granted. Just like picking up the phone.

The essence of X.400 is a universal set of protocols which are invoked when the user wants to go beyond his own system into another. So the X.400 software creates a kind of gateway allowing messages to be passed out of and into a closed group.

The concept of Open Systems Interconnection has existed for some time as an ideal and, in time it will be applied to many different areas of business activity, from manufacturing automation to transaction processing. One important area it has already been applied to is electronic mail. Indeed ▷



the X.400 standards are the realisation of OSI for the whole spectrum of electronic messaging media.

British Telecom's new GOLD 400 is providing a public X.400 network service to interconnect all X.400 systems, regardless of type or make of equipment. So a single connection to the public service allows any one system to communicate freely with all the others. GOLD 400 also provides simple connections with telex, fax and BT's electronic mail bureau, Telecom Gold, to form a totally comprehensive messaging service.

Firstly, it is a 'store and forward' service, with no real time contact between senders and recipients. The service takes care of delivery, so senders can despatch their messages at a time to suit themselves and their workloads. Sending a message from one computer system to another is as simple as addressing an envelope, with no multi-digit figures in sight.

Messages are composed and sent from the sender's usual equipment - no retraining required - and there is no need to know what sort of terminal the message will be delivered to. GOLD 400 takes care of necessary conversions.

Most notable feature is the powerful electronic directory. To check on an X.400 address a subscriber can search the directory database - in real time - in a number of different ways.

Customers of Telecom Gold now have access to the whole X.400 world. Telex subscribers will also have the benefits of X.400 messaging through software fitted in the system. Registration is required for private e-mail systems, to get details into the directory and the full capability of GOLD 400 is at the customers' fingertips. ■

A warm reception for the latest hotel switches

BRITISH Telecom's SX2000S is the second of a family of SX2000 PABXS designed to appeal to the 100-600 line (trunks plus extensions) customer. A step ahead of the SX2000 which has a maximum of 625 trunks and 2,500 extensions.

The SX2000S will encompass all usual SX2000 features plus many new ones. All are common to both systems - these include greater Digital Private Network Signalling System (DPNSS) function and a comprehensive hotel package, such as room status and automatic wake-up calls.

Software releases in future will be compatible with the SX2000 and SX2000S.

All SX2000 peripheral devices like its screen-based operator's console, the Superset 7, and the TX14 FeaturePhone can be used with the SX2000S.

The SX2000S has been developed to enable smaller sites to enjoy the SX2000 features and functional at a lower cost.

The SX2000S equipment is housed in one or two cabinets, depending on the line size required, that is up to 300 lines one cabinet, 300-600 lines two cabinets.

As an option the system can be offered with a dual processor (redundancy).

Each cabinet is similar in size to the Regent, which is of particular use when space is at a premium. So, in fact, they can be stood in a reception area. ■

Picture: this housing cabinet is compact enough to fit in an office reception area.



Mezza boost for office routine

A COMPUTER that works for people, the way they're used to working. Information to hand, messages reliably delivered, appointments accurately scheduled - every time. In other words flawless office efficiency.

That is the beauty of Mezza - an advanced UNIX based multi-user computer designed to work with a PABX - which will fully satisfy the information, office and communication needs of managers, professionals and administrative staff.

It combines telephone and computer in an entirely new way. With the integration of its digital telephone and use of existing two-wire telephone link to communicate, Mezza is as simple and straightforward to use as the telephone.

Most impressive of Mezza's facilities is its voice messaging capability which extends voice communication beyond real time communication. Voice messages may be electronically mailed to any other user on the system and voice comments added to text documents.

It's as easy to use as a domestic audio recorder and filing does not differentiate between voice and any other storage medium. There is also a full range of manager/secretary functions, such as dictation and transcription.

So without wasting time a boss, himself, can implement most of the functions he needs without using the keyboard, relying on softkeys and his own voice - so maintaining continuity between thought and action.

A user can switch activities quite easily. He or she can carry on preparing a document, while answering the telephone, then call up other screens, to consult a diary or, say, a file, then return to the original document, all at the touch of a few buttons.

Voice, text or graphics can be electronically mailed to any other user with 'private', 'urgent' or 'recorded delivery' options. Items mailed can be sent to individuals or groups. There is also a message slip facility which is generated every time you answer the phone for a third party, or receive no reply from another user. A voice message may be added to this message slip avoiding the need for the keyboard.

Mezza is UNIX based, and is specifically designed to co-exist with a multi-vendor environment. It is compatible with IBM compatible Personal Computers and IBM 3270 comms. It provides access to Telex and Telecom Gold. X400 plays an important role in the early development programme. ■



Flying a KITE for BT phones



telephones. There are plans for a number of variants of the core NRT, including such additional features as on-hook dialling, full two-way loud speech, integral telephone answering device, and extended single-button access memory fields.

In today's business environment, organisations recognise the importance of speed and efficiency in both voice and text communications. To cater for this need, CTP have developed two potential world beating products:

The M2120 (one of the M2100 series of products) is a 'forms-based' point-to-point messaging terminal designed for use over the PSTN and PABX extensions. The terminal can be used for accessing electronic mail systems like BT Gold, will emulate a VT100 terminal, and can be used as a viewdata (Prestel) terminal.

The QWERTYphone provides a full hands-free loudspeaking telephone, and a 250-number memory (with names and addresses) available at the press of a button. The product can be programmed to incorporate the main system features of most popular PABX's, has an integral V21 modem giving access to BT Gold and other dial-up databases, with an optional printer which can double as a simple electronic typewriter. ■

Photographs show (left) the KITE cordless phone, (below) the M2120 message terminal and (bottom left) a QWERTY phone.

KITE BT's new cordless telephone for the residential and business sector will allow the user to make and take calls up to 100 metres away from the base unit. This telephone incorporates full intercom between handset and base-unit, a 12-number memory, and other popular features.

Other modern telephones exhibited are the SCEPTRE, with its modern design and range of attractive features such as LED, alarm and ten-number memory, the VENUE 24, aimed at both the business and domestic market with its extended 24-number memory store and 'designer' case; the SLIMTEL 10 one-piece telephone for the domestic market and the TRIBUNE, a basic telephone offering both business and domestic customers a highly reliable product, whether used off a PABX or a direct exchange line.

However, the latest telephone development from BT, and exhibited for the first time, is NRT ('New Range Telephone'). In its core format, NRT is a ten-number, single-button access memory telephone which can store telephone numbers and/or the codes which control special features on PBXs or modern exchanges like . . . divert, call forwarding, ring-back.

As its name suggests, NRT will be a range of



Gateway test 'watchdog'

GATEWAY Remote Line Test system is an economical, reliable BT system which provides the full range of facilities normally associated with the traditional Test Desk. It also offers alarm monitoring and secure data access for remote operation of exchange equipment.

The system comprises two main elements: the Controller which is free standing or rack mounted at the Repair Service Control (RSC) and the Remote, located at the target telephone exchange to access the existing test selector network. ▷

continued after centre pages



Getting to know Geneva — what to do, where to eat,

Photograph below: Chillon Castle, nestling in the waters of Lake Geneva, inspired Lord Byron when he lived nearby, to write his memorable tale, *The Prisoner of Chillon*.



It is the seat of the peace-keeping League of Nations, better known as the UN, the World Health Organisation, the UN High Commission for Refugees and, of course, the Red Cross which was in fact founded in Geneva in 1863.

But there is more to Geneva than banking and do-gooding.

of Lake Geneva for a cable car ride over Geneva's 'own' mountains, the Diablerets Glacier range or visit Chamonix, at the foot of Mont Blanc, a two hour journey into France. Gruyere with its model cheese factory, and Chillon Castle, whose foundations lie under the lake, are two other nearby sights to see.

Switzerland attracts over one million visitors a year. It's not just the scenic splendour, the Botanical Gardens, the flower clock in the Jardin anglais, the lovely lakeside walks, but the fine food and wines – vineyards nestle on the slopes around the city – which bring back visitors time and time again.

In Geneva, though the 'mother' tongue is French and the most popular cuisine is Italian, you can eat 'foreign' – from Spanish to West Indian, Brazilian to Vietnamese.

But why not try some of the excellent local Swiss specialities, like Fondue and Raclette (cheese dishes), Sausages and Roesti (fried potatoes), Buendnerfleisch (air dried beef) and Fondue Bourguignonne (cubes of beef with various sauces). Most restaurants serve a special meal of the day, a *Tagesteller* (*Plat du Jour*).

What to see

Nobody should leave the city without enjoying the historical charms of the Old Town. Walk through the cobblestone streets of the Promenade St. Antoine to the Cathedrale St. Pierre, built in the 12th and 13th century. Archaeological treasures dating from 1,000 AD can be viewed here with the help of the most modern computers.

Next door is the Auditoire, the church in which Calvin taught and John Knox was minister. In the centre of the River Rhone is the Tour de L'Ile (the Island Tower), the remnants of a medieval fort.

Art lovers will want to visit the Petit-Palais to see the work of everyone from Renoir to Picasso, the unique Clock and Watch Museum, the Natural History Museum, reputedly the finest in Europe, and linger over the Baur Collection of Chinese and Japanese art. Political thinkers will find a 45-60 minute tour of the Palais des Nations is not just the sight of that strikingly modern UN skyscraper but a really beautiful palace set in the Ariana Park.

There are all sorts of fare reductions, like unlimited travel – day, four day and eight day tickets (ask at Geneva's Cornavin railway station) – as well as excursions by lake steamer, coach or cable car. Cross to the Montreux end

Photograph right: dip a cube of bread into a pot of melted cheese laced with wine and kirsch and, voila, you have that tasty dish, Swiss fondue.



Where to eat

Brasserie de la Bourse, 7, place du Marche, Brasserie Tivoli, 2, rampe Quidort (Swiss specialities); Churrasco, 21, rue du Rhone (steakhouse); Vedia, 65, rue du Rhone (Italian family cooking); Les Cinq Saveurs, 22, rue du Prieure (vegetarian); Domino, 16, rue du Vidollet (fish); L'Age d'Or, 11, rue Cornavin (Pizza). *Prices from 15 to 25 Swiss francs.*

Auberge de Gy, 1251 Gy (Swiss specialities); Parc Bertrand, 62, rue de Florissant (French); Buffet Cornavin, 3, place Cornavin, Cintra-Phone, 2, rue du Rhone (French/fish specialities); Le Celeste Empire, 7, rue Tour-Maitresse, Poons of Geneva, 137, rue de Lausanne (Chinese); Yankee Clipper, 3 rue

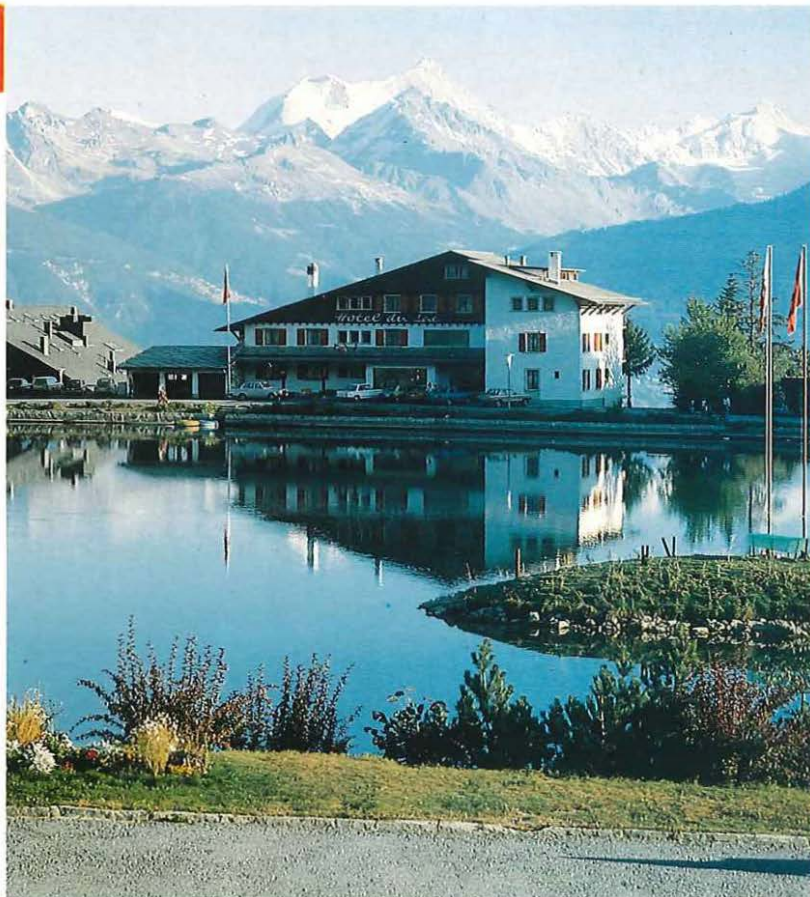
where to shop

Chaponniere (American); Manana, 3, rue Chaponniere (Mexican); Milan, 9, rue Chaponniere (Italian); Chez Spiros, 75, rue de Carouge (Greck). *Prices from 25 to 40 Swiss francs.*

Look for the word *Coop* for self-service, for French, Swiss, Genevese food, and *Migros* for international snacks (*from 11 Swiss francs*).

Local wine is very pleasant, Pinot and Garnay are excellent red and Perlan a popular white. The wines of nearby Vaud, Valais and Neuchatel won't disappoint the connoisseur, nor will the highly potent spirits, Kirsch, Mar, Pfluemli and Williamine.

Geneva is a shopping paradise, from its super chocolates to the marvellous, multi-purpose Swiss army knife, from watches to hand-made lace and antiques.



the split second, note that it takes six minutes to travel from the new railway station at Geneva Cointrin International Airport to Geneva Cornavin Station.

The Cointrin rail link opened on May 25 this year but started running (200 trains per day) on May 31. This new shuttle service can carry up to 58 million travellers a year.

PALEXPO, where Telecom 87 is being staged, is next to Geneva Cointrin Airport and within walking distance of Cointrin airport railway station for the new high-speed, three mile shuttle service to Geneva (Cornavin) centre. Or hop on a bus outside PALEXPO (Hall 1).

Before you go abroad remember to check the Area code of your home number or any number you are likely to phone from Geneva. Sometimes the national or area dialling code omits the initial '0'.

- To phone the U.K. from Geneva: Lift receiver, check for dial tone (it may be different to ours), dial 00 44, followed by the U.K. area code and the telephone number. E.g. To call Bristol 12345 (code 0272), dial 00 44 272 12345.
- To fax: Dial 00 44 (then the fax number of the company you are calling).
- To telex: Dial 051, then the number you want.

BT visitors will see some strange faces which may well become very familiar during the eight-day exhibition. Your 'neighbours' will be from Japan, France and Belgium. So if you want to show a bit of good old Brit politeness turn to back cover . . . ■

Photograph above: typical Swiss mountain chalet beside a lake in the famous resort area of Crans-Montana, where the alpine ski world championships took place in February this year.

Photograph left: a familiar sight and sound in the mountains, the local farmers playing their huge Alpenhorns, an instrument unique to Switzerland.

Where to shop

The centre of Geneva is full of large shops and department stores. Residents refer to this part of town as Les Rues Basses. Lively, yet relaxed, it is packed with bistros and restaurants, with terraces among the shops.

It is pricey but this is where you'll find watches, clocks, Swiss cotton and wools by the yard or made into fine men's and women's shirts, skirts and other clothing. Embroidered blouses, hankies, table linen and needlepoint lace make nice presents, so do the carved wooden chalets, figures, and pipes the Swiss are so good at.

However, a browse round the small squares and markets, which are held several times a week at Rive, Coutance and Carouge, may well produce something more ethnic and less expensive. Try the flea market on Wednesday and Saturdays on the Plaine de Plainpalaise and, for antiques, the Old Town.

With the Swiss passion for time-keeping to





Screen system to help

TOUCHLINE combines telephony with the ability to manage and manipulate data in a unique way.

The system's own database enables your staff to answer customers' calls quickly, efficiently and effectively. In reply to any order or query, relevant information can be at their fingertips instantly, with historical background on the caller - creditworthiness, repayment records, whatever . . .

And, unique to Touchline, all information keyed in, including the callers' details, request or problem, can be referred in its entirety from one station to another - when the pressure of incoming calls, or the need for more detailed discussion demands.

- As calls arrive they're directed to the call receptionist who has been free for the longest time.

Automatic Call Distribution: If no operator is immediately available a sophisticated ACD processor will queue calls and re-distribute them with no loss of priority.

- Essential equipment for the operator can be reduced to a Touchline console and a headset or hand-held telephone. A normal qwerty keyboard is used for data input.

Touchscreen Control: As each call is connected, the call receptionist is presented with a user-defined screen, which might typically be an electronic notepad, which allows the operator to key in the caller's particulars. Or, one of the system's data pages offering helpful information. Or, perhaps, a pro forma order form which can be transmitted directly to a mainframe computer upon completion.

The system allows you complete freedom to design your own facilities and you do *not* have to be a programmer to do it.

Sophisticated Telephony: Throughout the call, the operator is in continuous contact with the caller. Normal telephone facilities such as hold, release,

Gateway test 'watchdog' (cont'd)

- ▷ Each simultaneous test requires one Controller which accesses the Remote either via private circuits where test speed is vital. Or via a totally secure dial-up/dial-back arrangement, using the PSTN for smaller exchanges to reduce circuit costs.

The system has test-heads in every exchange to avoid the need for high-quality metallic test junctions. It is virtually impossible to have a total system failure as the system doesn't use a central processor.

Separate matrix switches may be provided to increase test access or to share multiple private circuit termination at the RSC among a few Controllers. A separate Central Reporting Unit (CRU) permits alarms to be reported centrally and separately from line testing positions.

The Gateway Remote Line Test System has a range of options available from 'stand-alone', through VDT sharing, to full electronic integration, and is compatible with all existing UK exchanges.

The Gateway LTS unit provides a network surveillance capability whereby Remotes can be programmed to test given batches of lines at set periods each night, reporting suspected faulty lines to the CRU. The data may be processed further by the Gateway Fault Analyser, a Merlin M5000 based system used with an ARSCC RSC administration system.

Gateway Remotes are self-checking and when not otherwise occupied make hourly 'confidence calls' to the CRU to confirm satisfactory operation.

The Gateway LTS functions satisfactorily on all analogue and digital exchanges within the UK network, including such facilities as MF4 test access signalling on TXE4 exchanges and direct test access on remotely located System X RCUs. This latter facility is independent of test junction availability and operates fully on exchanges designed to System Enhancement Programme 1 (SEPI). ■



keep business in touch

recall or transfer, as well as more sophisticated options like conference, private or intercom are all available by fingertouch.

Database Access: While the caller is on the line, the operator, by simply touching the screen, has access to the system's own 10,000 page database of supporting information. This could include product specifications, for example, prices, stock levels, deliveries; or say, airline seat availability, arrival and departure times. Whatever information you're likely to need can be retrieved and updated from the console itself.

And while this information is being displayed, a notepad or pro forma screen can be temporarily stored to be recalled at any time for consultation or amendment.

Mainframe Link: In addition if linked to one or more mainframes, the console can be used to access information files from a central database.

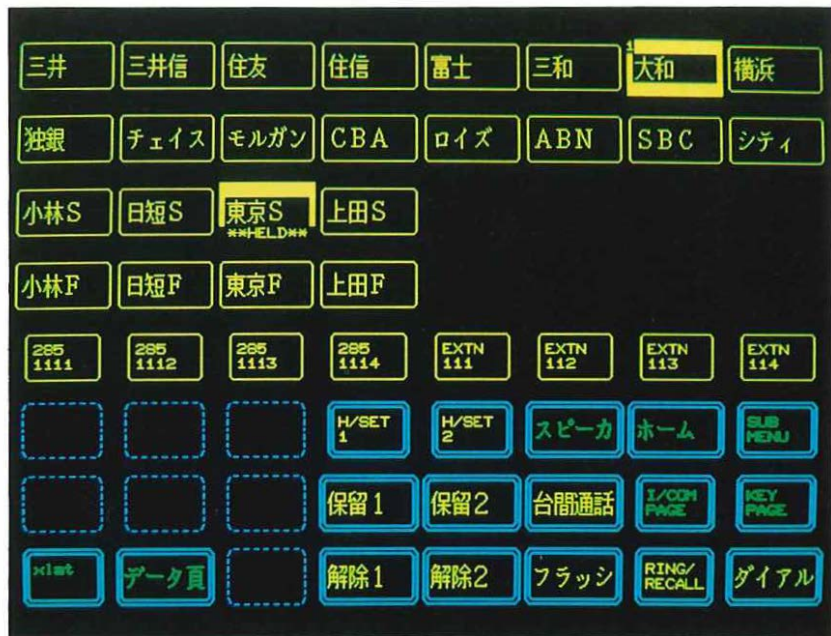
- Sometimes, of course, a customer's query will be too complex for the call receptionist - to deal with it, there and then, might allow a queue of unanswered calls to build up.
- Once your call has been handled, the ACD-processor will automatically direct the next call to the console that's been free the longest time. Calls not answered in a specified time can be re-queued without loss of priority. Supervisors are equipped to make and implement tactical decisions; on call distribution for example, re-allocating at will, any group of consoles from general telesales, perhaps to a specific promotion, or customer service.
- A multi-coloured electronic wall display helps operators to manage their own work rates, by showing how many calls are queued and just how long they've been waiting. Each coloured

square represents a variable number of seconds.

- Despite the vital role telephones play in most organisations, day to day operational records have often been woefully inadequate. With Touchline, you can have a complete statistical picture of all your telephone activity.

The Touchline Traffic Monitor: An optional fully menu driven system, complete with HELP facility for new users, the Touchline Traffic Monitor will gather whatever information is required, like Total incoming calls, Total calls answered, Total calls abandoned before answer, Total incoming calls waiting for a specified period before answer, Total outgoing calls. ■

Touchline, pictured with Kanji screen, made BT's City Business Products one of the UK's top high-tech exports to Japan last year. Other CBP success stories include screen-based systems for financial dealing rooms and the photograph (far left) shows the 120 key console in use at Marshall Woellwarth, one of the world's leading money brokers. Thousands of similar systems are in use in the UK and overseas. Below: the Kanji screen in close-up.



BT wins 20 year Gibraltar deal

BRITISH Telecom's Overseas Division was set up to exploit BT's skills and commercial experience as one of the world's largest telecommunications operators and to assist other countries develop their telecommunications services. The Division's work has been mainly in India, the Far East and Africa.

A significant feature of this thrust overseas is BT's willingness to invest in other national communications networks. In June 1986 it won a 20-year licence from the Isle of Man to continue to operate its telecommunications systems.

The Division set up a new BT subsidiary, Manx Telecom Ltd, and in January it started work - part of which includes installing highly advanced optical glass fibre cable underwater between the island capital Douglas and Millom in Cumbria.

Following this success, the Government of Gibraltar is to set up a joint venture company with BT to run Gibraltar's international telecommunications services.

BT will have a 50 per cent shareholding in this new joint venture company, Gibraltar Telecommunications International Ltd., which will be granted a 20 year licence to operate the services, commencing January 1988. The agreement between BT and the Gibraltar Government will be signed on 10th August 1987.

John King, Managing Director, Overseas Division, says: "The Gibraltar Government wanted new ways of operating its international services. They decided they would prefer a joint approach with a major telecommunications operator, and we are delighted to have been chosen in the face of strong competition".

"It underlines British Telecom's strategy to respond positively to opportunities in overseas countries, particularly in telecommunications network investment and management".

The country's inland telecommunications services will continue to be provided by the Gibraltar Telephone Department (GTD). ▷



Phone meetings save cash

BUSINESS meetings by telephone instead of face to face are rapidly becoming an essential way of life. Today a growing number of firms in the business, creative and education sectors clearly see the telephone meeting as a solution to many of the organisational problems of calling a conventional conference of key staff from different locations. The telephone conference can be implemented almost immediately and offers all sorts of other side benefits. British Telecom's Conference Products Division has at least one client who reports massive travel savings by having branch managers hold their monthly meeting by telephone instead of appearing in person.

Until recently the telephone meeting suffered one conspicuous limitation - no person seen to be present. Happily this has been overcome by the release of an important new development, the BT

Conference Products Division's Electronic Whiteboard. This enables interactive illustrations to be transmitted over a conventional telephone line.

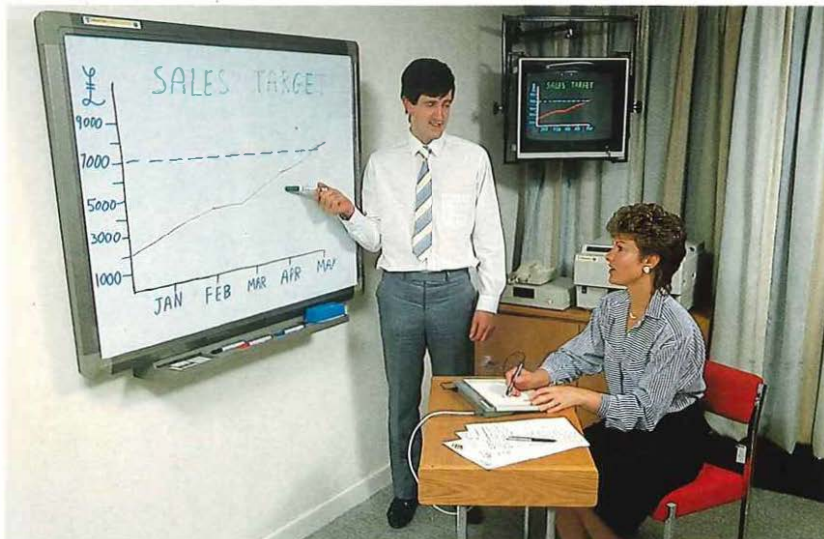
The Whiteboard is used exactly like a classroom blackboard, the difference being that it conveys the images drawn to any other suitably equipped person or group. Drawings or text are communicated in a choice of four (primary) colours and the operator uses conventional felt-tipped pens.

Joy of this new visual aid is that those at a meeting can interactively elaborate on the words or images communicated via the Whiteboard. They add their contributions on their own Whiteboard or a small desktop writing pad. The Whiteboard measures 1230 x 925mm and can be operated either as a free standing unit or wall mounted.

Words and pictures drawn on to the system can be recalled for later study through a 3 1/4 inch disk storage unit. Next development is to provide an interface between the IBM PC and the Whiteboard.

A Welsh educational organisation has used the system to link 'A' level students at five schools to a central teaching base. Lessons on a wide range of specialist subjects are taught using a five line telephone 'bridge' and the teacher illustrates the lesson by use of an Electronic Whiteboard. Students participate via classroom TV monitors, and extend the visual information on the Whiteboard by use of electronic desktop writing pads. ■

Photographs: BT's 'Electronic Whiteboard' and desktop writing pad in action.



- ▷ The arrangements for setting up the joint venture will be the responsibility of the Network Investment Division and will be co-ordinated by Derek Marsh, Manager Network Investment. "A BT team has already been to Gibraltar and assessed its switching equipment and local line planning requirements, says Derek Marsh. "Co-operation in these areas is being planned".

This new deal means the replacement of the old Cable and Wireless monopoly at the end of the year. Gibraltar's Municipal Minister, Brian Perez, says: "The British Telecom offer beat the Cable and Wireless one in every respect".

The BT proposals for technical assistance provide for an increase in the Gibraltar telephone department's share of international calls, both in outgoing and incoming international traffic.

The current annual turnover in international telephone calls, excluding traffic to Spain is in the region of £3 million annually and the 20% rate of growth reflects the increasing importance of Gibraltar's financial and other development activities. ■

'Go between' for worldwide mail

WITH the advent of Gold 400, which became available to Telecom Gold customers on July 1, 1987, the Dialcom 400 (sm) Message Handling System is the first public international messaging service to implement the internationally-agreed X.400 standard.

The Dialcom 400 MHS represents a quantum leap forward in the world of electronic communications because it allows dissimilar communications systems to exchange messages without any alteration of the original message.

For the first time, for instance, a company using a DEC in-house mail system (plus X.400 software) can link up to a public service, such as Dialcom, and the users on both systems can correspond with each other as well as with any other mail systems also running X.400. From a mailbox on any PC,



messages can be exchanged with virtually any electronic mail (E-Mail) system and have access to both facsimile and telex networks, thanks to the X.400 standard.

This means that Dialcom customers and mail services that connect to Dialcom 400 can send telex and fax messages without having to invest in, and maintain, expensive equipment. This will be possible because Dialcom400 will access to telex and fax and will be able to carry messages from E-Mail to other communications, media (and vice versa) without loss of format.

Dialcom 400 is designed to carry messages in 'envelopes' from one communications service to another without interfering with their contents so it operates like a discreet electronic go-between, which is referred to as the Message Transfer Agent (MTA).

No go-between would be much use without details of who to take the messages to - these are provided by the user when he types in the recipient's name and sends the message. This is done by responding to a series of prompts from the system.

Once the go-between has the recipients details, it can refer to the Dialcom 400 directory for information on exactly where to send the message and how to convert the envelope into a form the recipient's equipment can understand.

Dialcom was the first public message handler to adopt the X.400 standard, and also the first to make it commercially available. Besides Telecom Gold, Canadian National, Canadian Pacific (CNCP) is another Dialcom licensee that has signed a contract to use Dialcom 400, and many of Dialcom's other 17 licensees around the world are committed to implementing on their E-Mail services. ■

Speedy modems lead data race

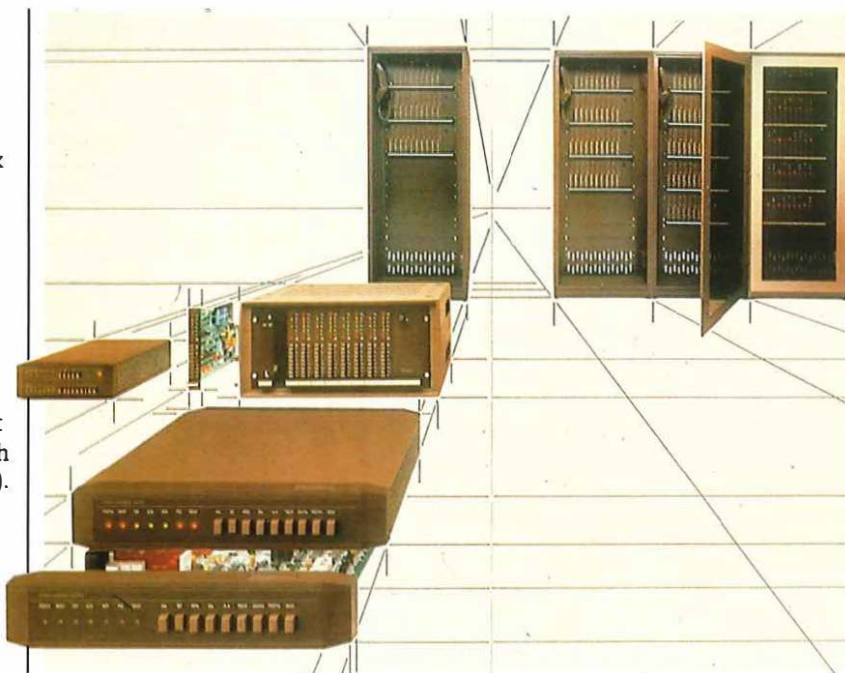
COMPUTERS which talk to each other over telephone lines was a simple need but a major challenge which produced an entire new technology - datacommunications.

Datacommunications set about resolving the fundamental dissimilarity between a computer's digital electrical signals and the analogue electrical waveforms used in telephone networks. So was invented the modem, a device connected between the computer and telephone line. Communication between computers was possible.

Today, with even more sophisticated user needs, data can be transmitted over an ordinary telephone line at 48 times the speed achieved in 1962.

Modems are now software controlled, and an advanced modem, like the British Telecom DM4962X, can calculate 100 times faster than an IBM personal computer.

As well as modems, datacomms products from British Telecom include statistical multiplexers which allow multiple users to share analogue and kilostream circuits, and time division multiplexers to derive speech and data channels from KiloStream



and MegaStream links. Datelnet 500, which combines speech and data for simultaneous transport over PBX internal extension wiring within a building, is yet another exciting step forward. Successes along the way have included the world's first V32 modem.

British Telecom will be exhibiting its fourth generation family of datacomms equipment. A unique feature is the modular packaging concept: every modem type makes use of the same cases, shelf and cabinet. So different modems can be mixed together in the same shelf, making for compact installations, straightforward planning and easier system management.

And because fourth generation includes a modem to match every major CCITT recommendation, a feat unmatched by other suppliers, users get a consistent and logical upgrade path. Expansion is simply a matter of slotting extra cards. ■

Picture: BT'S latest datacomms products represent an exciting step forward.

Business on the video map

VIDEO map and image system (VMIS), for displaying maps, plans, or photographs on a TV screen and overlaying extra details by computer, will offer local authorities, public utilities, police, fire services and businesses a powerful and flexible aid to planning and operations.

VMIS enables users to call up maps or other images easily and quickly on a monitor screen and superimpose additional graphics to show, say, the location of specific plant, equipment or resources.

Images are stored as still pictures on videodiscs. They are cross-linked to graphics and data held in a microcomputer/database.

Maps can be updated with minimum delay when there are changes of development or new buildings on green field sites.

VMIS is a powerful, flexible aid to planners and network or service operators. It can also help civil authorities deal with emergencies, assisting them ▷





Picture: zeroing in on Westminster with the VMIS system.

in deploying their resources rapidly to best effect.

A typical main work station, consisting of videodisc player, 32-bit microcomputer with VDU, digitiser tablet, graphics generator, video mixer, TV monitor and hard copy printer, costs from about £28,000, with a remote station at about half that.

Maps are displayed in colour on the TV monitor, their videodisc images precisely aligned with National Grid references in the computer. Maps can then be overlaid with graphics to pinpoint the routes of overhead wires, underground cables and pipes, manholes, distribution poles and other plant. Other associated data is displayed on an adjacent visual display terminal.

Ordnance Survey maps are stored in a range from 1:625,000 to 1:1,250, so users can 'zoom in' on a whole area, such as Greater London, to a 100m square.

The database correlates the Post Office's postal address file with national grid references, so any postcode location can be accurately pinpointed.

Images and their associated data and graphics can be transmitted easily and quickly in electronic form over communications networks. So speeding up the exchange of information about underground services between public organisations, avoiding the transfer of vast amounts of paperwork.

VMIS is based on British Telecom's M6000 series microcomputer which uses a 32-bit high-speed Motorola MC 68020 microprocessor. The M6000 has been adopted by the company for in-house use on UNIX applications.

To this basic M6000 unit a VDU and keyboard is added, together with graphics generator and high resolution colour display monitor, digitiser tablet, video mixer sub-system and videodisc unit.

The main computer comes with a variety of hard disk options, a 0.25in tape streaming back-up unit is used for security, and up to 16 MByte of RAM plus up to 2 Gbyte of hard disk storage.

Images are generated and controlled by a Philips professional VP400 series Laservision videodisc player. Each disc has a capacity of 55,000 photographic images per side. Image retrieval time can be as short as is 40msec. ■

Exciting range of new phones

PARTICULAR prominence will be accorded to NRT, ('New Range Telephone'), the latest in a line of developments. This exciting new product, on show for the first time, is certain to arouse considerable interest. This model will demonstrate the useful features that have been incorporated into its modern, neat design.

In its core format, NRT is a ten-number, single-button access memory telephone.

It can store both telephone numbers and/or the codes (* and #) which control special features on PEX's or modern exchanges, such as divert, ring back, call forwarding, as well as the new facilities on modern networks such as home banking and voice bank. In addition, it has last number re-dial and secrecy - and is wall mountable without a separate bracket.

The telephone was designed following analysis of an in-depth market research study and developed using the latest C A D techniques at British Telecom's Martlesham Research Laboratories. It is a telephone of quality and reliability, which will sell at an internationally competitive price, and please the customers.

As its name suggests, NRT will be a range of telephones. Plans are already in hand to develop a number of variants of the core NRT, including such additional features as on-hook dialling, full two-way loud speech, integral telephone answering device, extended single-button access memory fields etc. An absolutely basic version (without memory, but with last-number redial) will also be introduced. ■

Solving mysteries

BRITISH Telecom's Communications Facilities Management (CFM) has developed a range of management systems and services to demystify communications networks. They give the network manager greater control over his resources. And they provide the company management with information which shows how effectively their investments are being utilised.

Managing a network requires data and plenty of it. It must be timely, accurate and remain on tap for analysis months after collection. An ideal job for a suitably powerful computer? Yes, but that's only partly the answer. The system must also include a vital connection into the network itself: a high-tech intelligence agent reporting everything that happens, at any time, on every circuit.

This is network management. It is yet another field where technology can aid stretched human resources. Management systems deal not only with failures, but also with optimising existing facilities as organisations change.

If a circuit fails, the manager wants to know.



The how, when and why of every hiccup must be recognised instantly. When routes are congested, calls must be redirected. At any time, managers may call for a detailed analysis of their company's telephone or data traffic patterns.

Communications networks are complex and diverse mixtures of equipment from many different suppliers. A company may have millions of pounds tied up in its network, but without adequate management and monitoring tools, it remains blissfully unaware of the network's efficiency, or lack of it. Simple displays and printouts highlight

the difficulties rather than reams of unfriendly figures and reports aimed at the system designer.

CFM has focused on the needs of major customers. The result is a range of systems and services to help the network manager ensure that networks perform well, and to help senior management assess whether they are getting value for money from the network.

Network management services provide control and monitoring of customers' networks, large and small. These services operate either from BT's secure, purpose-designed centres or customers' premises. ■

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Chatsworth House
Portland Close
Houghton Regis
Dunstable
Beds LU5 4AW

West Electronics Limited
4 Balena Close
Creekmoor Estate
Poole
Dorset BH17 7DB





Saying it in English

Good morning
Hello
How are things going?
Cheers (over a drink)
Goodbye

... and in French

Bonjour
Ca va
Ca va?
A votre sant or Chin (but
not in front of a
Japanese)
Au revoir

... and in Japanese

Ohayo gozaimasu
Domo (with a nod and
smile)
Do deuska?
Sayonara

... and in Flemish

Goede morgen
Dag
Hoe gaat't?
Tot ziens or tot
Genoegen (until I have
the pleasure of seeing
you again)

