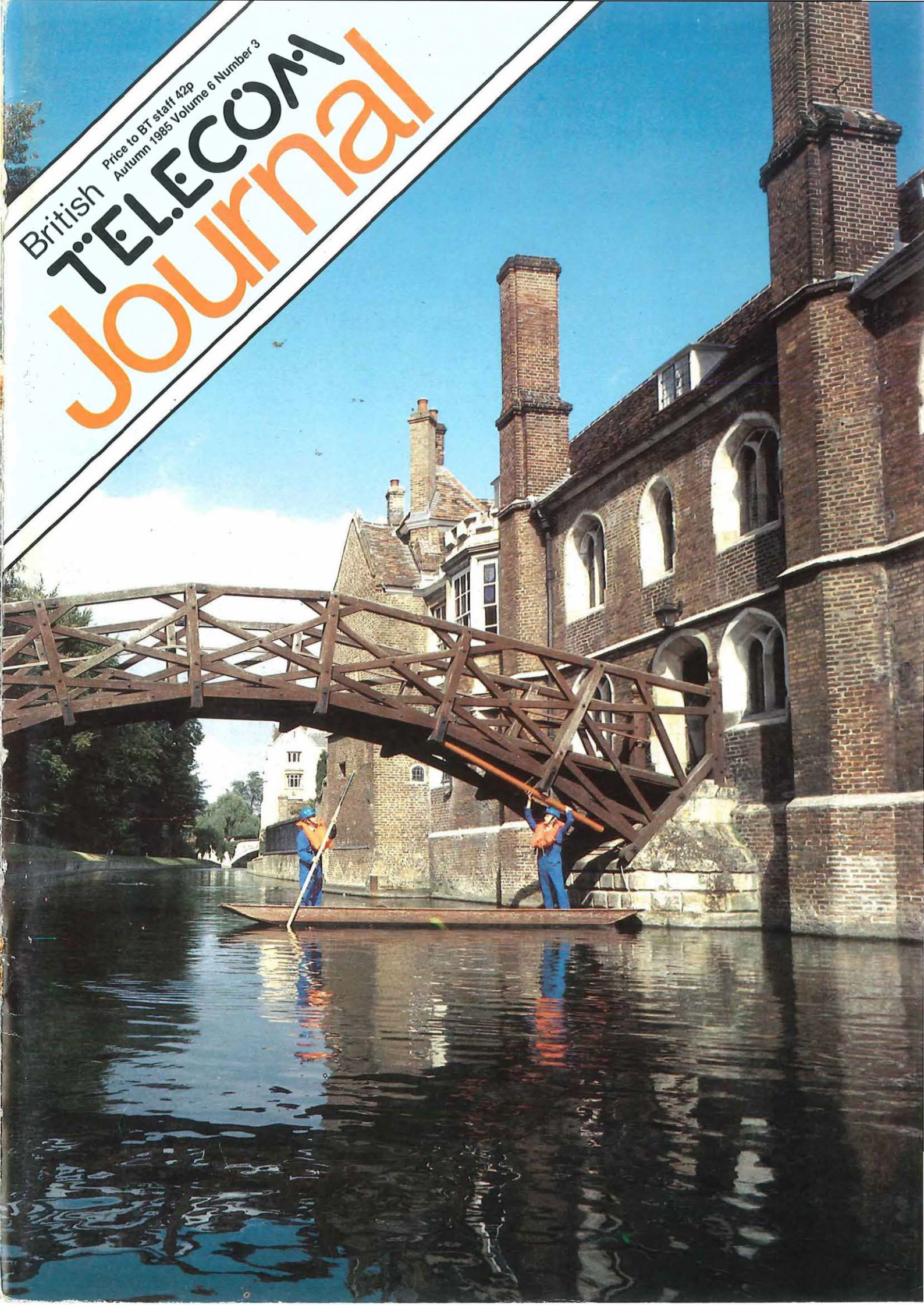


British

Price to BT staff 42p  
Autumn 1985 Volume 6 Number 3

# TELECOM Journal

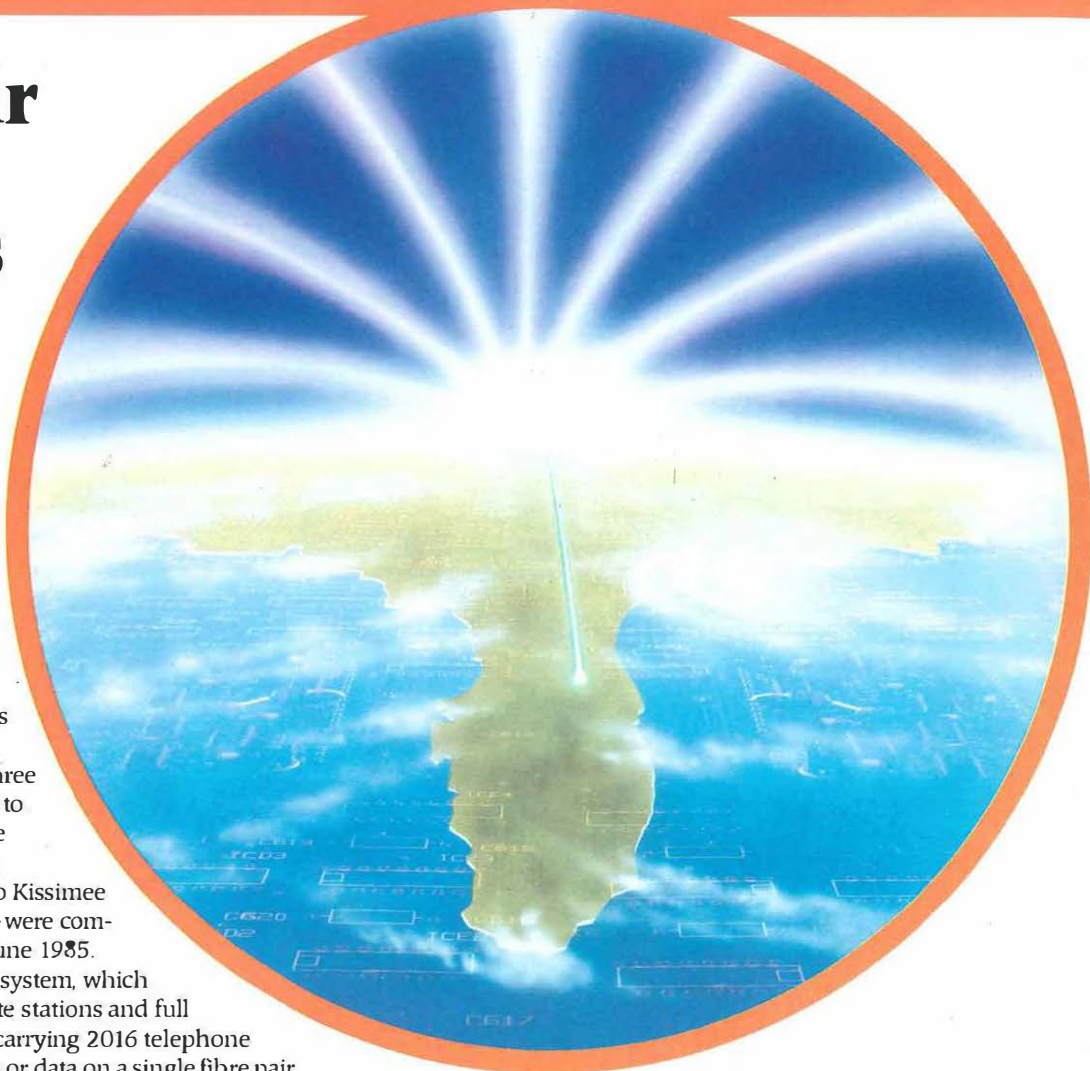


## Plessey flair starts the Lightwaves flowing in Florida.

Plessey Transmission Systems is right on schedule with its 140Mbit/s Lightwave programme for the United Telephone Company of Florida.

Plessey was awarded a contract in October 1984 to supply 140Mbit/s Lightwave optical fibre systems and M34E Muldex systems for Phases 1, 2 and 3 of United's four-year programme. These first three phases, from Winter Park, Orlando to Kissimmee, Fort Myers to North Cape Coral, Fort Myers to Port Charlotte, Ocala to Leesburg and Avon Park to Kissimmee – a total system length of 290 km – were completed on schedule, by the end of June 1985.

Each 140Mbit/s optical fibre system, which includes line terminals, intermediate stations and full supervisory systems, is capable of carrying 2016 telephone channels or the equivalent in video or data on a single fibre pair.



## Florida demonstrates Plessey state-of-the-art fibre optics.

Providing for future telecommunications needs like these is how Plessey Transmission achieves and maintains its leading capability in high-capacity optical fibre systems.

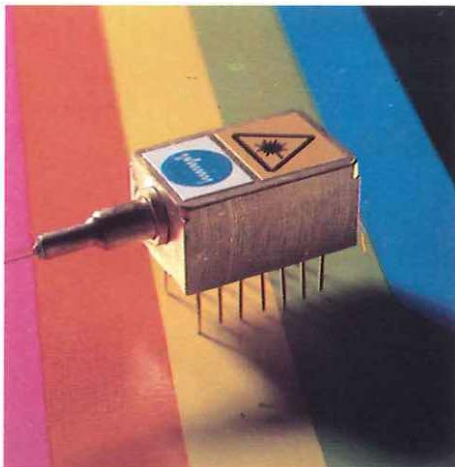
For more than a decade Plessey has developed and combined the technologies of opto-electronic devices, digital multiplexing, digital line systems, and optical fibre connectors to create optical fibre transmission systems second to none.

Today, worldwide, there are over 11,000km of Plessey optical fibre systems carrying traffic, under installation or on order. In achieving this, Plessey has notched up a string of firsts such as the first optical fibre system put into normal traffic in the UK, the first long wavelength optical fibre system in normal traffic service in the world, Britain's longest optical fibre link, the longest

operational unrepeated optical fibre link in the world and the world's first commercial contract for a 565Mbit/s optical fibre highway.

Phase 4 of United Telephone's programme, the Fort Myers to Avon Park link, will be equipped with Plessey 565 Mbit/s optical fibre systems, each system being capable of carrying 8064 telephone channels or the equivalent in video or data.

For further information, contact Mike Hocking, Transmission Systems, Plessey Network & Office Systems Limited, Beeston, Nottingham, United Kingdom NG9 1LA. Tel: Nottingham (0602) 254831, ext. 3542. International telephone: 44 602 254831. Telex: 37201.



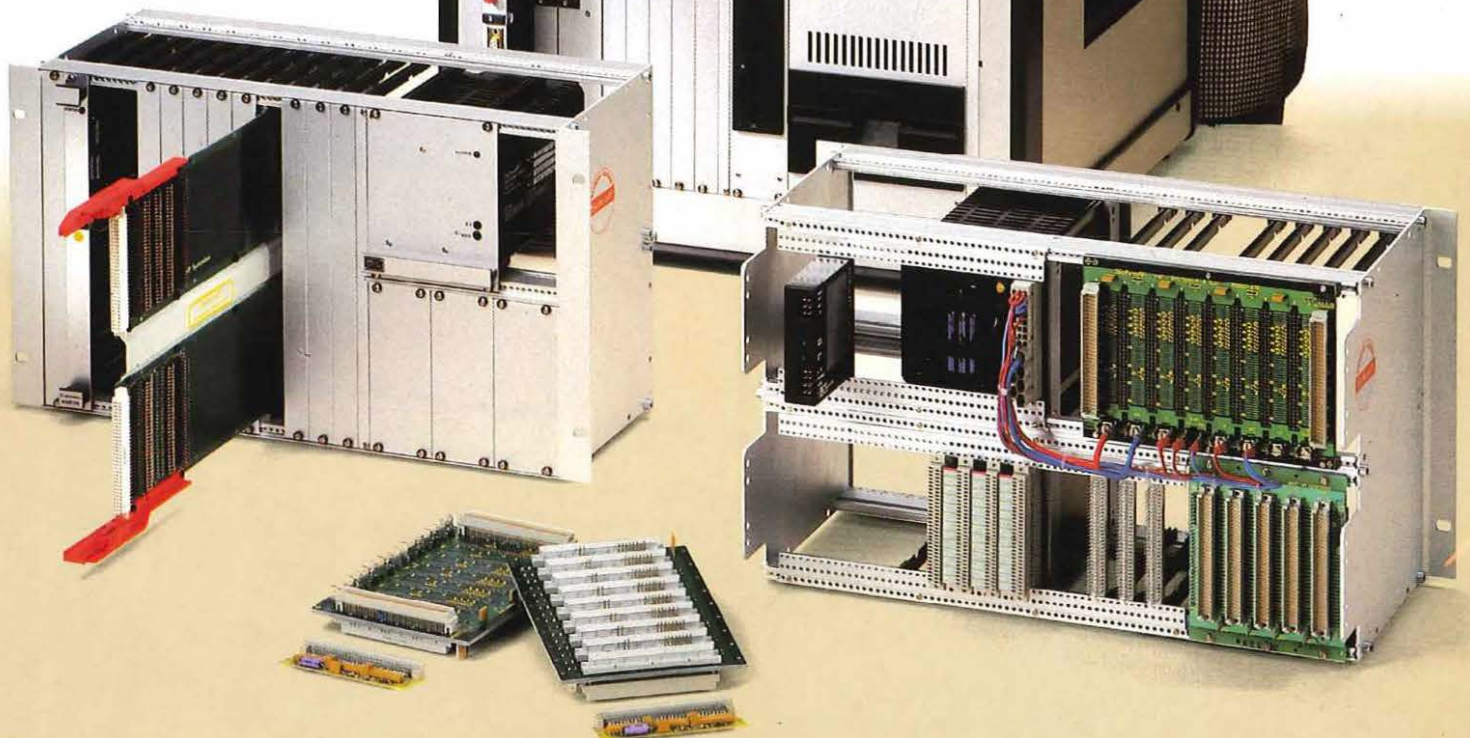
# PLESSEY

# Schroff – progressive design: Modular packaging for microprocessor systems VMEbus and Multibus II

For all microprocessor systems based on Euroboards a wide range of standard products is available in the form of kits or pre-assembled equipment. From 19" subracks and desk housings to bus backplanes and from plug-in power supply units to power fail modules.

VMEbus and Multibus II are typical examples of standardised modular systems. The modular design of the Schroff range allows for almost every configuration. To house the systems Compac and Comptec cases are available in a number of sizes – 1U, 3U, 4U, 6U, 7U and 9U with depths of 300 to 600 mm.

International demand for the well-proven components of Schroff has grown by reputation and recommendation – choose Schroff, the reliable partner with comprehensive manufacturing expertise and technology.



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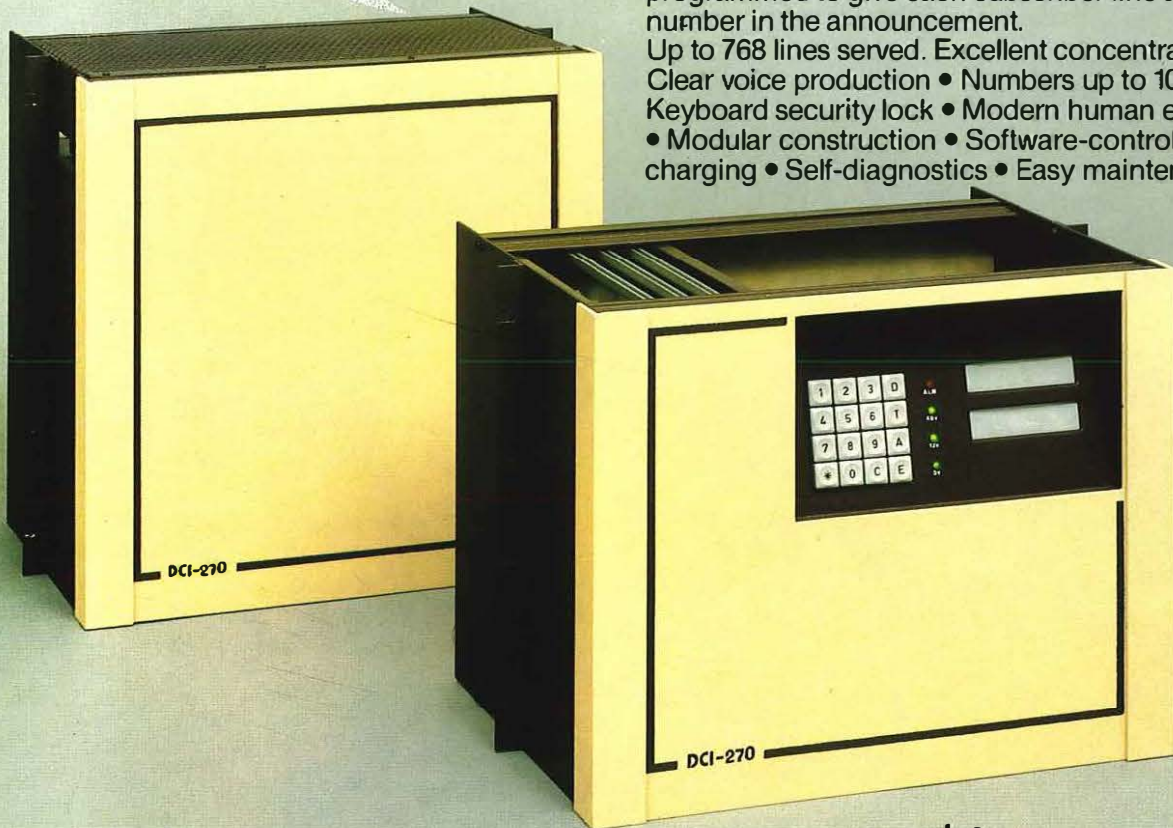
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Dynamic Logic Ltd., The Western Centre, Western Road  
Bracknell, Berkshire RG12 1RW  
Tel. 0344-51915; Telex: 849433



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With an eye to tomorrow's telecommunication we're already heavily into light.

Today, our experience in optics ranges through the complete orbit – from the design, manufacture and supply of a wide selection of modern fibre cables to a total turnkey service in optical systems, both digital and analogue.

For the past 50 years TCL Project Teams

have defied geography in bringing telecommunications to some of the world's remotest regions – the most recent being the Kalahari Desert. They have undertaken projects from Nigeria to New Zealand.

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## Analogue Transmission Testing. Well In Hand.

The new AM-44E personal VF transmission test set offers a unique range of features in a compact hand-held unit.

Easy to operate, the test set provides full signal measurement and signal

generation capabilities: signal level, frequency, idle channel noise and signal-to-noise ratio. Level and frequency are displayed simultaneously.

There is even a full dial-up facility, and the speaker/

microphone enables one tester to communicate with another over the line under test or act as an independent telephone.

**Another testing first from GADC.**



**General Audio and Data Communications Ltd.**

64-82 Akeman Street, Tring, Herts. HP23 6AJ. Telephone: Tring (0442 82) 4011/5551 (Enquiries quote No. 7BT)  
Telex: 82362 BATECO G Cables: RAHNO TRING.

Regional Sales and Service: Manchester, Unit 5, Fivefold Industrial Park, Manchester Street, Oldham, OL9 6TP. Manchester (061) 626 3371.

Associated Companies Teleprinter Equipment Ltd. Communication Accessories and Equipment Ltd.  
Morse Equipment Ltd. Teleprinter Rentals Ltd. Datacare—a division of Teleprinter Equipment Ltd. Parent Company: William Batey & Co (Exports) Ltd. (Founded 1946).

The phantom office\* comes sharply into focus with Divert-a-Call. The first in a range of automatic call forwarding equipment which forms the basis of a whole new family of British Telecom Services.

Divert-a-Call has been designed and manufactured by Dynamic Logic, a British company using experience gained from more than a decade at the forefront of PSTN telemetry.

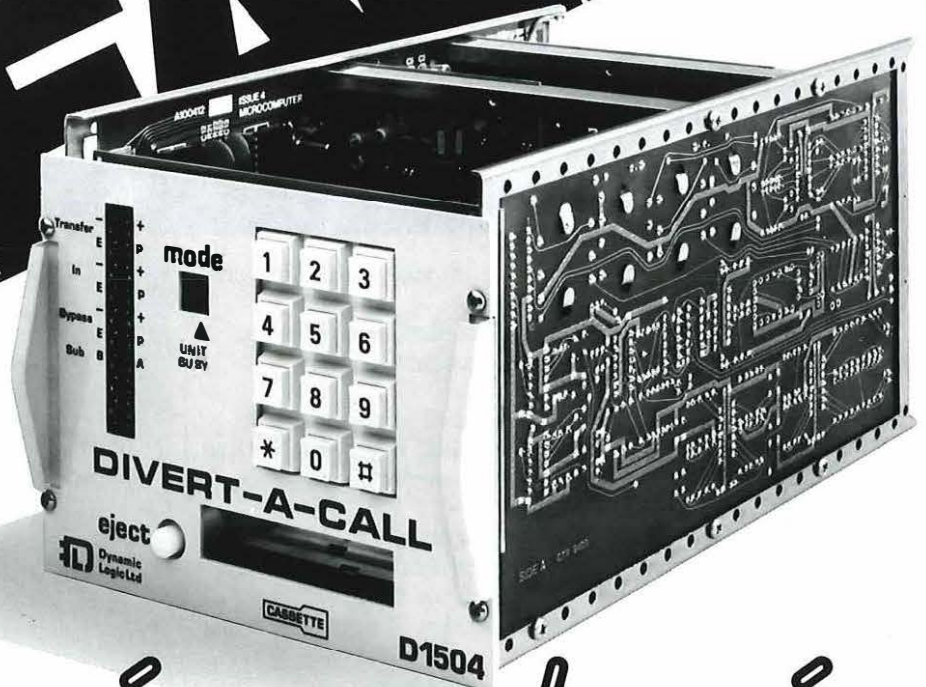
Based on advanced microprocessor technology, the Divert-a-Call range is fully software driven, enabling calls to be remotely diverted to 10 different destinations from a single exchange based unit.

The subscriber can select or change destinations from any location within the telephone network using a synthesised speech facility which is protected by a security code.

Divert-a-Call incorporates a hybrid amplifier to compensate for the variable transmission losses encountered within any telephone network.

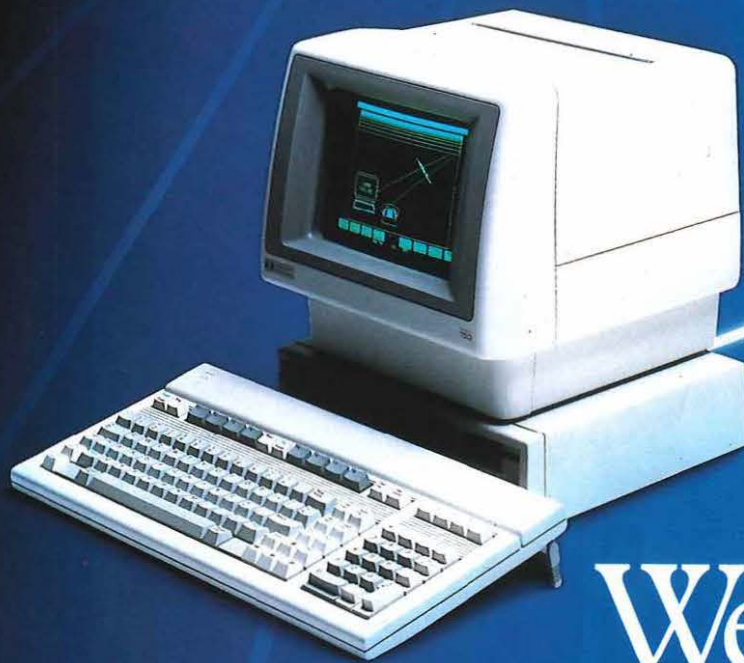
Diversions can be transparent or the caller can be informed using the personalised announcement facility.

Dynamic Logic's Divert-a-Call heralds many new and exciting approaches to marketing and business administration.



*dynamiclogic*

Dynamic Logic Limited  
The Western Centre Western Road Bracknell Berkshire RG12 1RW England  
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At Hewlett-Packard we've over 200 different instruments and systems for testing and trouble-shooting networks. Not just for end users, but for service providers, manufacturers and network operators.

In fact, it's the largest range of communications test and measurement equipment anywhere in the world. So whatever your problem, we've got exactly the kit you need.

And if you are not sure what you need, we've got the people to help you find it.

**Total capability in telecom and datacom measurement and test.**

The Hewlett-Packard range extends from easy-to-use, portable equipment for field service to complete systems for monitoring nationwide networks.

In between there are digital transmission analysers, PCM testers, digital radio test systems, protocol analysers, plus a host of specialist and general purpose instruments and systems for communications test. They all help ensure accurate, continuous



communications with the minimum of downtime and lowest possible maintenance costs.

You'll find them wherever communications are used. In voice, data and image transmission . . . in analogue and digital communications . . . in every technology from cable to satellite.

**As used by your manufacturer.**

Hewlett-Packard equipment is used at every level within the communications industry.



making them talk.  
(the last count.)



Many manufacturers, for example, rely on HP systems to aid development, increase productivity and make the most of available skills in production test.

So when you choose HP, there's every chance you'll be using exactly the same equipment as your manufacturer or carrier. And that makes for better communications all round.

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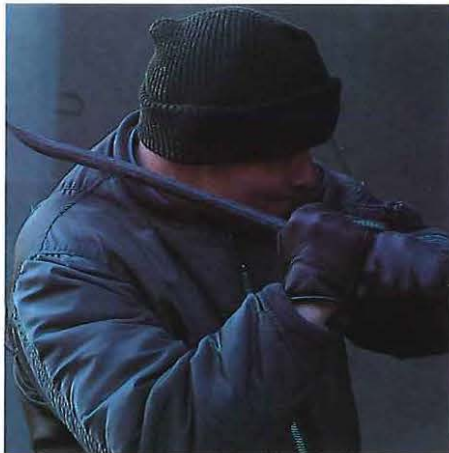
...HIGHLY RELIABLE, PRESTIGIOUS SERVICE



...NO COINS TO COLLECT



...LITTLE INCENTIVE FOR VANDALS



There is no doubting the attractions of the Phonecard 'phone for your customers - a glimpse at the queues at any mainline railway station makes that clear. However, reflect on the advantages to your own area of the deployment of Phonecard 'phones.

Landis & Gyr, who designed and manufacture the Phonecards and card operated telephones, has already supplied thousands of similar installations to other European telecoms authorities.

Installations in 14 countries prove beyond doubt the advantages which accrue to the authorities which have been operating them.

- Phonecard 'phones encourage users to make longer calls because there are no 'bleeps' or requests for more coins.
- A high proportion of long-distance calls are made by Phonecard users who include many overseas students, foreign businessmen, etc.
- Vandalism to Phonecard type 'phones in Europe is reduced by 60% compared to conventional payphones.
- European experience also indicates that up to three and a half times less maintenance is required than with conventional systems.



- And there are the obvious advantages of cash in advance, no coins to collect or bank, simpler accounting and the prestigious nature of such a hi-tech service.

Look at the facts - Phonecard is as attractive to you as it is to your customers.

**LANDIS & GYR**

Landis & Gyr Limited, Victoria Road, North Acton, London, W3 6XS. Telephone: 01-992 5311. Telex: 21486. Cables: Elgeemeter London W3.

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# eMargin what A harrised teLex opeRater could do to yoUr set of 5 figures.

No matter how good your telex operator is, there will always be times when the demand for outgoing and incoming calls will exceed the 'cool' of the operator.

And mistakes occur.

Trouble is, it's likely that mistakes will happen when you have a load of complicated figures to send down the line to head office — bad news! But if you are equipped with a PC or WP or even

an electronic typewriter you can now prepare your data/message in the normal way and when you are confident all is correct, press a button and send it through to Trend's new Puma Telex Terminal. The telex operator is calmly getting on with more routine messages whilst a clever little device inside the Puma called the "Mailbox" sorts out the priority, routing, dialling and transmission of your call.

The "Mailbox" option when fitted to the Puma Telex allows business computers and modern office systems simple access to the international telex network.

WORD  
PROCESSOR

ELECTRONIC  
TYPEWRITER

PUMA TELEX  
PLUS  
'MAILBOX'  
OPTION

PERSONAL  
OR BUSINESS  
COMPUTER

1½ MILLION  
TELEX USERS  
WORLDWIDE

Features such as:

- An enlarged memory of 40K characters (plus an extra 40K with "Mailbox")
- A strip display of 40 characters for message preparation, editing and display of incoming calls
- Global memory search for individual words
- Timed message release - with automatic insertion of time and date
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At last, you can combine all the features of your existing office systems with the most flexible telex terminal available — with the same compact size as the original Puma Telex — all for virtually the same price, so switch to Puma and be sure. Contact Trend or your local BT Sales unit for full details.



## Switch to Puma and be sure!

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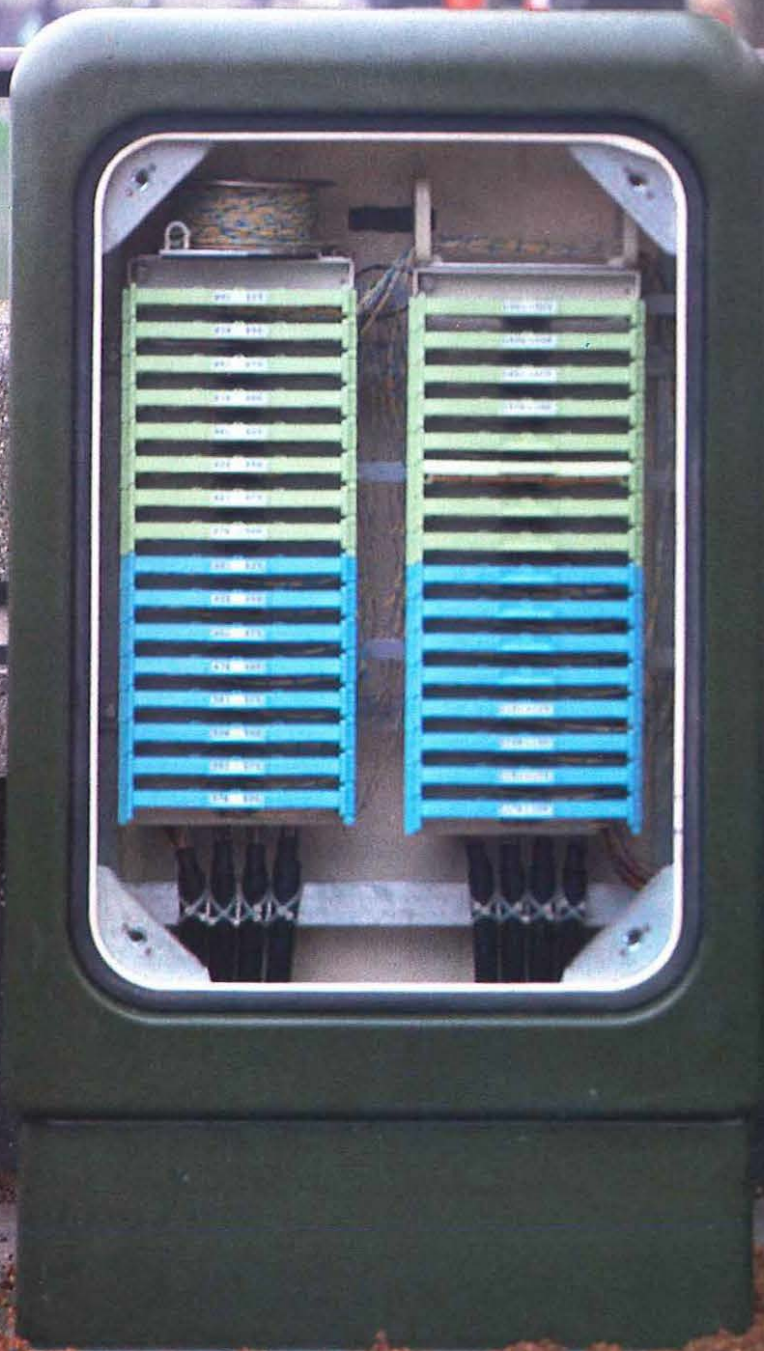
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this cabinet  
in less than a day"

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## HERE'S A FUSION SPLICER THAT MAKES LIGHT WORK OF OPTICAL FIBRES

When you come across the Ericsson logo, you expect something special.

After all, the name has long been associated with quality, reliability and thorough technical know-how.

The FSU 850 carries on that tradition.

For this is a Fusion Splicer which enables you to make accurate and correctly aligned splices in all makes and sizes of single and multi mode fibre.

Here's just a few of its impressive features.

Software controlled with up to 31 programs. (Twenty of these can be protected from unauthorised access.)

High precision translators which make it possible to clamp fibres on their primary coating rather than on the cladding surface.

Vacuum V grooves which are moved by DC servo motors for fibre alignment.

And magnification at a massively powerful 120 times. (Now you'll get a clearer picture of why we think our unit has the edge.)

Yet for all that the FSU 850 is fully portable. That means you can take it to the splice in question — no matter how inaccessible it appears to be.

Other characteristics include an RS 232 Interface for automatic alignment accessories and remote control, and an automatic cut out to reduce battery power.

All this with a typical loss in field use of 0.15dB.

And at a price that's a lot less than you'd imagine.

But all that's only part of the story.

In fact, we've saved the best until last.

With the FSU 850 you can build up a system to suit your own particular requirements.

For example, you can add a heat oven. This will enable you to heat shrink a protection sleeve over the splice.

And you can add a Local Core Alignment system. (This is conveniently called the LCA 850.) This unit has been specifically developed to reduce manpower in field installations and can be used to make either manual or automatic core alignment.

By using the FSU 850 and LCA 850 together you add the following list of features.

Bend Relief. (This relieves the stress on the fibre.)

Autorange. (Removes the need for sensitivity selections.)

And, as you'd expect, a checking system which ensures accuracy and correct alignment. Once the splice has been made the unit verifies the required level has been achieved. If, for some reason, the light transmission differs, a warning is given.

It really is easy to produce a perfect splice every time with Ericsson equipment.

The 850.

The Fusion Splicer Unit that brings together economy, efficiency, versatility and the correct alignment of optical fibres.

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The SLICE is easy and inexpensive to install. It's totally solid-state and reliable. Simply plug it onto a suitable terminal block in place of bridging clips. Plug in as many as you need, up to 25 on a 25 pair terminal block. Then sit back and let the SLICE help you save dispatches.

Now, there's a fresh approach to saving your maintenance costs.

Find out more about the SLICE from Teradyne by calling Alan Garrett, Telecommunications Division, Teradyne Limited, The Western Centre, Western Road, Bracknell, Berks. RG12 1RW. Telephone: Bracknell (0344) 426899. Telex: 849713.

The logo for Teradyne, featuring the word "TERADYNE" in a bold, green, stylized font. The letters are blocky and have a slight shadow effect, giving it a three-dimensional appearance.



The CL680 line test system from Vanderhoff is just the kind of state-of-the-art product you would expect from one of the leaders in the industry. Consisting of one or more master stations and exchange located remote test units, the modular CL680 provides a cost effective means for centralised routine and automated fault testing of customer lines.

It's so easy to use it practically runs itself yet offers as wide a range of tests and facilities as you could possibly wish for. These include:

Automatic tests with call queuing, supported by user assigned diagnostic messages and line termination statements: Parametric single-shot or camp on repetitive tests:



**“This winter  
your customer fault  
repair service could  
be in for a testing  
time!”**

Field personnel access with synthesised speech report back:  
Automatic routing programmes under full user control.

Needless to say, all this means you can identify faults accurately, reducing maintenance costs and improving the quality of service to your customers.

If you would like to hear more about the remarkable CL680, call Denis Webb on 0203 341111. Or write to him at:

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**Why not get switched on to the Vanderhoff CL680**

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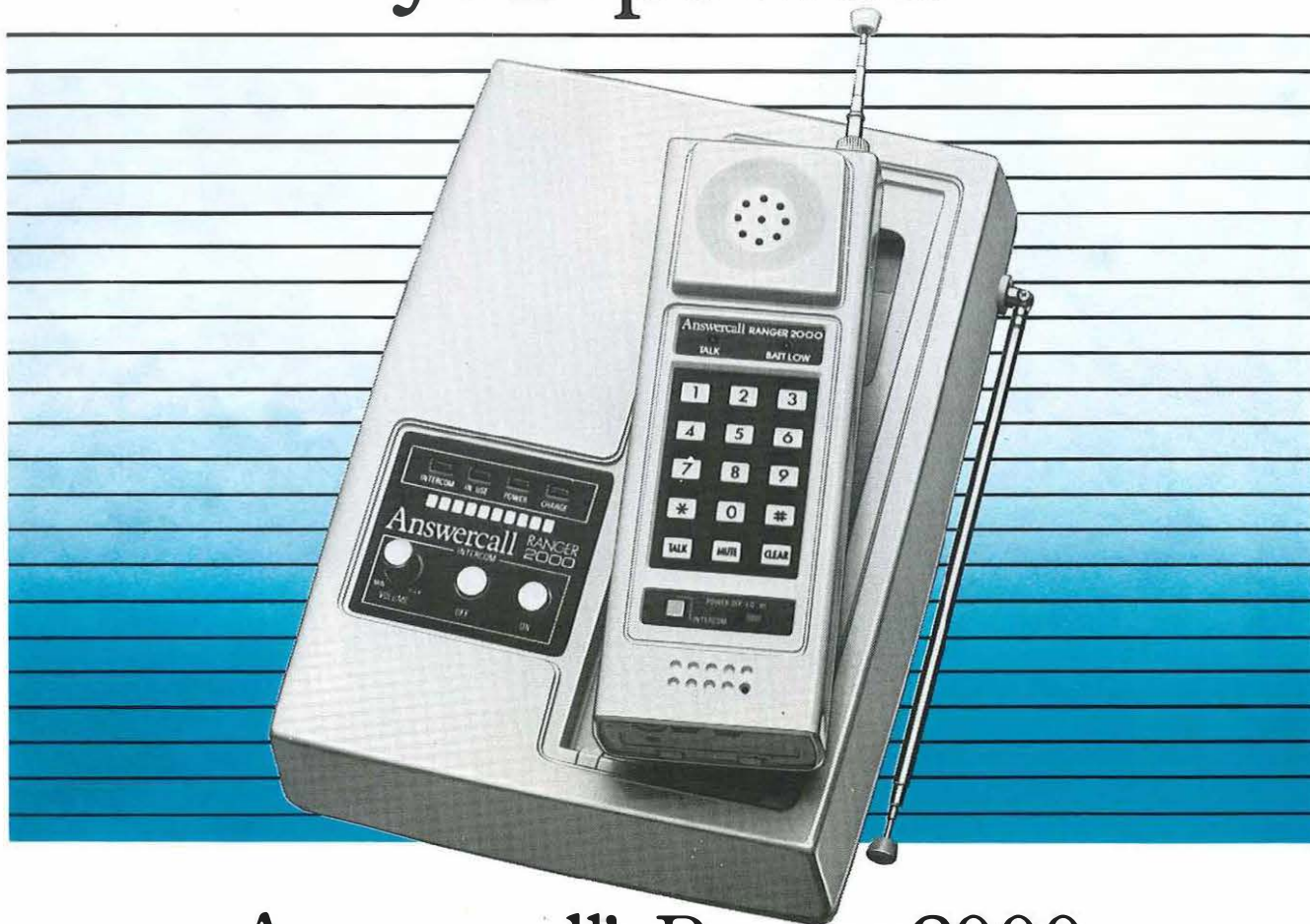
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Name of Establishment: \_\_\_\_\_

Address: \_\_\_\_\_

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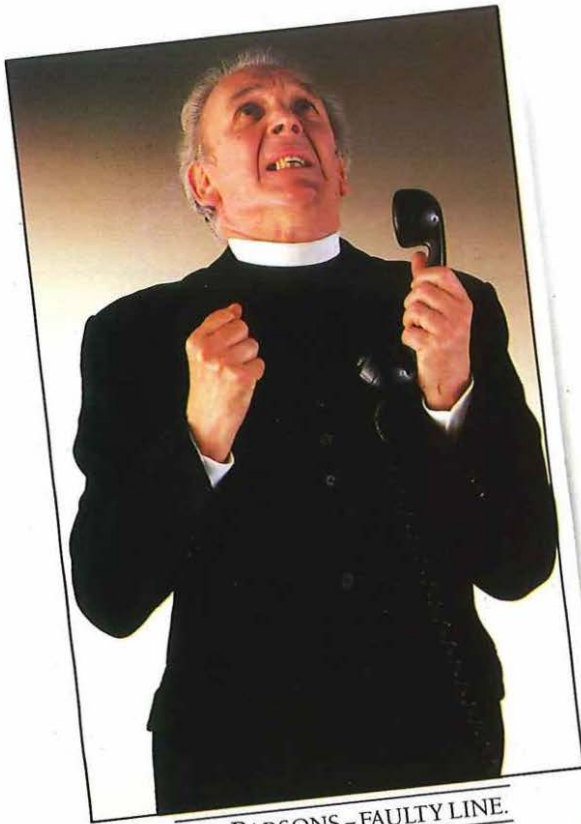
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MICK MORRIS

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If your Repair Service Centre takes longer than 25 seconds, you've got a problem.

Because while all your customers are important, some, such as business lines, are more so than others.

So how do you decide which repairs need priority?

Your administration system can help to an extent, by organising your engineers properly and sending them to the right place with a clear picture of what they have to do.

But to do that, it needs to have accurate, reliable details on the condition of the line, the type of fault, and its location.

And most of all, it needs them quickly. Which is where the LRS-100 fits in.

Because as an advanced line-tester, it will do everything that's expected of it, and more.

As well as giving superior information about existing faults, it'll test groups of lines overnight to locate potential faults.

And it'll carry out follow-up tests ('Robot Testing') on problem lines at regular intervals, to find intermittent faults.

But perhaps its biggest advantage is in producing a 'System Recommended Action'.

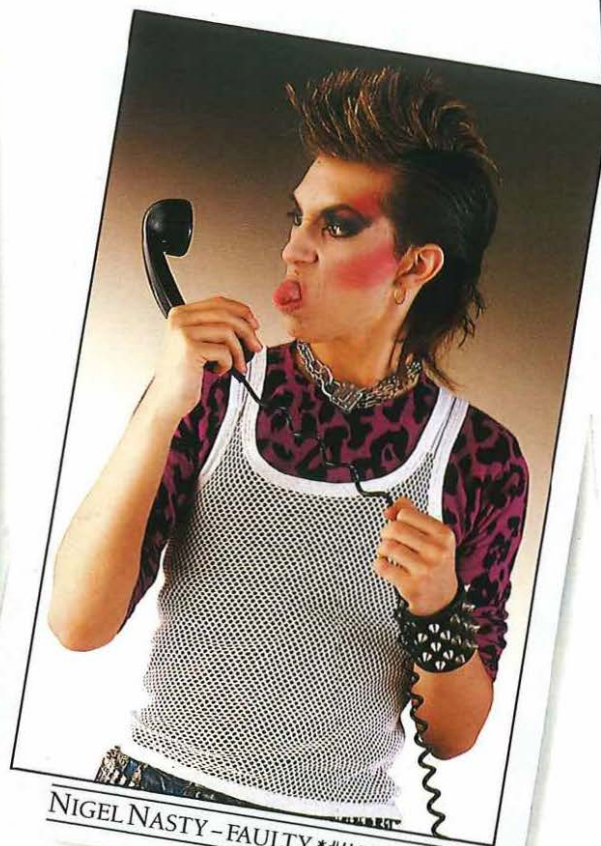
This means the LRS has the ability not only to identify, analyse, and determine the severity of a fault, but also to assign it to the appropriate work group.

All within 25 seconds.

Combined with the quality of its testing,



- FAULTY LINE.



NIGEL NASTY - FAULTY \*#!\*o! LINE.



MS PRIMM - FAULTY LINE.

# arrange these customers importance.

that's why the LRS-100 will help reduce 'double-handling' of faults by engineers, and the number of repeat reports.

In turn, the performance of your existing administration system is improved, no matter which one you use.

LRS is compatible with current BT RSC administration systems, and in a few months will be integrated with CSS.

And at this moment, it's operational in BT London South, Glasgow, and soon in Belfast, Middlesbrough, Sheffield, plus several other Districts.

Making LRS the BT approved line-test system with a track record.

If you'd like to work with a line-tester that

gets the best out of your RSC, ring Tony Hart on 0628 72921. Or write to Northern Telecom plc, Langton House, Market Street, Maidenhead, Berkshire SL6 8BE.

Because with the LRS-100, you'll be putting each and every one of your customers first.



— LRS 100 —  
ADVANCED LINE - TEST SYSTEMS

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Underground communications in mines are subject to stringent safety regulations. A far cry from the cordless telephones which are becoming increasingly popular. Two aspects of communication. Both very different, yet both requiring a dependable and safe power source. Varta provide the power.

Varta produce Europe's largest range of batteries in a diverse range of primary and secondary technologies. Consequently, the advice we give is unbiased by any production limitation. As well as our standard range, our Special Engineering service can custom-build prototypes and production runs to meet any application. So the earlier you call us in, the easier the solution will be.

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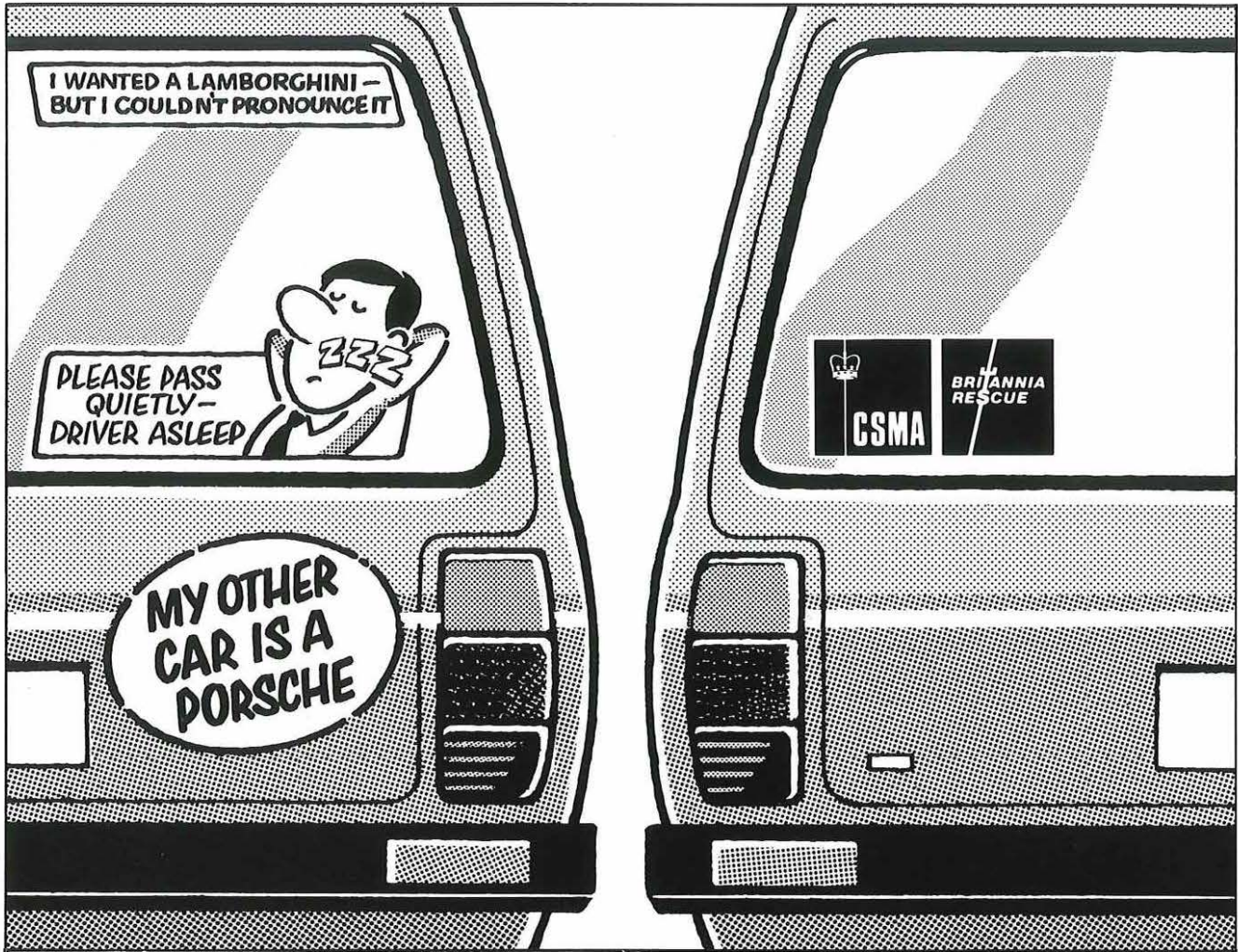
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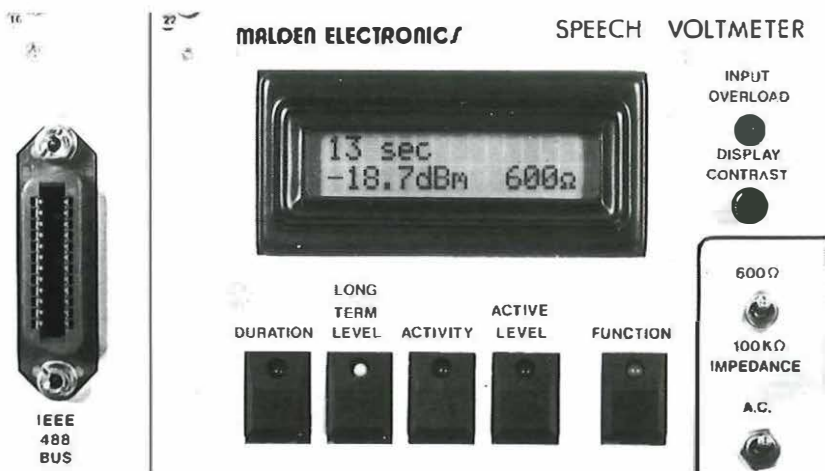
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# FIGURES OF SPEECH



The ability to display speech patterns digitally, puts the SV6 Speech Voltmeter in a class of its own. Manufactured by Malden Electronics, under licence from B.T., the SV6 overcomes the disadvantages of traditional methods, where a considerable degree of operator interpretation is needed.

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For all the facts and figures, talk to Malden.



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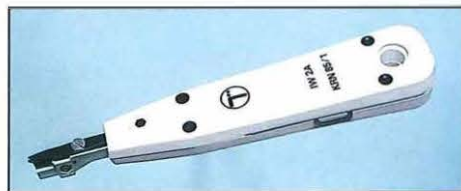
**make light of communication.**



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**ONE SIMPLE TOOL**

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The insulation displacement connection—with its unique torsional restoring force—provides a gas-tight connection, requires only one simple tool—the Inserter Wire 2A—to make connections or reterminate, and has an unbeatable reputation for speed and reliability.

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- Existing cast-iron cabinets
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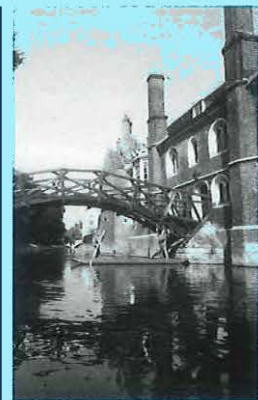
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**Cover:** Isaac Newton's 'mathematical' bridge in Cambridge was designed to stand without bolts or screws and although it is now strengthened in the conventional way, it remains an historic landmark. The bridge is once again at the centre of technological progress as British Telecom engineers use local water transport to check the route of a four-inch cable duct which is part of a major project to up-date the entire University's communications without spoiling the environment. (See pages 18-19).

# Keeping in touch

**M**icrochip technology has pushed the telecommunications industry into overdrive. People and businesses are now able to communicate faster and more effectively than ever before whether it be through the spoken word, pictures or data.

British Telecom has proved itself not only to be in the front-line but in many aspects the instigator of this revolution and as the tempo of change quickens the opportunities for new products and services are certain to multiply.

The trend is, without doubt, good news for both British Telecom and its customers. But the industry as a whole needs to be aware of the growing possibility that the spectacular rate of progress could outstrip public understanding.

As working practices and equipment become outmoded, only the well-informed will be able to make realistic judgements about replacements. Ironically, in the business world, decision making of this kind tends to fall upon the shoulders of senior managers who 'earned their spurs' before the microchip's heyday.

If this is true of the professionals it is even more so of the general public. Whether from

lack of information or perhaps incomprehension, most people utilise only a fraction of the facilities of modern equipment.

The dilemma certainly presents a challenge to the advertising and marketing experts involved in promoting individual pieces of equipment and that challenge is being vigorously met throughout British Telecom.

But the problem goes deeper than that. At a time of 'supply-led' demand in which products are proving successful even though many customers will never fully exploit their potential, there is a pressing need for more general instruction about the benefits available in the new age of communication.

British Telecom is doing its best to fill the gap. In presenting the 1985-86 series of Faraday Lectures on behalf of the Institution of Electrical Engineers, the company is attempting to explain the new revolution to the layman. The lectures, which will tour 16 towns and cities between October this year and March 1986, will be heard by about 70,000 people. The ultimate goal lies further ahead: hopefully in time, barriers to true communication will no longer exist. (T)

*British Telecom Journal* costs 42p per issue for staff. External subscribers pay £15 for two years including post and packaging. Full details on page 45.

# What's in a name...?

Kevin Purell and Philippa Spragg

**Distinctive brand names can help sell British Telecom's ever-growing number of products and services in an ultra-competitive marketplace. But equally the use of names can also be fraught with legal problems for the unwary.**

Potential buyers look first for quality in any product but although a number or reference code may simply identify the product a well-chosen name can become a badge of individuality which is both appealing and memorable and, in time, synonymous with the product's characteristic quality.

A product or brand name, recognised in law as a trade mark, can be a valuable asset to marketing strategy because:

- ★ it identifies the manufacturer or trader and distinguishes his products or services from those of competitors
- ★ it offers an assurance of consistent quality
- ★ once established, it helps future products or services, which would otherwise be faced with the lengthy job of building a reputation from scratch.

Corporate trade marks are already well established within British Telecom and the BT Logotype – the words British Telecom in special form – has acquired a favourable reputation and done much to generate goodwill in the public mind.

In a sense, the company's investment by way of research, development, innovation and improvement is ultimately focused in its corporate trade mark and any new product or service has a considerable marketing advantage if promoted in conjunction with the corporate identity.

On an individual product level, a special name may also be appropriate to stimulate customer appeal but the decision depends on the market sector in question. Potential customers of highly sophisticated equipment such as modems are unlikely to be influenced by a name as their main concern lies in the technical specification and the knowledge that the product is manufactured by a company with proven experience and expertise in the field.

## Costly business

Just as with any other form of property, a trade mark not only costs money to establish in the first place, but the owner must also be prepared to devote time, effort and money to keep it to himself and to maintain it in good condition. It is for these reasons that manufacturers of large computers, for example, invariably denote different models by their company name and a model code number.

But products and services directed at the consumer and general business user compete in

## Registration of a trade mark

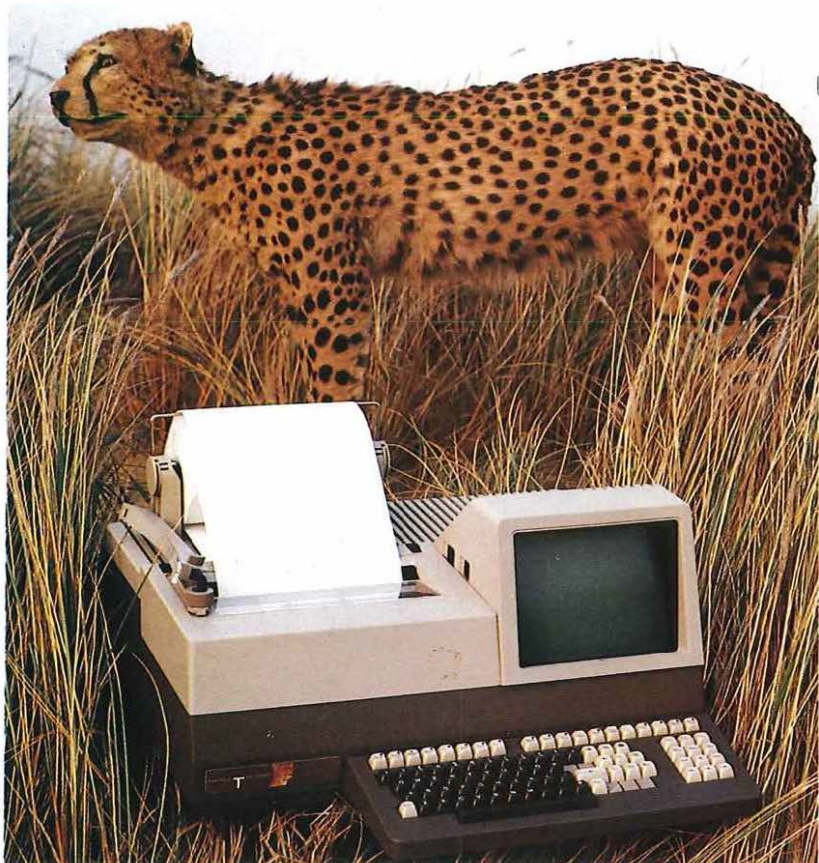
Rights in a trade mark may exist simply through use, even though not registered. But the statutory recognition of property rights simplifies the protection mechanism. Another party misusing a registered trade mark or another very similar mark will infringe the registered owner's rights.

At present in the UK, trade marks can only be registered in relation to goods, but by autumn next year service mark registration should also be available.

Registration is not automatic and a mark must meet the official requirements for distinctiveness as applied by the Trade Marks Registry of the Patent Office. Registering a trade mark is no simple clerical procedure – objections to applications for registration are usual and have to be met by skilled argument and sometimes complicated negotiations with owners of conflicting marks.

The law also recognises rights of ownership in the reputation and goodwill attaching to a trade mark arising from its use on an extensive scale over a period of time. This enables the trade mark owner to prevent others from using the same or a similar mark under the law of 'passing off' but the procedure is difficult and expensive in comparison with infringement proceedings.

The Cheetah and Puma trade marks for telex terminals conjure up images of speed.



# INPHONE



## PhonePower

# British TELECOM



a very different 'fashion' market where names can hold significant advantages.

To meet commercial requirements, a trade mark needs to be attractive, memorable and distinctive. It should not, therefore:

- ★ be descriptive
- ★ suggest that products possess characteristics which they do not
- ★ be identical or easily confused with other trade marks or the names of competitors
- ★ be a surname or geographical name
- ★ be an acronym, a group of letters or numerals.

Made up names such as Xerox\*, Kodak\* and Datel can be good trade marks and names which are fanciful in context – Cheetah and Puma telex terminals, for example – can also be effective.

The consequences of infringing someone else's trade mark rights by adopting, whether innocently or deliberately, a too similar mark are severe. Clearance searches are essential at an early stage of selection and British Telecom's ▷



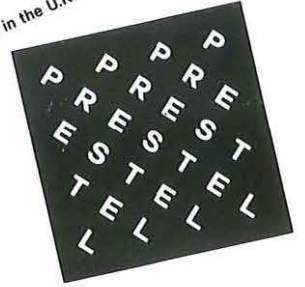
Prestel, the world's first videotex system, is an important British Telecom trade mark.

Below: Distinctive names help to simplify the choice of a new phone for housewife Mrs Frances Hapden, of Addiscombe, near Croydon, who studies the Inphone range with the help of her sons Ben, aged seven, and Michael, aged two.





®Registered trademark of British Telecommunications plc in the U.K.



Intellectual Property Unit (IPU) can help by searching in the official registers.

If export potential is seen for a particular product, then similar searches have to be carried out in each and every country of interest. Language checks are important too because a product name adopted for the UK might well be found to have unfortunate connotations abroad.

Unfortunately many of the 'good names' have already been registered and in the crowded telecommunications field, finding a new trade mark which is free of possible conflicts can be difficult. Searches should begin as soon as possible and temporary product 'codenames' should be avoided – their use can become ingrained and they may well have already been registered by a competitor.

Incorrect use can devalue a trade mark, or may even result in its loss. Even when registered, a trade mark such as Yellow Pages requires vigilance to ensure that it is maintained as a valuable asset.

In fact, the mark Yellow Pages proved difficult to register because it is so descriptive. It was necessary to file a large amount of evidence showing use of the mark, specimens of advertising and details of promotional expenditure over a period of some 14 years to convince the Registrar of trade marks that it had become sufficiently distinctive to be accepted.

Prestel, another important trade mark, also tends to be regarded as 'public property', and constant vigilance is kept to ensure that it is not allowed to become a generic name for videotex systems.

It is also important to keep an eye open in the market for others using British Telecom trade marks, or confusingly similar ones, in the same



field. If such use is allowed to continue, the distinctiveness of the marks is diminished and their value drastically reduced. In these circumstances, swift action is essential – details should be forwarded to the Patents and Advisory Division of the IPU without delay and no direct approach to other party should be made in the interim. The IPU can advise whether British Telecom is in a position to take any action and – if so – can set the wheels in motion. ①

\*Xerox is the registered trade mark of Rank Xerox (UK) Limited.  
Kodak is the registered trade mark of Kodak Limited.

Mr K J Purell is a senior patents manager with British Telecom.

Mrs P E H Spragg is British Telecom's trade marks manager.

### Guidelines for using trade marks

A trade mark should always be used as an adjective in combination with the descriptive term for the product and not as the name of the product itself – examples include: the Monarch private exchange; the Megastream data transmission system; the Puma telex terminal and the Voicebank message service.

This prevents the trade mark becoming the generic name for the product and the loss of the original owner's valuable exclusive rights as happened with the marks ESCALATOR, ASPIRIN and LINOLEUM.

In printed text, distinguish the trade mark from surrounding words, preferably

by using capital letters, bold face, or other distinctive presentation.

Draw attention to British Telecom's ownership when the mark appears in product literature, advertising, promotional and other material. Examples of proper indications includes for an unregistered mark: "INPHONE is a trade mark of British Telecom" and "DATEL is a registered trade mark of British Telecom," for a registered mark.

The indications can be given in a footnote to the text, associated with the trade mark by an asterisk or, if the mark is registered, by the symbol R.

Never use the trade mark as a verb, nor in the plural or possessive form.



# Digital advance leads the world

Roger Pine, Howard Brown  
and Colin Haworth

**T**he quantity of data which modern businesses need to transmit across the network is expanding rapidly and to cope with this demand closed private networks are having to grow to huge sizes. Dedicated public data networks are helping to solve the problem but the development, resources and costs involved will become increasingly significant in the future.

At the same time the continuing growth in telephony services together with advancing technology have resulted in a new generation of digital exchanges and transmission networks which offer rapid call set up and high quality transmission with very low levels of data errors – characteristics which are important to data customers. By extending this digital switched network directly into customers' premises, for both voice and data services, British Telecom has created the Integrated Services Digital Network (ISDN).

Its main advantages are:

- ★ better utilisation of local exchanges and lines
- ★ greater flexibility because single access to the network can support both voice and data calls
- ★ a common network for both voice and data calls providing a more easily managed and operated network
- ★ access to a greater range of network services, such as packet switching, telephony and leased lines
- ★ high speed switched data transmission at lower prices.

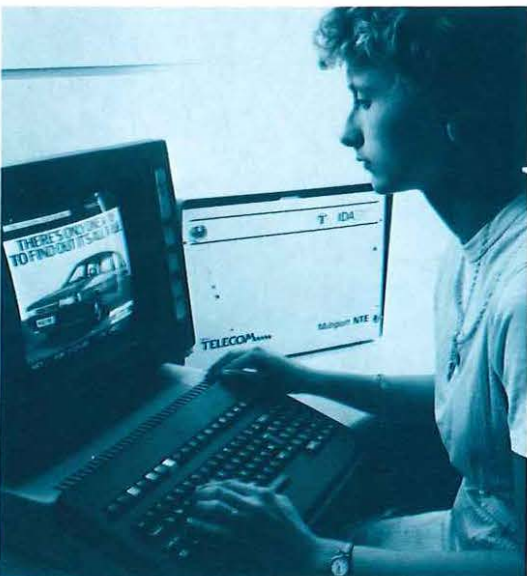
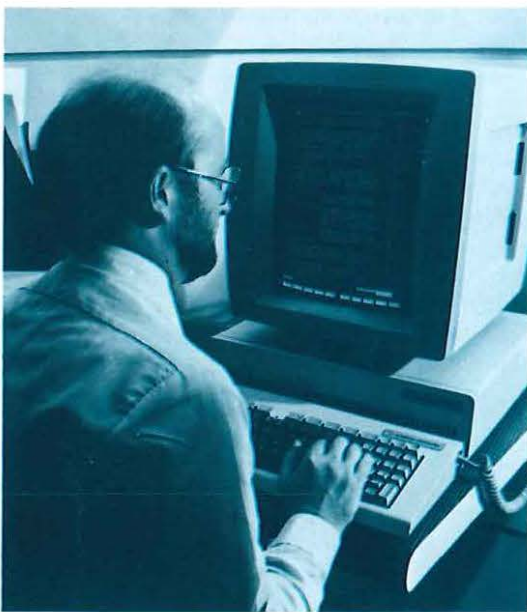
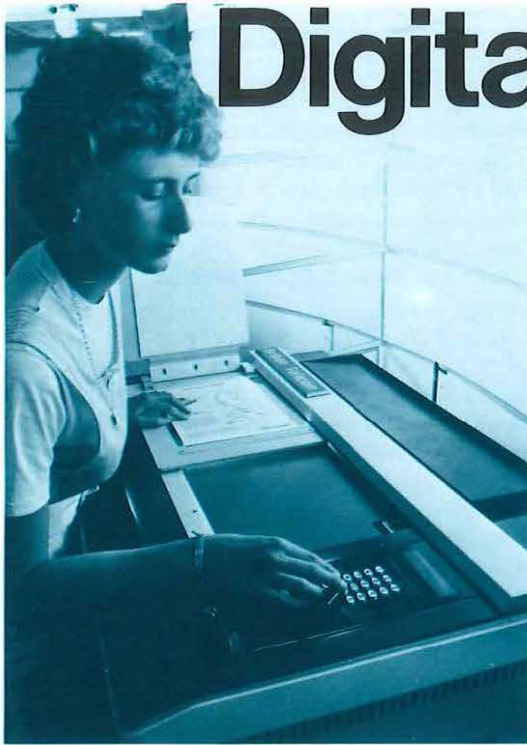
## Connections

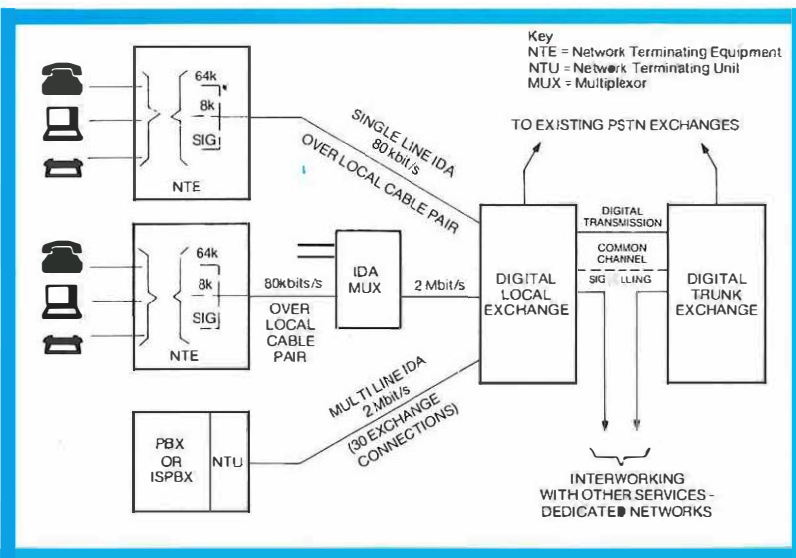
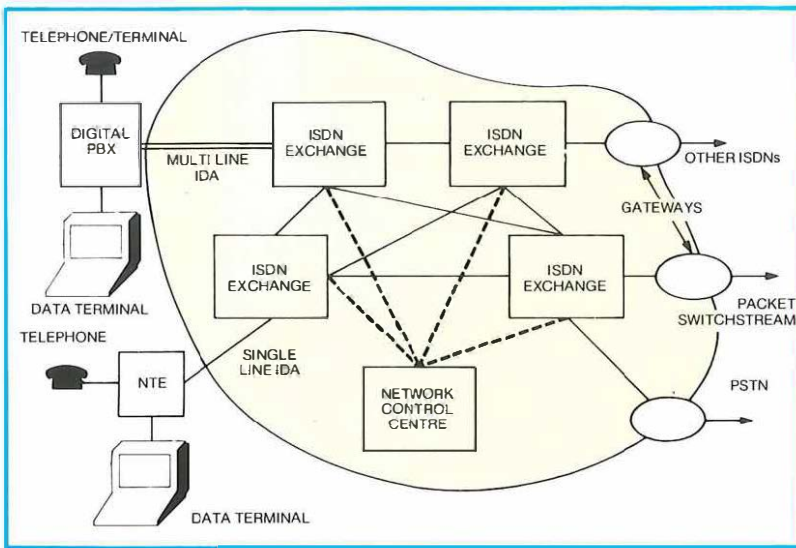
ISDN can be regarded as a network which evolves from the Integrated Digital Network (IDN) into a fully digital telecommunications network providing multi-purpose services to the customer. The IDN provides 64 kbit/s switchable connections across the network between terminating digital local exchanges. To make best use of an IDN for data purposes it is necessary to extend the digital capability to the customer. In British Telecom, the digital link between a customer and the local exchange is known as Integrated Digital Access (IDA).

There are two methods of providing IDA – single-line and multi-line. Single-line (known as basic access) uses a single telephone line in the local network. An existing public switched

**In June this year British Telecom became the first administration in the world to implement a commercial integrated services digital network (ISDN) with the launch of integrated digital access (IDA). The move was part of a multi-million pound modernisation plan which, as more and more digital exchanges become operational, will revolutionise the telecommunications industry.**

An integrated digital communications network will accelerate the race to the electronic office and customers will have just one connection point for speech, data, text, fast facsimile, pictures, graphics and slow-scan TV terminals.





telephone network (PSTN) customer could have his direct exchange line converted to a single-line IDA by changing the telephone and the analogue interworking equipment for IDA equipment. Each single-line IDA terminates on a Networking Terminating Equipment (NTE) and provides up to two independently switchable exchange connections, each with a separate directory number. It is also possible for any one of the exchange connections to be a private circuit.

In the pilot ISDN now underway, one of the exchange connections uses a 64 kbit/s traffic channel which may be used for either speech or non-speech purposes while the other connection uses an 8 kbit/s traffic channel which can only be used for non-speech purposes. A third 8 kbit/s channel is used for signalling for both traffic channels. The three channels are carried on an 80 kbit/s transmission system on a single pair in the local network.

Multi-line IDA (known as primary access) provides up to 30 independently switchable exchange connections. Each traffic channel operates at 64 kbit/s and may be used for speech or non-speech purposes. The signalling for all 30 traffic channels is multiplexed into an additional channel.

Multi-line IDA may be used for the direct connection of digital PBXs, known as Integrated Services PBXs (ISPBX). The link back to the local exchange is a 2 Mbit/s digital path.

Where a single-line IDA customer is in the ISDN local exchange area and is within reach of the 80 kbit/s transmission, the local line may be directly connected to the digital local exchange. When a customer is in an exchange area remote from the ISDN local exchange, or out of reach of the 80 kbit/s transmission from an ISDN local

Top: ISDN will evolve to be a national network and will eventually replace the PSTN and at key points, links to existing networks are available. International and other specialised links are planned.

Above: ISDN schematic diagram showing methods of connecting IDA.

British Telecom's Chief of Operations Iain Vallance (left) inspects an IDA line card with Bob Zwolinsky, operations and maintenance manager at the Baynard House Exchange, London.



### Pilot ISDN service

British Telecom opened the first stage of the Pilot ISDN in London on 25 June with BP International as its first customer. It is based on the 489 System X local exchange in Baynard House, to give IDA service for up to 250 customers in London, Reading, Bristol and Slough. Later this year the Pilot ISDN will be extended, with the opening of System X exchanges at Maida Vale in London, Midland in Birmingham and Blackfriars in Manchester to bring IDA to a total of 1,000 customers in about 60 towns and cities.

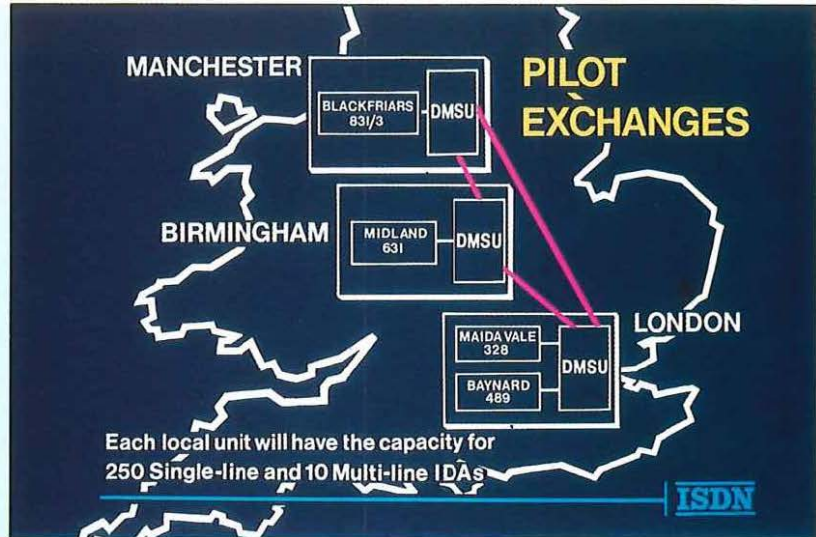
Orders have been placed for the further extension of the ISDN to 130 towns and cities from the middle of next year. The rate of further growth will depend on customer demand, but the service will have the potential to grow in line with British Telecom's plans for the deployment of System X and AXE10 exchanges. On this basis IDA service could be enjoyed by customers in up to 1,000 towns and cities by the late 1980s.

exchange, a remote multiplexor is used.

Each IDA multiplexor can handle 15 single-line IDAs. NTEs are used at the customer's premises, to terminate single-line IDAs and provide:

- ★ connections of customer terminal equipment via standard CCITT data interfaces
- ★ conversion of customer signalling protocols
- ★ adaption of the terminal user data rate to the ▷

*British Telecom Journal  
Autumn 1985  
Digital advance leads  
the world*



The location of pilot System X exchanges which will serve about 1,000 customers.

Co-author Colin Haworth operates the NTE 1 customer unit to bring up a picture on a slow-scan TV screen. In the background is the NTE 3 unit which accesses the ISDN line.

channel data rate.

For lines in the local network an 80 kbit/s duplex transmission will be employed. Signalling will be by way of a message-based common channel signalling system known as Digital Access Signalling System (DASS). DASS2 is used for ISPBXs, it being compatible with the Digital Private Network Signalling System (DPNSS).

CCITT, the body which sets international standards for telecommunications, is expected to set new agreed standards for single-line IDA. These will include 144 kbit/s local network transmission with two 64 kbit/s traffic channels and a 16 kbit/s local network transmission with two 64 kbit/s traffic channels and a 16 kbit/s channel for signalling. Future British Telecom single-line IDA services to these new standards will be provided by multiplexors located either in the local digital exchange or remote from it. Services to these new standards will be provided by both System X and AXE10 exchanges. The current 64 kbit/s plus 8 kbit/s 10A service will continue in parallel with the new standard.

Integrated Digital Access (IDA) promises to be a major boost for business communications enabling data, voice, text and graphics terminals to communicate via System X and System Y.

### Instant access

It is in effect, the customers' link with the ISDN and it is being marketed initially for large corporate customers who need instant access to a wide range of facilities from one simple connection to a desk top terminal. They will benefit most from the easier management, better utilisation and savings on accommodation resulting from the common access link.

Applications include photovideotex, which provides photographic quality colour pictures in about five seconds on the screen of a business microcomputer. The pictures are held on a remote database and can be entered by the customer from an editing terminal. The system is attractive to travel and estate agents, the parts distribution industry, and publishers wishing to link picture libraries.

IDA can be used for fast, high-definition, facsimile based on the emerging Group 4 machines or enhanced Group 3 machines. A

sheet of A4 text can be transmitted in around eight seconds by using the machine at 64 kbit/s and the facility is suitable for sending multi-page reports between different company locations. It also allows complex technical drawings to be exchanged without errors.

### Application

Another important application is slow-scan TV which provides commercial TV quality pictures, with a new picture appearing every five seconds using standard video cameras and TV monitors. The system is suited to the surveillance market and as an aid to audio-conferencing.

IDA permits remotely stored programs to be accessed and down-loaded to business microcomputer. Remote program interrogation and use also enables Computer Aided Design (CAD/CAM) type programs to be used by remote terminals.

Tariffs for the Pilot ISDN service, initially available in London, Reading, Bristol and Slough will enable customers to transmit data on the Circuit Switched Data Service part of the ISDN at up to 64 kbit/s at the same cost as for a telephone call and the distance and time of day elements of telephony tariffs apply.

Costs for access to the packet Switchstream service are attractive at the higher speeds and the cost of digital private circuits are comparable with KiloStream tariffs. IDA provides its own set of supplementary services in addition to those it can offer from the Star Services range and the Packet Switchstream repertoire.

Work on applications has already been done but more will be needed involving major customers, terminal manufacturers and British Telecom. The Pilot IDA service has been launched to enable this development of applications to take place now, rather than awaiting international interface standards.

ISDN will revolutionize the telecommunications service and industry in a way which few people can at present imagine. ISDN is expected to grow dramatically as British Telecom's network of digital exchanges expands, as internationally agreed standards become available and as a wider range of suitable terminal equipments are developed and marketed. ●

**Mr R Pine** is head of digital systems specification and evaluation division, LCS/Network Strategy and Digital Exchange Department.

**Mr H R Brown** is head of IDA marketing.

**Mr C H Haworth** is head of the ISDN implementation group.

#### IDA supplementary services:

**Closed User Group**, which enables a customer to specify a group of other terminals from which he wishes to receive calls from, or make calls to. This service emulates a private network but uses the public network and is useful for the customer who wishes to communicate only between his own offices for commercial security.

**Calling and called line identification** which provides the identity of the remote terminal to the called or calling customer. In companies where internal accounting is performed such information is useful. It also provides for

added security.

**Abbreviated Address Calling** which reduces the effort needed to establish calls.

**Voice/Data Swap** which enables a swap to be made to a data mode to send a facsimile or other DTA information. This greatly enhances the effectiveness of many telephone discussions.

**Compatibility checking** which enables the customer to choose an automatically sent service code to identify which type of application he is using on a call. The network will check for compatibility at the distant end to ensure that only compatible terminals are interconnected.

# Ringling the changes!

Dave Prescott



The Palace of Westminster project began in May 1983 when the authorities, through the Central Computer and Telecommunications Agency of H M Treasury invited tenders for the supply of a new digital system to replace the crossbar PBX installed in 1972. Following consultation with British Telecom Enterprises Business Systems, a tender was submitted.

Work began in earnest, when in February last year, it was announced that British Telecom's bid for the order had been successful against stiff competition. Detailed plans were drawn up, with the project falling into three main phases:

- \* planning and design
- \* manufacture and installation
- \* testing and changeover.

Planning and design began with a detailed review of the specification. Manufacturing details and a software development programme were prepared by Plessey Network and Office Systems Ltd, the manufacturer, and the engineering planning process started in London South Central Area. This involved discussions with the customer about the accommodation at three locations and included details of power consumption, dimensions, weight, lighting and ventilation. Additionally, external plant requirements were assessed and programmed.

## Delivery

On-site, a conversion programme to change the telephones to plug and socket working and to install distribution frames and cables in readiness for delivery of the system was started. Plans were also made for an extensive user-training programme supported by articles in the house magazine and display stands, manned by sales support staff, with working models of the telephones to be installed.

The system was manufactured and factory tested early this year and delivered to site during the Easter recess. The cabinets were then placed in position and cabled to the distribution frames. Power systems were installed and, what at that stage were five 'independent' units, were powered up for basic system testing to begin.

Meanwhile, the software development had progressed to the point where five systems could

be interconnected by 2Mbits/s digital circuits to create the 5,000 extension capacity required.

While the PBX engineers were concentrating on the system itself, installation staff were preparing for conversion and the installation of more than 50 'Octara 32' Keysystems as replacements for the key and lamp units, 1,300 Facility phones and 1,100 basic telephones. Line status sensing equipment and light emitting diodes on the Facility phones, provide Member/secretary and message waiting facilities.

The changeover of the system was simplified by duplicating all incoming and outgoing routes and was undertaken by disconnecting the extensions progressively from the old exchange, changing the routing of the incoming traffic to the DX and connecting extensions to the new system. Special arrangements were made to provide essential users with continuous service by means of two extension circuits – one from the old PBX and one from the new.

At all times, before and after the changeover, British Telecom staff were on hand to advise and help officials, staff and Members of both Houses of Parliament obtain maximum benefit from their new telephones and systems. Ⓣ



**In early September a new digital private exchange and 3,000 telephone terminals serving the Palace of Westminster were brought into service. The system, a British Telecom Merlin DX, manufactured by Plessey, incorporates a number of novel features including Digital Private Network Signalling System (DPNSS) and, with capacity for 5,000 extensions, is the largest of its type to be installed.**

Technician Mike Chilver of South Central Area tests the recall facility on one of the new Palace of Westminster telephones.

Mr D J Prescott was project manager for the Palace of Westminster installation.

**British Telecom's range of home computer games – sold under the Firebird banner – are now establishing themselves in a highly competitive marketplace.**

The world of publishing software for home computers is rather like a computer game itself. There is the constant threat of attack by enemy firepower and the search for mysterious clues in an adventure fantasy-world. Survival is a matter of wits, intuition, logic and fast reaction.

But it is in this most volatile of markets that British Telecom is not only surviving, but fast becoming one of the leading home software publishers in the UK. The operation is called Firebird Software.

Firebird's arrival is comparatively recent in the short history of home computers. The computers themselves only began to surface about five years ago immediately appealing to electronics enthusiasts and the like. Prices fell as silicon chips became cheaper, the machines became more complex and soon, games inspired by arcade machines such as space invaders, were appearing on the screen.

By April 1982, when the ZX Spectrum had been launched there were a sizeable number of software authors selling their programs to other computer owners. Software houses mushroomed, often run from bedrooms or attics

and advertised their wares in classified advertisements by mail order.

The Spectrum, and other computers such as the BBC micro and the Commodore Vic 20, were selling in millions. In short, the market had exploded and home computers were big business. Rapid transformations took place. Commercial pressures forced software publishers into competitive spirals of glossy advertising expenditure, sales shifted from mail order to the High Street stores, and the products themselves became impossible for the casual amateur to write or market.

By the time Firebird was launched last year, publishing computer games was no longer an easy way to make a fortune. With about one in five households owning a computer, the UK market was moving towards saturation, and advertising hype of poor games was creating disillusionment among customers.

The Firebird strategy was carefully planned. Advertisements appeared inviting programmers to send in their games for evaluation. The message was clear: British Telecom as a publisher had considerable resources.

A two-tiered pricing policy was adopted with a

# Firebird takes off

Herbert Wright

Below: Part of the Firebird range of computer games.



'silver' range for the budget market, at £2.50, attracting the casual buyer, and a higher priced 'gold' range of games with exceptional quality meeting the constant demand for games with state-of-the-art programming or fresh original play concepts. A marketing strategy to defuse the cynicism of hyped-up games was also developed which meant that every 'silver' game would display a screenshot on its packaging, so the customer knew exactly what he was getting.

Soon 20 titles were launched in the 'silver' range and Firebird was ready for the assault on the all-important Christmas market. In the two months up to that period, about 40 per cent of the industry's sales are achieved, so it was a critical time. By January 250,000 cassettes had been sold: Firebird had arrived.

As this year began, Firebird's reputation was established as a major games house, but only for budget software. To gain a reputation in the 'gold' range an intricate logical puzzle called Gyron was launched offering a Porsche 924 as a prize.

Firebird also acquired the rights to a game called Elite – an epic combining spaceflight simulation, combat and trading in 3-D vector graphics, in a universe of 2,000 planets in eight galaxies. Originally published by Acornsoft for the BBC micro, Elite had become the best selling game for that computer of all time, and was a thriving cult. Most other games however were selling to the bigger markets of Spectrum and Commodore 64 owners. The potential for Elite in these markets created intense competition for its rights, and it was Firebird's bid that was successful.

Elite became only the second game to reach number one in the software charts with a retail price over £10. It achieved this in the difficult summer months, when most games players were on holiday and sales low, and it continues to sell phenomenally. The Spectrum conversion was launched in September, closely followed by Amstrad and MSX versions. ①

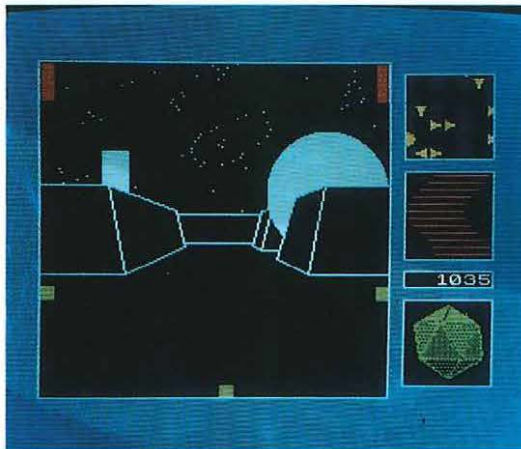
Currently, Firebird's total sales are about £750,000 with the addictive Booty (Spectrum and Commodore 64) selling more than 100,000 copies. The range of titles has expanded ready for a second Christmas assault. Changes in the 'silver' range are set to alter the whole concept of budget software while the 'gold' range will carry a wide range of titles.

The difficult market of computer utilities will be presented with a revolutionary music system for the Commodore 64 and the gap between computer and board games will finally be bridged. It is also planned to open an American office.

*British Telecom Journal  
Autumn 1985  
Firebird takes off*



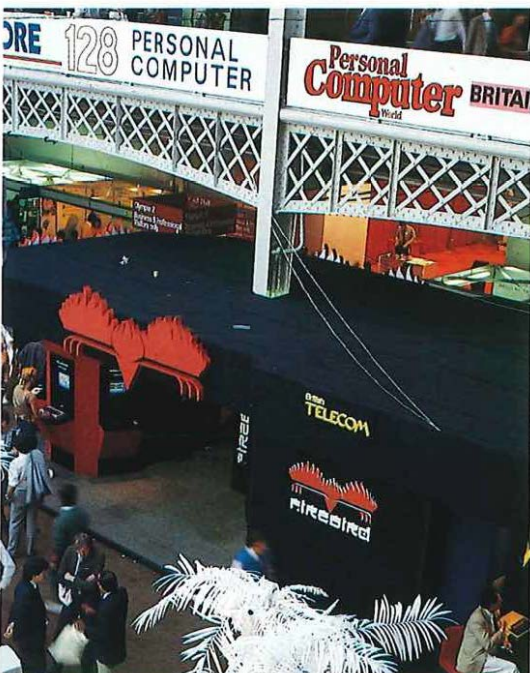
Screen shots from Elite, Gyron and Chicken Chase.



Below, left: The Firebird stand attracted much attention at a recent computer exhibition in London.



Mr H L Wright is responsible for co-ordinating all publishing activities of Firebird Software.



**During 1984 there were about 16,500 accidents to British Telecom staff at work with about a quarter of them resulting in sick leave. Safety Division wages a constant battle to cut the cost both in terms of money and human suffering.**

Dressed for the occasion: four examples of what the safety conscious engineer should be wearing for the particular work being undertaken.

**E**very year industrial accidents in the UK cost hundreds of millions of pounds. But the financial account – considerable though it is – is only part of the story. The catalogue of human misery, with permanent disability and sometimes death, is also an unacceptable feature.

British Telecom, of course, has always been aware of the extent of the problem and Safety Division has been an active force in positive prevention for many years. Indeed, its safety record, although by no means a matter for complacency, compares favourably with many other major companies.

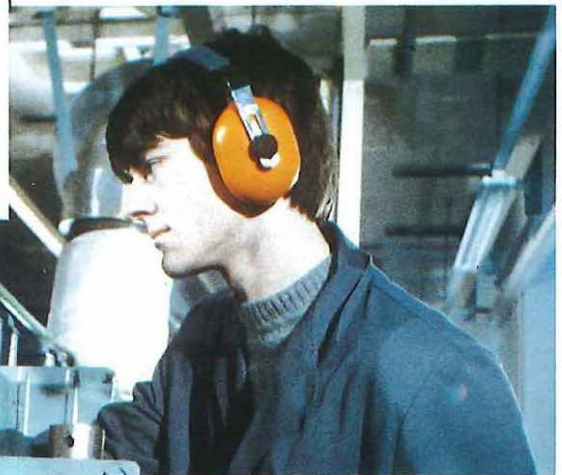
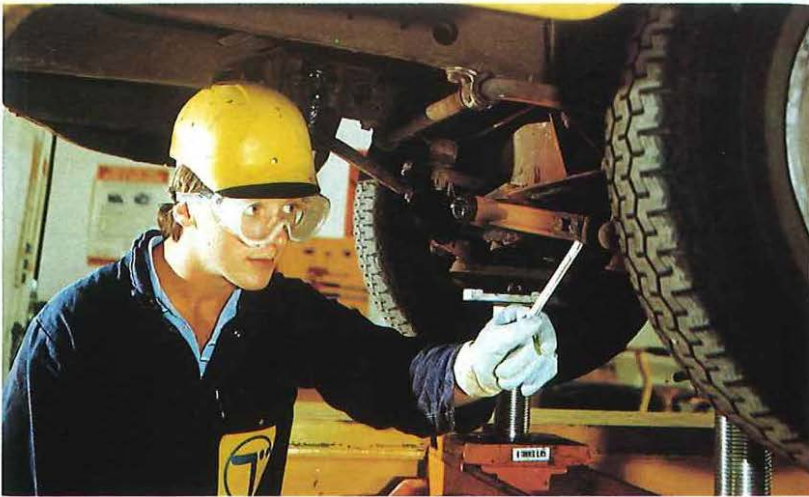
Safety Division's role is to provide operational advice and guidance and create awareness of safety matters. Everyone is affected by the Health & Safety at Work Act (HASAWA) of 1974 and it is the duty of the Division to ensure that staff throughout the company fully understand and can interpret their responsibilities.

Many are unaware of their legal position where safety is concerned. The Health & Safety Commission (HSC) has ultimate responsibility for policy and formulation of Regulations and Codes of Practice on HASAWA, and has appointed a separate body, the Health & Safety Executive (HSE), to enforce legal requirements and provide an advisory service for employers and employees. Local authorities also have responsibilities for the enforcement of safety legislation.

Eve Sharp

**SAFETY MATTERS**

Prosecutions for criminal offences in safety law can be brought by the HSE or local authority inspectors and it is not only British Telecom as a whole which is at risk because if an accident





occurred and negligence was proven on the part of an individual, then that person could be convicted in a court of law.

The annual cost of accidents to industry as a whole is between £1,100 million and £1,800 million pounds depending on the method of calculation. The average cost of a permanently disabling injury is about £10,000, £2,740 for a serious injury and for other officially recorded injuries, £150. In British Telecom, an average sick leave accident costs about £1,600 and a non-sick leave accident about £50. On that basis accidents cost the company nearly £7 million last year.

Overall the picture of serious accidents in British industry is bleak. During 1982 in the UK there were 9,761 fatal and major injuries involving loss of limbs, eyes, and the like – and a year later this figure had risen to 9,914.

Analysis of accident frequency in British Telecom shows that, despite a reduction in staff members, there has been an increase in injuries, particularly sick leave injuries, and these are predominantly among engineering staff. The increase is not confined to a particular geographical area of the country nor to any specific engineering duty. Studies into this problem are currently being made with the help of other public utilities while in-depth investigations into serious accidents are carried out by Safety Division every quarter. This is done on a random selection of 100 accidents so that the main and contributory causes can be identified and preventative action taken.

It is important to ensure that a constant flow of information and expertise is available to British Telecom staff at all levels but particularly the promotion, oversight and implementation of safety practices in the engineering field. The engineering technical and allied grades in British Telecom are the largest group of people at most risk as with 116,000 members they account for nearly 50 per cent of total staff.

Safety depends on many influences not least of which is response to instructions. It is when this breaks down that most accidents occur. Arrangements for carrying out British Telecom safety policy include provision of suitable training, supervision and safe



Safetyscene – Safety Division's twice yearly newspaper.

Some recently produced posters from Safety Division.

systems of work. Details are found in Standing Instructions and these arrangements are subject to continuous monitoring and review. Advice and support is available not only from Safety Division but via professionally qualified safety officers.

Throughout the country there are safety officers in all Districts and London Areas, who are recognised by other industries and enforcement authorities such as the HSE.

A still from a Safety Division film on fire prevention.

For the protection of staff British Telecom provides about 20,000 safety belts (for staff working on telephone poles, radio masts, etc); 100,000 safety helmets; 22,000 gas detectors and 16,000 safety lamps (for staff working underground); 25,000 respirators; 100,000 pairs of eyeshields; 150,000 pairs of gloves; 20,000 high visibility garments for engineers; 300,000 traffic signs and 3,500 electric beacons (for staff working on or near roads). A protective footwear subsidy scheme is available to a wide range of staff.

Where the size of a unit does not justify a full-time safety officer, a specially trained safety adviser is appointed to provide local expertise. Safety Division is in frequent contact with all local safety staff, keeping them updated on policy, information, providing conferences and training.

Local committees exist to deal with normal safety matters but where a serious problem is identified, this can be referred upwards and handled either by the specialist division or referred to the British Telecom Safety Committee or the British Telecom Engineering Safety Committee. Both are national bodies and

managers from all parts of the company, safety professionals and union members are represented on them. Other smaller committees have been set-up to ensure that a wide range of topics is covered.

A major task of Safety Division is to provide detailed Standing Instructions and present safety messages in the most effective and stimulating way. A series of informative booklets on specialist topics – Engineering Safety Guides – are issued to staff and these cover specific areas, like the action to be taken on external work and gas precautions.

**April 1982 - March 1983 Total staff including part-time 245,976**

Group	% of total BT Staff in Post	% of total accidents by Group	No. of accidents
Operating (TP & TG)	17.5	14	2026
Clerical	27	7.5	1110
Cleaning	2	2.5	374
Catering	2	5.5	789
Engineering	47	64.5	9409
MT Workshops	1.5	2.5	358
Other Work	3	3.5	516

**April 1983 - March 1984 Total staff including part-time 241,124**

Group	% of total BT Staff in Post	% of total accidents by Group	No. of accidents
Operating (TP & TG)	15	12.5	2,133
Clerical	28.5	8	1,332
Cleaning	2	2.5	440
Catering	2	5.5	921
Engineering	47	64.5	10,774
MT Workshops	1.5	2.5	402
Other Work	4	4.5	712

**April 1984 - March 1985 Total staff including part-time 234,445**

Group	% of total BT Staff in Post	% of total accidents by Group	No. of accidents
Operating (TP & TG)	12	12.5	2,067
Clerical	31	8.5	1,412
Cleaning	2	2.5	461
Catering	1.5	5	811
Engineering	47.5	64.5	10,612
MT Workshops	1.5	2.5	416
Other Work	4.5	4.5	714

**Eyecatching**

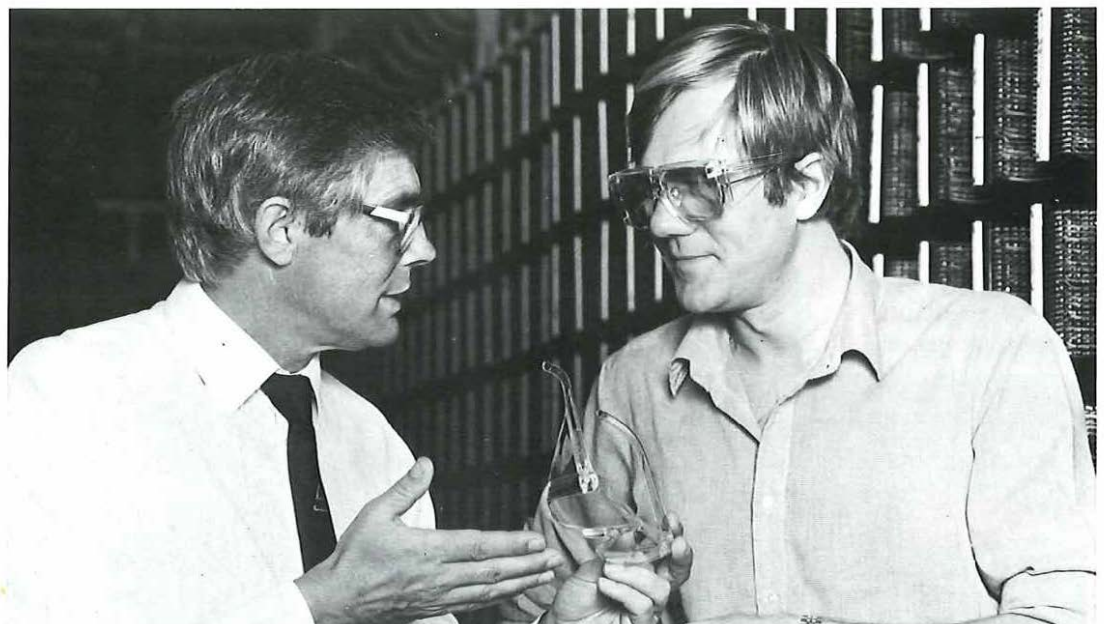
To keep the wheels of information turning, the Division also produces posters. A constant change of style keeps attention alive and the aim is to create eye-catching material which makes passers-by stop and read. The desire to communicate, is further exercised by publication of 'Safetyscene' an internal newspaper, produced twice yearly to provide staff with lively, thought-provoking comments on topical matters. Competitions are also run regularly so that staff can become actively involved with safety. Film is used where suitable and leaflets and an annual calendar are also provided as a reinforcement of the essential safety message.

Within British Telecom, there is co-operation between the various departments and help is given in introducing new equipment and techniques, and identifying mechanical, electrical and health hazards presented by the equipment or technique.

Frequent liaison outside British Telecom with other bodies and representation on committees like the National Joint Utilities Group Health & Safety Committee brings together a wealth of expertise and skill from a wide range of industry.

Knowledge provides the opportunity of solving problems and Safety Division's aim will always be to reduce risk, avoid hazards, eliminate injury and persuade people to work safely not just for their own benefit but for the good of other people and British Telecom as a whole. ①

Bournemouth Safety Officer Mike Eades (left) discusses the merits of safety spectacles with technical officer Mark Goldsmith.



Miss E Sharp is publicity officer for British Telecom's Safety Division.

# It's a fact

## A summary of British Telecom progress since 1981

### Number of exchange connections

	Year ended 31 March				
	1985	1984	1983	1982	1981
Business .....	3,938,000	3,774,000	3,646,000	3,574,000	3,509,000
(% growth over previous year) .....	(4.3)	(3.5)	(2.0)	(1.9)	(2.5)
Residential .....	16,614,000	16,062,000	15,564,000	15,177,000	14,689,000
(% growth over previous year) .....	(3.4)	(3.2)	(2.5)	(3.3)	(5.3)
<b>Switching</b>					
Number of exchange connections served by electronic and digital systems .....	6,869,000	6,273,000	5,013,000	3,606,000	2,707,000
(% of total exchange connections) .....	(33)	(31)	(26)	(19)	(15)
Number of electronic units .....	2,121	1,965	1,748	1,480	1,305
(% of total switching units) .....	(31)	(29)	(25)	(22)	(19)
Number of digital units .....	84	51	14	1	0
(% of total switching units) .....	(1.2)	(0.8)	(0.2)	(0)	(0)

### Call growth

% growth in telephone call volume over the volume in the previous year was about:	Year ended 31 March				
	1985	1984	1983	1982	1981
Inland .....	8	6	3	3	2
International .....	14	12	11	14	13

### Exchange equipment

At 31 March 1985 British Telecom operated exchanges in the following technologies:	Local exchanges	Trunk exchanges	International exchanges
Strowger .....	3,564	325	0
Crossbar .....	599	121	5
Electronic .....	2,121	0	0
Digital .....	78	5	1
Total .....	6,362	451	6

### Trunk network transmission

Systems operating at 140 Mbit/s in the trunk network are:	Number of systems	
Coaxial cable .....	519	(77%)
Microwave radio .....	100	(14.5%)
Optical fibre .....	57	(8.5%)
Total .....	676	100%

Each system has a point to point capacity of 1,920 digital channels giving a total capacity of 1.3 million digital channels. By 31 March 1985, 45,000 fibre-kilometres of optical fibre had been installed in the national (trunk) network, 9,500 fibre-kilometres in the junction network.

### Telex system

	At 31 March				
	1985	1984	1983	1982	1981
Number of exchange connections .....	97,000	92,900	90,600	90,400	87,900
(% increase on previous year) .....	(4.4)	(2.5)	(0.3)	(2.8)	(5.0)

### Capital expenditure (net)

	1985	1984	1983	1982	1981
	£m	£m	£m	£m	£m
Additions:					
Land and buildings .....	170	162	176	133	136
Plant and equipment					
Transmission equipment .....	592	550	479	405	339
Telephone exchanges .....	643	586	673	705	593
Other .....	474	265	225	237	221
Total additions .....	1,879	1,563	1,553	1,480	1,289
Changes in materials awaiting installation and disposals and adjustments .....	(24)	(30)	(3)	(4)	(39)
Total net expenditure on fixed assets .....	1,855	1,533	1,550	1,476	1,250

Note Other includes inter alia customer equipment, motor vehicles and computers and investments in satellite consortia.

### Research and development expenditure

	1985	1984	1983	1982	1981
	£m	£m	£m	£m	£m
Research and development expenditure for year ended 31 March .....	182	179	172	158	123

Note The main areas of expenditure are: switching and transmission systems development; information technology; network strategy and standards, and; basic technology in hardware and software.

### Manpower

Number of employees by division as at 31 March	1985	1984	1983	1982	1981
Local Communications Services .....	197,500	210,600	216,100	220,300	n/a
National Networks .....	10,800	2,700	1,500		
British Telecom International .....	10,400	11,700	12,800	14,200	
British Telecom Enterprises .....	3,500	2,100	1,200	900	
Development and Procurement .....	10,100	11,400	12,100	12,500	
Corporate headquarters .....	2,900	2,600	2,300	3,700	
Total .....	235,200	241,100	246,000	251,600	251,400

Note Figures for earlier years have not been reworked to reflect transfers of staff between divisions.


The number of jobs in British Telecom was reduced by about 16,500 over the three years to March 1985.

# Women at work

**M**ore than 70,000 women currently work for British Telecom but no longer is their activity restricted to the traditional roles of telephonist, clerical worker or perhaps a job in sales.

Today there are nearly 1,000 women technicians in British Telecom whose jobs include helping to install and service telephones, exchanges, computerised equipment, telex machines and other apparatus. They operate various mechanical aids, such as trench excavators, and are equally at home at the top of a telephone pole or underground in a manhole.

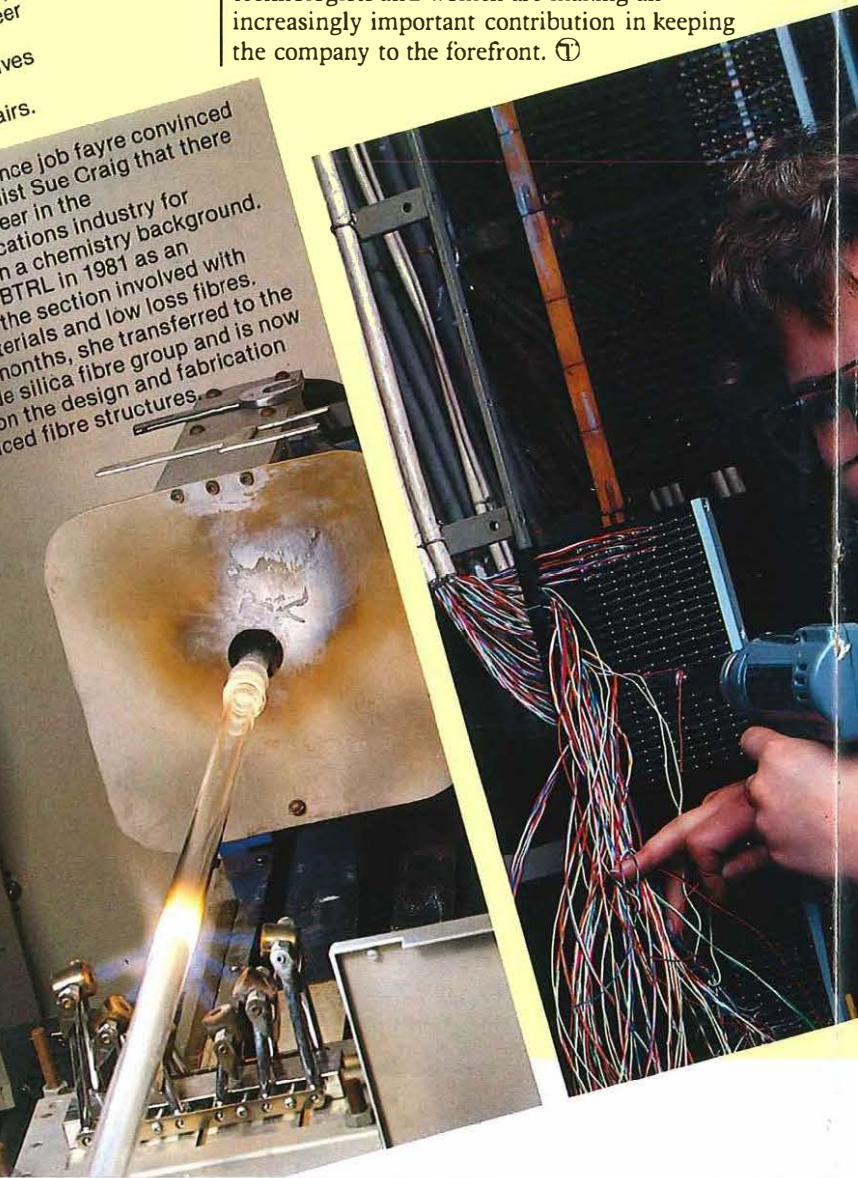
Some are employed at British Telecom Research Laboratories (BTRL) Martlesham, working on projects to keep the company at the forefront of technology while others work as coastal radio station operators helping to maintain vital communications with ships and offshore oil rigs. There are surveyors and draughtswomen, handling a range of jobs from setting up new electronic telephone exchanges to working on satellite-tracking equipment.

British Telecom's performance depends on employing the most creative managers and technologists and women are making an increasingly important contribution in keeping the company to the forefront. 



△ Sue Bagshaw joined the company as a telephonist after a spell working in a bank. But when her exchange closed down she opted for another change of direction in her career and retrained in engineering division. Now a skilled technician, her work involves the installation and maintenance of customers' apparatus and coinbox repairs.

A visit to a science job fayre convinced graduate chemist Sue Craig that there could be a career in the telecommunications industry for someone with a chemistry background. She joined BTRL in 1981 as an engineer in the section involved with optical materials and low loss fibres. After 18 months, she transferred to the monomode silica fibre group and is now working on the design and fabrication of advanced fibre structures.



# work

When skilled technician Tracy Farrance applied for a job with British Telecom, she had nine 'O' levels including maths, physics and chemistry but was surprised to receive the forms for engineering entry.

She spent the first two years of her apprenticeship working in various engineering groups and then opted to work in internal construction where she has remained ever since.

Her job involves running cables, often in confined spaces, awkward positions and high above ground level. She has helped with the recovery of two old Strowger exchanges – work which involved wearing protective clothing and a respirator to guard against asbestos dust while she broke cement with a pneumatic drill and dismantled ironwork.



Mona Corbin opted out of her 'A' level studies at college and decided to look for a technical job.

Now at the end of a three year apprenticeship with British Telecom as a trainee technician, she is specialising in customer works co-ordination which involves designing private circuits and occasionally going out to customers' premises to solve problems.

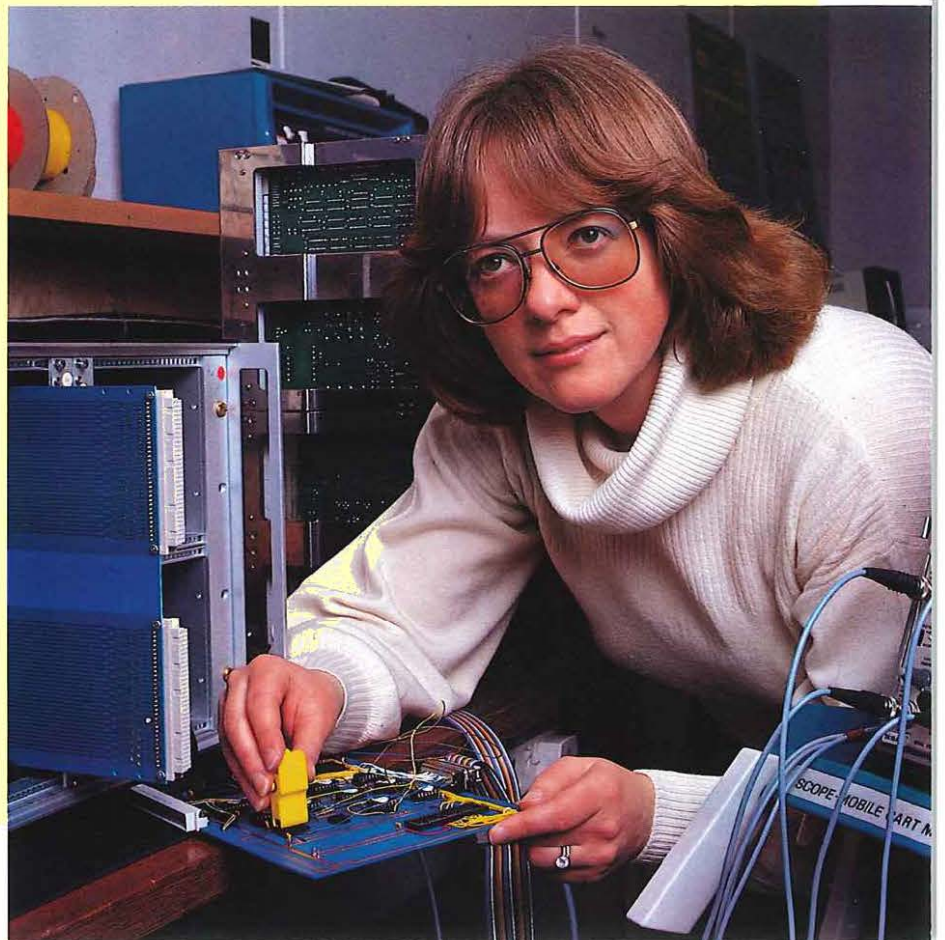
She finds her job varied and interesting and enjoys the mixture of practical and academic elements.



Cambridge graduate Joanna Crowe spent two years at BTRL, Martlesham, before gaining a British Telecom scholarship to attend Imperial College, London, for an MSc course in communications engineering.

She was promoted on her return and worked on a computer model which predicts customer opinion of transmission performance. Her detailed knowledge of transmission problems led to an involvement with an International Consultative Committee for Telephony and Telegraphy (CCITT) study group which meets in Geneva to work on telephony transmission performance.

For the past three years, she has been involved in the writing of the British Standards covering attachments to the British Telecom network, particularly simple telephones, loudspeaking telephones and PBXs.



**The University of Cambridge, one of the oldest seats of learning in the country, is being equipped with one of the most modern telecommunications systems. The task, due for completion next spring, requires both respect for the past and an understanding of future needs. Deputy editor JUSTIN QUILLINAN reports.**

Project engineer Terry Basham (standing) and project planner Roger Abraham take measurements in a manhole outside the ornate gates to King's College, Cambridge.

**A** young man wearing a straw boater and blazer ignored notices in three languages and wandered across the manicured grass outside King's College, Cambridge . . . His actions were a breach of the strict code of etiquette necessary to prevent damage to the facilities and amenities of the historic university city. But only weeks before, the same hallowed turf was lifted – under close supervision – to enable British Telecom engineers to lay voice and data cables in one of the biggest operations of its kind to be carried out in the city.

Miles of Megalink cabling are being laid throughout the city centre to give 23 Cambridge colleges and 35 university departments a modern, computerised telecommunications network. The contract was won by British Telecom Cambridge Area by competitive tender against strong opposition from several other companies.

The task is demanding by any standards. The installation includes three BTEx switches working as one system and 13 remote

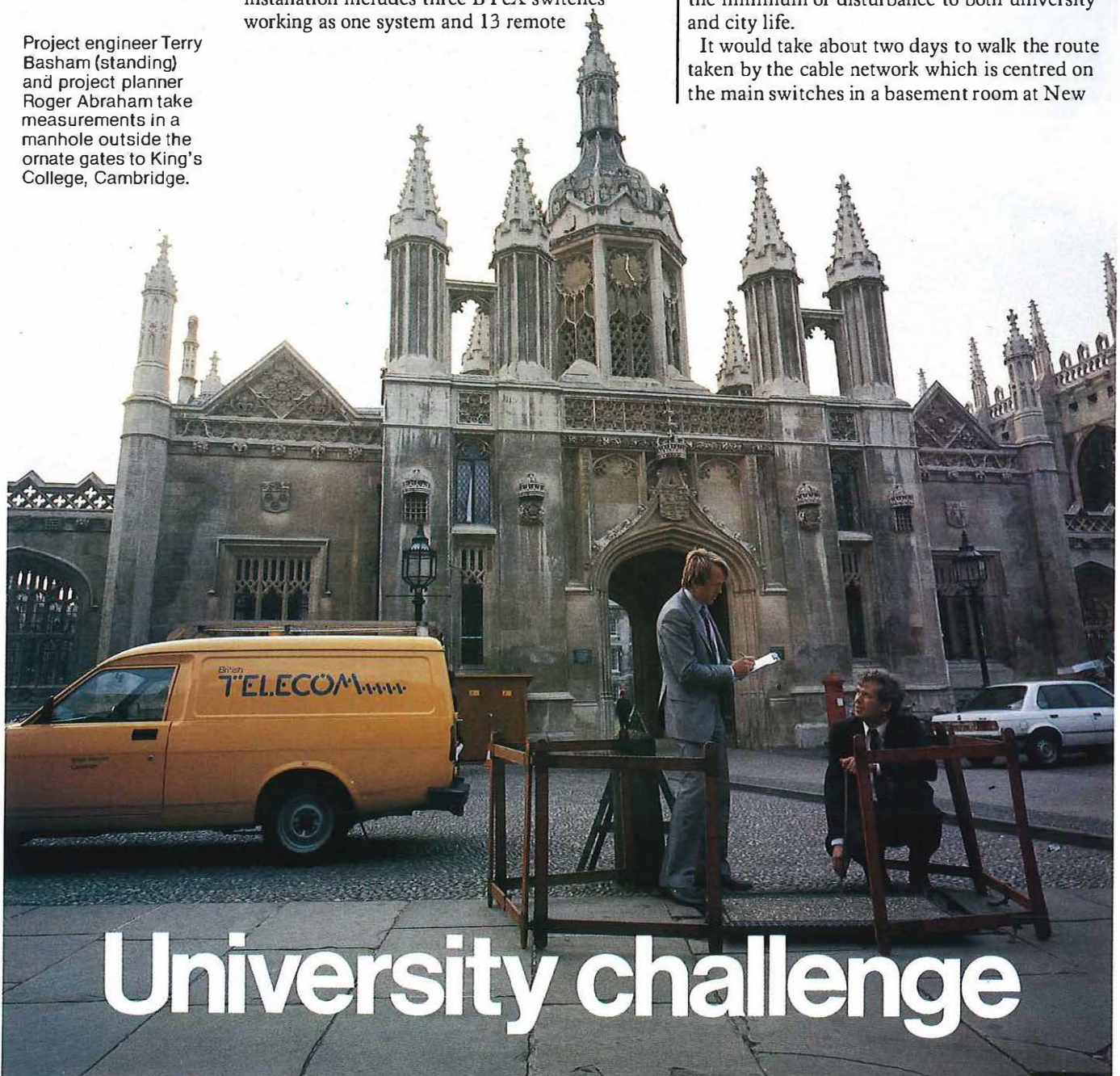
peripheral equipment sites, replacing 57 main switchboards. They will be connected by a new Megalink network for voice and data and the equipment includes a large Merlin call management system and up to 6,000 new telephones of the latest type.

With so many extensions and 244 exchange lines, the installation is equivalent to a small town and will take about 50,000 man hours to complete. But statistics fail to tell the full story, and comparisons between the Cambridge University project and industrial or commercial installations of a similar size are almost meaningless.

### **Environment**

Mediaeval stonework has had to be diamond-drilled to avoid vibration damage and ancient architecture has had to be adapted to provide the air-conditioned, anti-static environment necessary for computerised equipment – all with the minimum of disturbance to both university and city life.

It would take about two days to walk the route taken by the cable network which is centred on the main switches in a basement room at New



# University challenge

Museum. But evidence of the work already carried out is hard to detect even in some of the best-known and most photographed surroundings in the country. Cables, for example, will run underneath Sir Isaac Newton's famous 'mathematical bridge' – built without bolts or screws – and when installed, the four-inch pipe will be invisible to the casual observer. Its route was planned from river level by British Telecom engineers and college staff working, appropriately, from a punt.

Finding suitable accommodation for the switches and peripheral equipment also required careful thought and clever design. The three BTeX switches, together with three teletypes and facilities for the maintenance staff who will have to undertake software changes, are housed in a room no larger than eight metres by seven. The equipment, fed by individual 100 amp supplies, is expected to produce a heat output of 20 KiloWatts and because of the confined space available, a compact air conditioning system had to be designed to maintain the correct operating temperature.

Peripheral equipment, housed in 13 different locations, also required special ventilation and anti-static flooring and furniture. In Old Schools, the only suitable place was found to be a ground-floor toilet and an oak door with the

words 'Mens Lavatory' written in gold lettering now leads into a room stacked with Merlin electronics.

The new network will replace a tandem-switch, Strowger system which was installed by British Telecom about 15 years ago. At the time, the system represented a significant advance in telecommunications and was one of the first of its kind in the country. Today, however, it is overloaded and troublesome to maintain and the new system will enable the university to take advantage of reduced running costs.

### Traditions

Its replacement follows in the best traditions of helping a university famous for its communication of knowledge over the centuries, to communicate effectively in the modern world and a team of 22 British Telecom staff are involved in the delicate operational work being undertaken.

The 'University challenge' has meant learning lessons which will be useful when it comes to installing similar systems in the future. The main one, is that a successful compromise can be struck between the needs of the ancient and the modern – given careful thought, effort and the co-operation of all parties concerned in the enterprise. Ⓣ

*British Telecom Journal  
Autumn 1985  
University challenge*

Engineer Dave Parker shows the Head Porter of Trinity College, Cambridge, one of the new telephones which will replace the old instruments in the college.

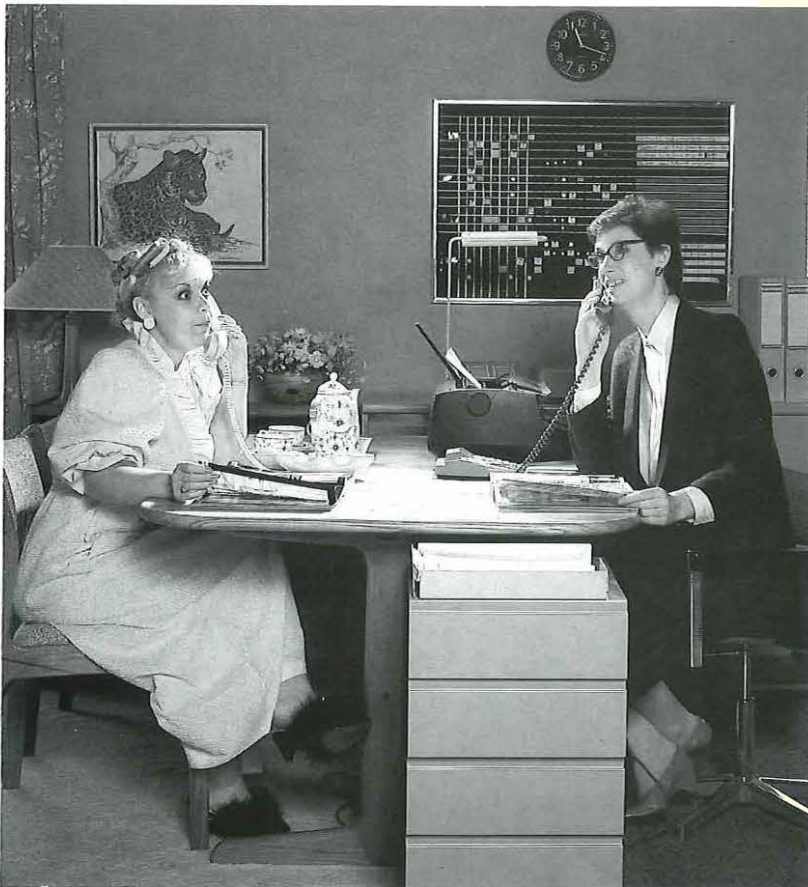


# Cutting customers'

TV viewers are familiar with the 0800 LinkLine commercial which is part of an extensive national advertising campaign.

## at home..

Bryan Friend



**A new range of services aimed at boosting company sales both at home and abroad has been launched by British Telecom. LinkLine from National Networks, is an automatic system which offers free or reduced-rate calls for sales and service and International 0800, from British Telecom International, takes the concept overseas.**

**N**ational Networks' LinkLine has launched its first two services for business users following successful trials over a three-month period. LinkLine 0800 is an automatic Freefone service, similar to the highly successful 800 Service in the United States, giving access from anywhere in the UK by dialling 0800 and a further six digits. The caller gets a free call and the LinkLine customer pays the cost of the call at special LinkLine rates.

The second service, 0345, operates in similar fashion but the charge for the call is shared between the caller and the LinkLine customer. The caller pays a local call charge and the customer pays the difference between that and the full LinkLine charge.

Both services have been designed to offer:

- ★ a single national number
- ★ direct dialling
- ★ an attractive direct response mechanism
- ★ new opportunities for sales and marketing

## ..and abroad

Meena Ratti

**B**ritish Telecom International (BTI) is offering a fully automatic, non-operator service, across international boundaries. Called International 0800 the service is already available from the USA, France and the Netherlands. By renting an International 0800 number a UK based company is now able to maintain a presence overseas, without the expense of setting up an office.

BTI research has shown that a modest sales office in downtown New York costs a minimum of £71,175 a year to maintain. Lodging and travel costs for an overseas executive can be estimated at £17,500 and the total must be subsidised by the UK employer and borne by the product. Alternatively, a small company which exports 80 per cent or more of its goods to the US without running a local office can expect to budget at least £33,000 annually to visit key customers and distributors.

When International 0800 was launched last year it gave UK companies the opportunity of renting numbers on the American toll-free network, the 800 Service, and answering calls at home. The service enabled companies to penetrate the £151 billion American import market at a fraction of the usual risk and cost.

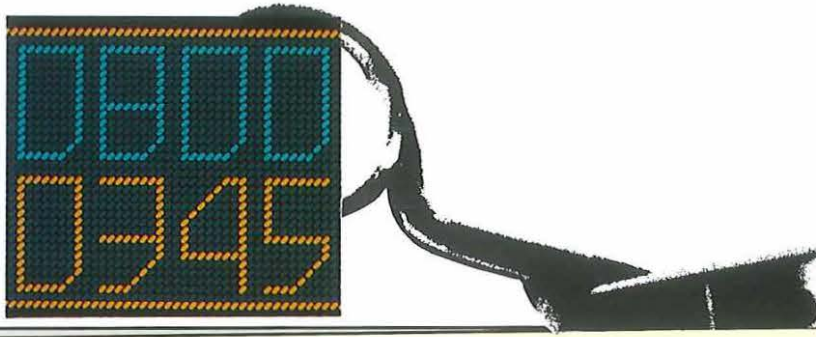
The 800 Service has been operating for over 15

- ★ incentives for increased orders from agents
- ★ faster and more personal customer service.

Calls are routed over the Derived Services Network (DSN) which is an overlay on the public switched telephone network (PSTN). It uses traditional analogue technology and has eight nodes - Derived Services Switching Centres (DSSCs) - in London, Birmingham, Guildford, Cambridge, Bristol, Manchester, Leeds and Glasgow. Each of these LinkLine exchanges is co-located with a trunk exchange and serves a discrete geographical area. ▽



# costs



British Telecom Journal  
Autumn 1985  
Cutting customers' costs

years and now has over 412,000 numbers in operation, according to a recent Financial Times report. The quantity of numbers in use demonstrates how attuned American consumers and businessmen are to doing business using 800 numbers.

Although not as established as the American system, domestic toll-free services operate in both France and the Netherlands. The French service, called 'Green Numbers', connected over 5 million calls in ten months last year to the 2,500 companies renting numbers on the system.

International 0800 allows UK companies to rent numbers on each of the domestic systems, but answer calls in the UK. No additional equipment or lines are necessary as the overseas toll-free number will be translated to any public switched telephone network number the UK company nominates.

The service has been taken up by companies dealing in such diverse markets as steel importing, medical research, computing, travel and many others. International 0800's versatility means that it can meet these companies' widely differing needs.

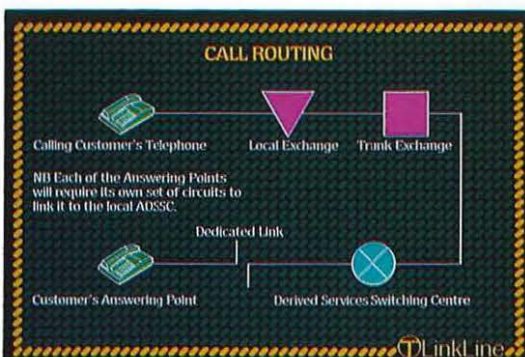
Most obvious applications include achieving sales direct over the phone, and also to supporting agents and distributors. Firms benefit from increased response to advertising and improved cash flow through credit card ordering, and also by better motivating overseas staff by offering a toll-free number for enquiries and promotions.

Other prime applications include test marketing in which a company can test a new product or market overseas at a fraction of the usual risk and cost. International 0800 allows speedy response to advertising so that the UK company can assess if a more expansive marketing programme is justified.

A company with an overseas sales office may well find it more effective to centralise its answering capability in the UK using

International 0800 and may decide to sell certain product lines over the phone to leave overseas staff to concentrate on more complex lines.

International 0800 has the potential to benefit virtually any company involved in marketing internationally. In the short time the service has been available it has proved its worth in a wide variety of market sectors and in a number of different applications. ☎



To use the service, the caller dials the appropriate LinkLine code followed by the company's number and this is routed via the local exchange to the trunk exchange on receipt of the initial 0. The full number is then passed to the LinkLine exchange for that catchment area and then routed either directly or via a second exchange to the customer who can opt for answering points in each or any of the eight catchment areas.

To bill the called customer rather than the calling customer, it was necessary to make changes to the network and to install call logging equipment. A system to price calls and input information to the National Billing System (NBS) to enable LinkLine charges to be included on a customer's normal telephone bill was also required.

### Local rate

All calls are logged on entry to the DSN. For 0800 calls normal metering on the caller's line is suppressed while for 0345 calls metering is triggered at local call rate. Calls can be made from anywhere in the UK.

Market research identified a number of prospective customers and the first 20 included two major airlines, travel trade companies, a major hotel chain reservations office, a windscreen replacement company, insurance and finance companies and a major oil company.

In addition to stimulating new business by offering a directly dialled free service and personal response it was found that there were opportunities for the service to improve and extend after-sales and maintenance services to customers. Companies can also use LinkLine to streamline their own internal communications by offering free dial-back facilities to outstationed or travelling employees.

To coincide with the full launch of the two

services, a public awareness campaign was initiated using television, radio, press and poster advertising which greatly increased the number of enquiries from potential customers, and led to a number of orders.

LinkLine is being handled and organised centrally by National Networks Trunk Services. New customers are given three LinkLine 0800 numbers which they can call to report faults on their lines, for customer service, and for ordering additional lines.

Steps are being taken to replace the initial network by a digital system and a contract has been awarded to APT (a company jointly owned by the US major telecommunications organisation, AT&T and the Dutch Philips). This will replace the eight existing nodes (on the same sites) and add a ninth in Liverpool.

The digital DSN will make further facilities available to LinkLine customers including:

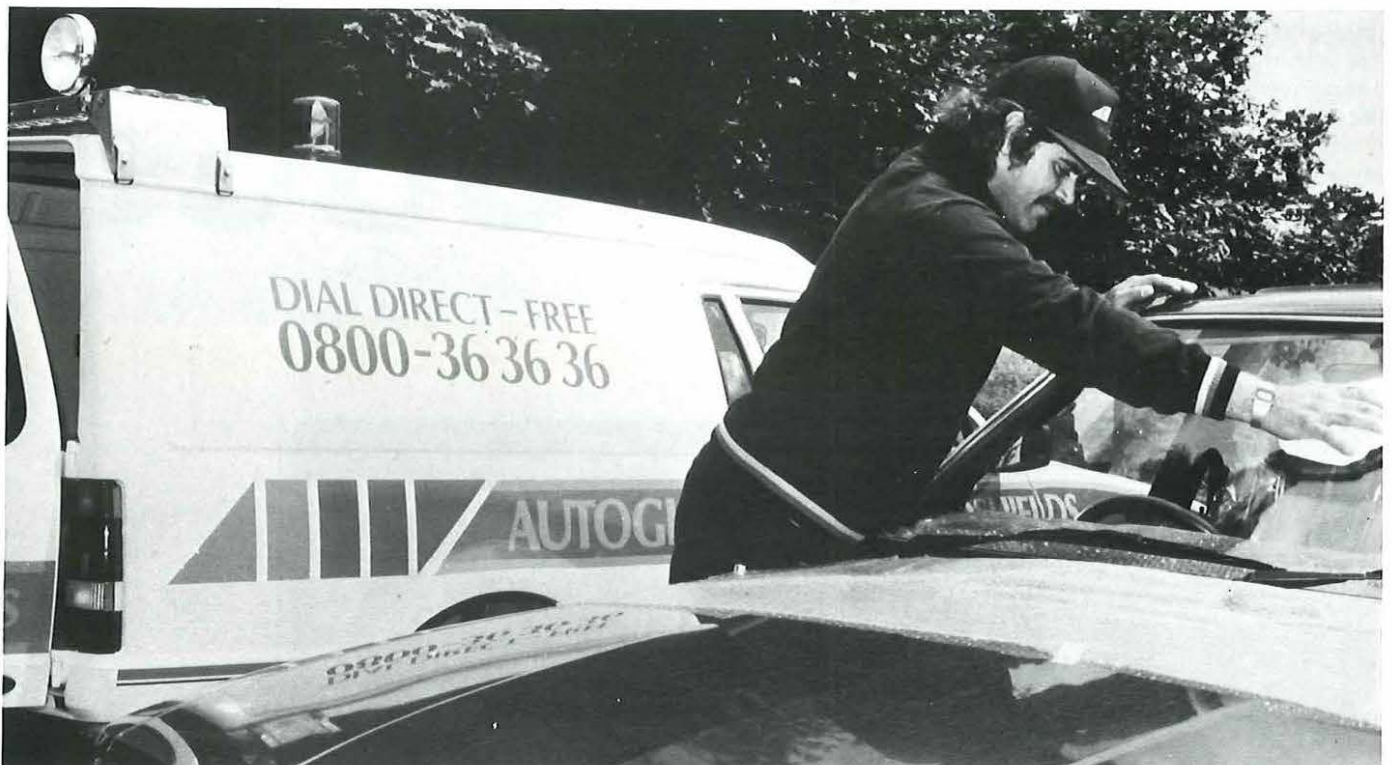
- ★ call queuing facilities
- ★ call diversion
- ★ different routing operations depending on the time and day
- ★ routing according to point of entry
- ★ courtesy response
- ★ announcement insertion
- ★ additional routing prompted by MF signalling from handset

Further business services are planned and will include 'premium' services where the calling customer pays a higher than normal rate for the call for specific information or additional service.

Customers will also be offered a range of selective marketing information to enable them to evaluate the success of a particular campaign or identify particularly responsive areas of the country. These services will be available for particular periods of time and not on a permanent basis. (T)

Mr B Friend is LinkLine product manager.  
Mrs M K Ratti is the advertising manager for International 0800.

Satisfied customer Autoglass Windshields has found LinkLine so successful that it has repainted all its vans with LinkLine livery.



# Building an image –by design

Vanessa Gilby

The famous architect Le Corbusier once said that a house is a machine for living in. British Telecom, with a portfolio of about 10,700 buildings – 6,400 of them operational – could fairly claim to emulate this description. Its building types range generally from those found within any large commercial enterprise – normal office accommodation for management and administrative functions, to those custom-built for the specialised business they serve.

Telephone exchanges, for example, range from those situated in remote rural locations to the huge city centre requirement. Other specialist buildings include repeater stations, sector

switching centres and group switching centres, together with various microwave radio stations. Each type requires its own tailor-made buildings, individually designed.

The main British Telecom network is also backed up by certain support services, again each with special requirements needing a custom design. These include repair centres, directory enquiry service units, motor transport workshops, factories, laboratories, computerised billing centres, and residential and study accommodation.

Architecturally, British Telecom buildings have responded to the internal functional needs for clear heights, heavy floor loadings, access, equipment layout and environmental criteria, as well as locational requirements due to cabling. Certain external factors such as town planning considerations and landscape factors in country locations have also affected design. The choice of structural types, the selection of roofing and wall claddings have also been influenced by the availability of materials, and the prevailing architectural style.

In the early history of the telephone system, existing buildings were adapted for use as exchanges, some apparatus being installed in private houses. One of the more diverse examples is Ryde ATE on the Isle of Wight (below). Known previously as Ganock House, this is an 1840s red brick town house, converted for operational use, and now listed as a Grade 2 historic building.

It was extended in the interwar years by virtue of a red brick neo-Georgian building to match, which later had another floor and radio dishes added. In the 1960s it was further extended ▷

*British Telecom Journal  
Autumn 1985*

**The changing face of British Telecom over the years has not only been technologically based. From the prestigious new headquarters building in London to a host of tiny exchanges scattered in remote rural outposts, the company's architectural image has been one of continuing development.**

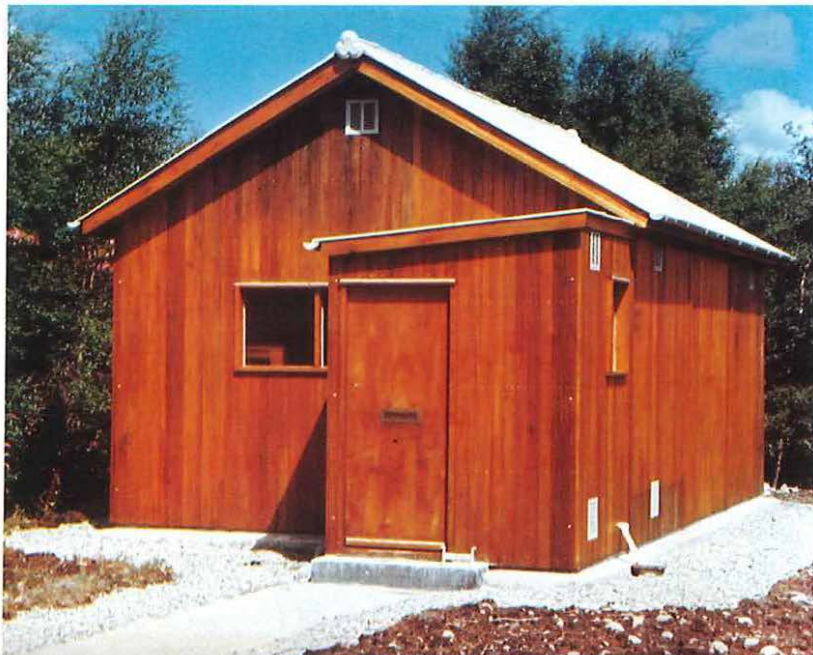
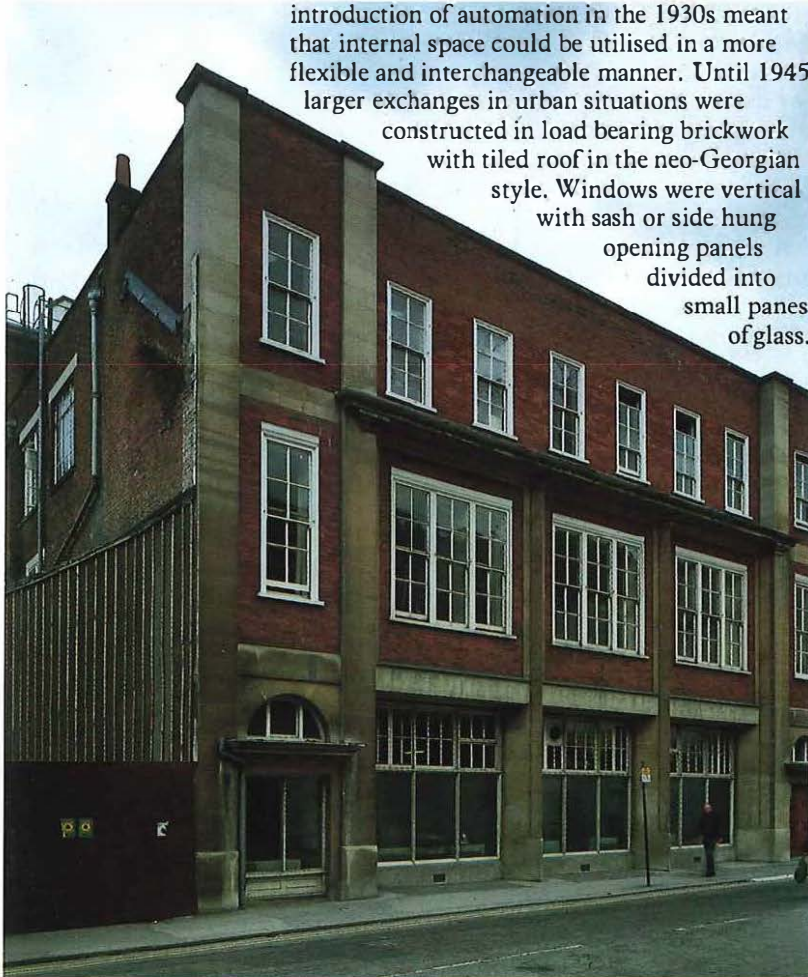


with a contrasting architectural style of white and green precast concrete panels with vertical slit windows, and an intriguing corner feature – a cantilevered turret bay window.

One of the early purpose-built exchanges still operational is Reading Central Telephone Exchange (below). Built in 1908 by the National Telephone Company it has an imposing facade in the neo-Georgian style.

Because the size and shape of exchange buildings have related to equipment and use, the introduction of automation in the 1930s meant that internal space could be utilised in a more flexible and interchangeable manner. Until 1945 larger exchanges in urban situations were

constructed in load bearing brickwork with tiled roof in the neo-Georgian style. Windows were vertical with sash or side hung opening panels divided into small panes of glass.



After the war material shortages affected the design of buildings, particularly the small standard type, and by 1953 there was an acute shortage of bricks. As a result many exchanges were built in framed timber, with ship-lap boarding externally (bottom, left). Even today, where prefabrication is required – the timber option is still available.

Today British Telecom has about 30 buildings which are recognised by statutory listing as having historic or architectural merit. Of particular interest is Lutyens House, in Finsbury Circus, London, leased for office

**Lutyens House**, (right) completed in 1924, was Sir Edwin Lutyens first major commercial building. The classical stone facade screens seven floors and includes an entrance to Moorgate underground station.

The first two rusticated floors rise up through another two storeys to finish in a three storey Corinthian screen of attached columns.

The steep pitched tipped roof has a concealed gutter and hides the seventh floor tucked in behind. This is lit entirely from the rear. Inside there is a marbled hall, staircase with sloping vaults, wall lights and dark painted ceilings.



purposes by British Telecom and formerly known as Britannic House. The stonework externally, the marbled halls and the doors and other joinery details throughout the building, and the use of classic motifs are a source of delight to both occupants and visitors.

Another distinguished example is Harrington House, the Craig Court exchange building, which is a converted house in Westminster. This elegant structure, built about 1780, can boast a beautiful staircase designed by Sir Christopher Wren (above).



Most British Telecom buildings are not rated architecturally, but with a great diversity of age, materials and style, many are of interest. After the Second World War the larger multi-storey type exchanges were usually constructed with a concrete frame, with flat roof, precast floors and non-load-bearing brick or concrete panel cladding interspersed with windows. Window walling, with continuous glazing panels and clear glass or coloured infill sections, were also fashionable.

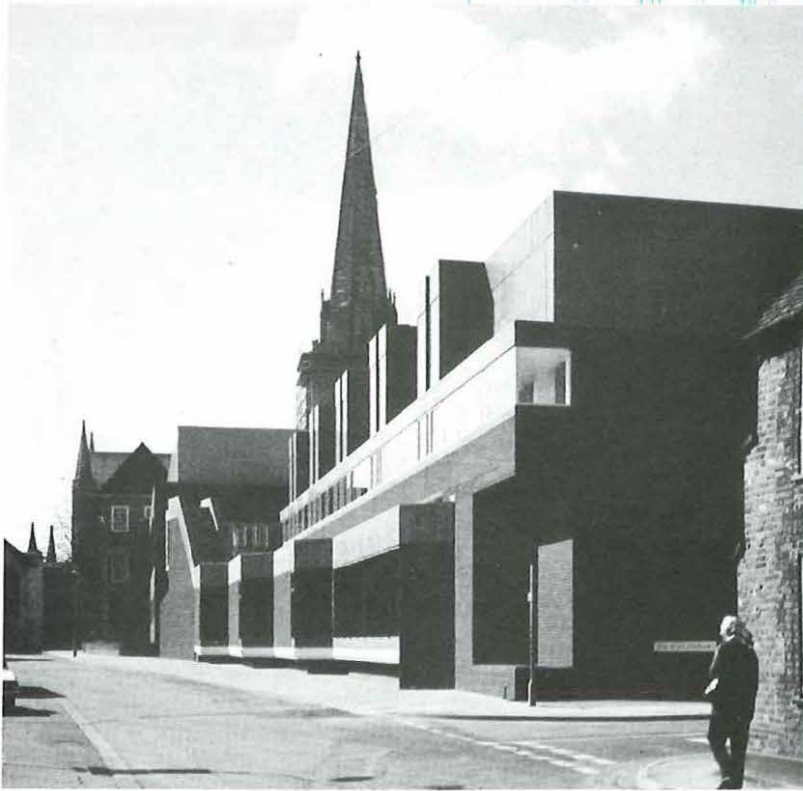
In the 1960s, British Telecom, like many organisations, found itself in a boom period which resulted in a considerable building programme. Medium-sized exchanges were often built to a system design, with steel frame and lightweight floors and cladding, and many are therefore similar in appearance. About 40 different types were developed by British Telecom in association with the Property Services Agency (PSA), some of which were designed on the unit principle and others on a fully interchangeable modular basis.

Although many of these types are no longer built, standard buildings continue to be developed. The 'Q' and 'S' types particularly are still being constructed with new functional innovations, such as chimneys to ventilate the power room, first-class interior and exterior finishes and improved staff facilities (above, right).

New types of building are being designed to meet particular new needs, where a batch are known to be required. An example is a range of small radio stations designed for the countryside. The first to be constructed was on a Dartmoor hill-top on the site of a former Roman fort (below). The appearance of a rural barn was provided on this exposed mound and great attention was given to the selection of materials to give both high performance functionally, and visual suitability.



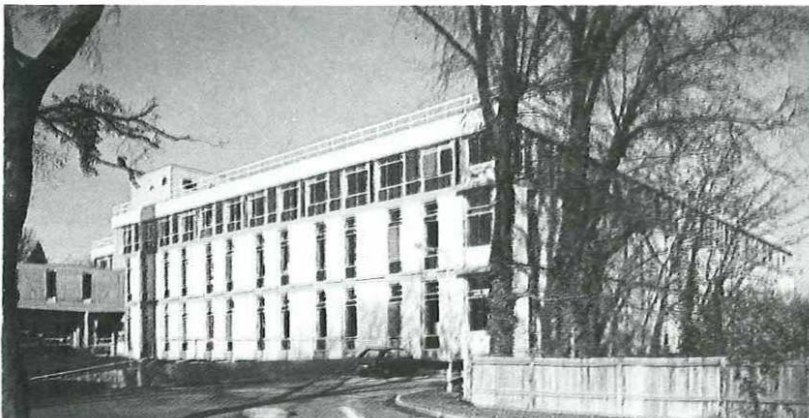
British Telecom has many medium-to-large operational buildings of a more straightforward nature. Chichester Telephone Exchange (below) is situated within sight of the cathedral spire, and has been carefully extended to reflect its sensitive position in a conservation area. The materials selected – red brick with lead fascia details to floors – are articulated back from the facade to allow strong shadow lines to break up the mass of the elevation.



Cambridge Zone Switching Centre (below) is another example where careful design has enabled an operational building to merge into its surroundings. Built in 1970, it is a smart functional block with ground and first floors having slit windows set between bright white precast concrete panels. The top floor is partially stepped back with increasing glazed areas and dark in-fill panels. This gives the visual impression of a building lower than it really is.

Recessed, modelled and strongly coloured or contrasting cladding panels can be highly effective in the right environment. Southend-on-Sea ATE is a large operational building standing

Miss V E Gilby is head of Building Practices in Building Standards Division of LCS/Energy, Transport and Accommodation Department.

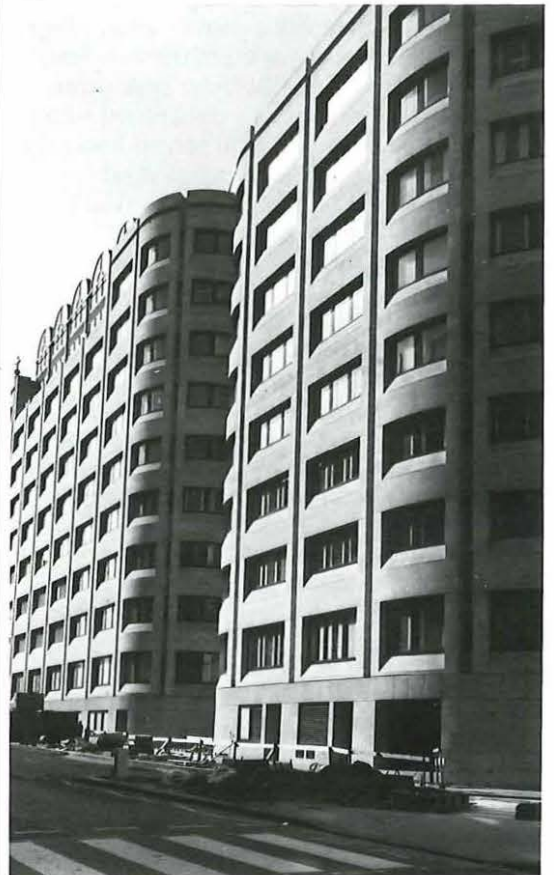


as a large block on its own. The glazed area of the elevation is about 50 per cent, but because of the design of the panels giving a strong horizontal effect, the proportions are reduced. Indeed, the building succeeds in looking more like a pavilion from a distance.

Good examples of both modern movement and vernacular architecture can be found within British Telecom. The new headquarters at Newgate Street, in London, (below) has caused much interest in building circles. The internal planning, the relationship of the three blocks and the central atrium (the highest in Europe), the lifts and the roofing construction are all unusual in their own way and together create a prestigious office building.

But perhaps the best known operational building is the London International Switching Centre at Mondial House. It has a key position both on the Thames and adjacent to Cannon Street Station. The design had to be approved by the Royal Fine Arts Commission before it could be built, and the drawings were exhibited at the Royal Academy in 1970. It is regarded today as a classic of modern design, with its crisp white outline.

Although British Telecom may not have been in the forefront of architectural design, it has certainly led the way in an understanding of building technology relating to high performance buildings. High technology buildings and the skills of cable management have become an essential part of recent office and industrial building planning and British Telecom's experience and long term knowledge are therefore coming into their own for general application in all modern buildings. ⊕



# Mobius passes the test

Colin Doré



British Telecom Journal  
Autumn 1985

For the past 40 years British Telecom has, after extensive quality checks and commissioning tests, accepted delivery of new automatic telephone exchanges by their performance in sample programmes of test calls set against a predetermined number of failed calls. Originally the process was known as a 'call through', sample programmes being manually generated by a specially trained team of operators. With the advent of more sophisticated test equipment, the task was automated by a series of specialist testers dealing with one type of exchange or signalling system equipment.

The evolution of Test Call Senders (TCS) to the current third generation saw a tester able to cope with all exchange systems and, by using various adaptors, most signalling systems. The current TCS also requires an Automatic Answer Unit (ARU) or, in the case of local calls, an answer box to provide termination conditions for these signalling systems. These ARUs and answer boxes provide the conditions necessary to enable the TCS to detect ringing tone and answer conditions.

As the facilities grew so did the size and weight of the TCSs and ARUs eventually leading to specially equipped lorries to carry them and, in some cases, a hoist to install them on site.

Current TCS/ARUs are programmed on site either manually or by using a paper tape reader and teleprinter. The paper tape can be centrally prepared with all the information necessary to carry out a meaningful series of tests. Results are automatically printed out so that a permanent record of the exchange performance can be kept.

Mobius, British Telecom's fourth generation

TCS equipment – named after the German mathematician (see page 29) – is the culmination of two and a half years of development and planning by LCS/Local Exchange Systems Division. It embraces most of the facilities of the previous specialist TCSs and ARUs and also incorporates many new ones. It utilises multi-microprocessor and digital signal processing techniques. The modular design of the hardware and software provides complete flexibility for current and future signalling systems as well as allowing facilities to be tailored to the operating company's requirements.

## Flexibility

Mobius comes in two sizes, each with a capacity of up to 16 and 32 lines. Each unit can be equipped up to its maximum capacity in groups of four lines. Each group of four lines can be independently programmed to deal with an exchange/signalling system. This means that a Mobius 32 can simultaneously test up to eight different exchange/signalling systems four times each per system. It is considered that there is sufficient flexibility for Mobius to be developed to interface with, and test all known exchange signalling systems.

Mobius can be programmed to send calls in synchronous, sequential and pseudo random modes. In the synchronous mode calls on all lines in use are generated to start within 16 milliseconds of each other. The sequential mode means that calls are generated in turn at a user-programmable rate known as 'call separation', which can be varied between 100 milliseconds and 180 hours. The pseudo-random call

The development of Mobius will make acceptance testing of automatic telephone exchanges throughout the country a more efficient operation.

**A highly sophisticated and easily transportable system for acceptance testing of automatic telephone exchanges has been developed by British Telecom. Known as Mobius, it will lead to higher quality standards and better customer service.**

generation pattern is pre-programmed into Mobius and has been designed to simulate closely real traffic calling rates.

A unit can be programmed to send test numbers in two ways – up to 64, 26 digit test numbers or 32 sequential groups of up to 26 digits. The latter way allows the user to generate calls within two numbers nominated in the group and is called ranging. The user must program these numbers into Mobius as they are unique to the exchange under test. When using the ranging facility, Mobius can be set up to send calls to 32 groups of numbers:

group 1 111111 to 222222

group 2 333333 to 33345

and so on to

group 32 81234 to 98675

The ranging facility saves the user programming in many hundreds of numbers.

Mobius can then be programmed by the user to call each number within each group sequentially or every other number or every fifth number and so on. This means that all connection paths through the exchange can be tested. The digit store of 26 was chosen so that System X Star Services can be tested with full international numbering facilities.

A Mobius 32 contains a total of 18 processors and several British Telecom designed integrated circuits called Filter and Detectors (FADs). The FADs themselves are programmed by the processors to detect both the frequency and level of the various voice frequency signals and exchange supervisory tones found in the public switched telephone network (PSTN). As exchange or system faults are found, they are entered in up to six categories and assigned a fault code. The fault codes must be cross-referenced with the 'program' handbook of the signalling or exchange system in use. Typical fault categories would be failures in the DC conditions, signalling system, transmission, timing, and the switching areas.

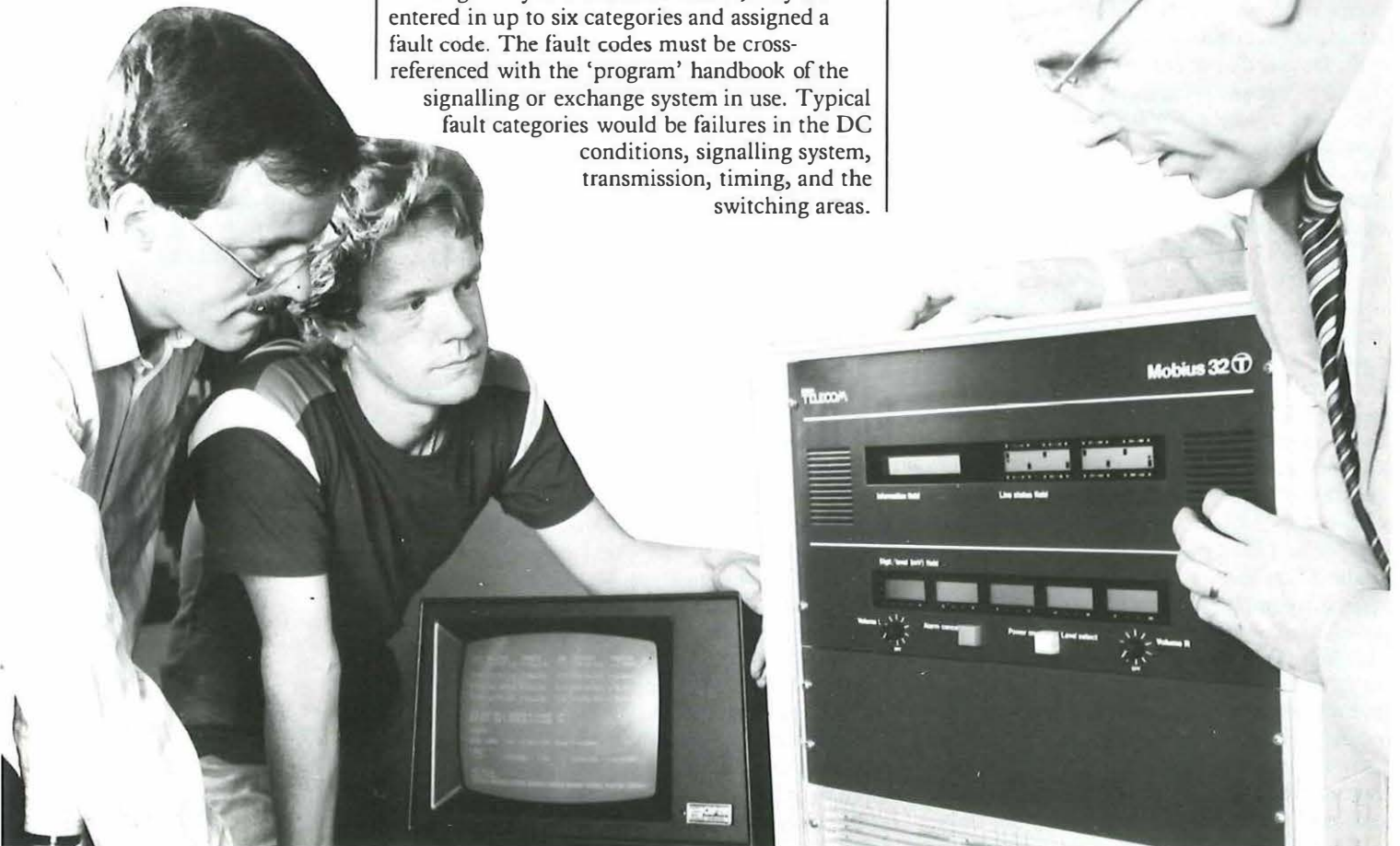
Another advantage of Mobius is that it contains extensive self-check facilities. It automatically checks its memory on 'power up' and these tests may be called up at any time by the user. Several self-test programs are available, ranging from simple interface checks to a full back-to-back test which checks every condition which Mobius can generate and detect. Mobius continuously monitors its internal voltage levels and if any fault is detected, it automatically 'powers down.' The system can be set up manually on site via a VDU or teletype, automatically on site from a centrally-configured small portable personal computer or remotely using a standard modem link to a VDU.

### Information

Configuring Mobius has been simplified by employing user-friendly techniques called a menu. The user is guided through programming the machine by these menus. He responds to prompts displayed on the VDU or teletype which ensures that he inputs the necessary information in a logical order.

The advantages of Mobius over other TCSs and ARUs are numerous. It can be programmed to interface with exchange systems and inband signalling systems and one Mobius can be

Harry Ferris, in charge of Mobius acceptance testing at LCS headquarters in London, points out some of the capabilities of the equipment to technicians Neil Smith and Vince Haysom.





programmed to test up to eight different signalling systems either as incoming or outgoing simultaneously. All exchange supervisory tones can be detected and analysed, and all signalling parameters (both AC and DC) can be changed by a skilled operator on site via a VDU or teletype. Full bothway transmission test and called-number verification is performed when Mobius is used back-to-back either with itself or another Mobius. Finally total off-site programming is available.

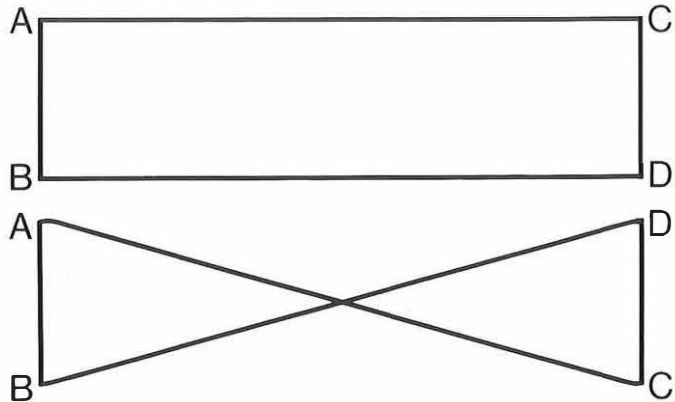
Obviously Mobius provides British Telecom with many benefits. As a tester, it will lead to higher quality standards from exchange equipment suppliers and its enhanced capabilities will be a major bonus. It also costs less than 20 per cent of its predecessor, is more reliable and can be maintained by Area Repair Centres. And Mobius has already been sold to two leading British Telecom exchange suppliers.

Currently an additional printed wiring board is under development and this will allow Mobius to be interfaced directly with a pulse code modulation (PCM) system. When available, it will allow Mobius to access any number of channels within the PCM system under test providing British Telecom with a full digital and analogue facility on a single tester. Ⓣ



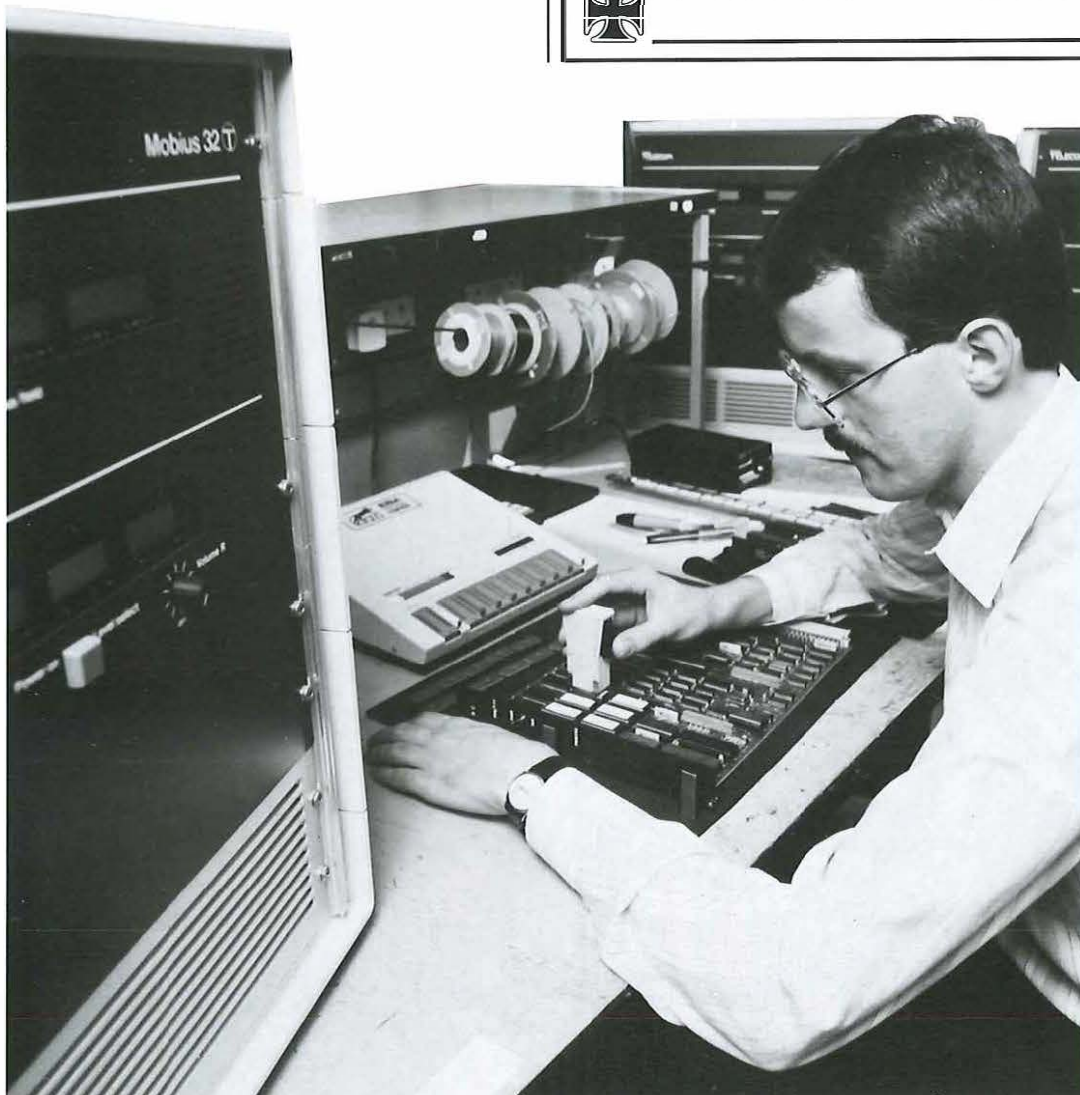
**August Mobius** was a 19th century German mathematician. The Mobius Strip named after him is a surface with only one side and edge formed by joining the ends of a rectangle after twisting one end through 180 degrees.

The name was chosen for the British Telecom exchange test equipment following a number of suggestions from British Telecom Staff.



A strip of paper **ABCD** is laid flat on the table. The end **AB** is held flat while the strip is twisted once so that **CD** is reversed to **DC**. The end **DC** is then pasted onto **AB**, **D** going on **A**, **C** going on **B**. How many sides has the twisted band formed by the pasted strip?

Suppose next that in the original strip (before twisting) **CD** is pasted onto **AB**, **C** on **A**, **D** on **B**. The result is a cylinder with an inside and an outside. This cylindrical surface has two sides. **The twisted strip has only one side.** Yet is a safe wager that nine persons out of ten would assert that a surface with only one side is an impossibility – until they had seen it constructed.



Neil Smith at work changing software for the Mobius signalling system.

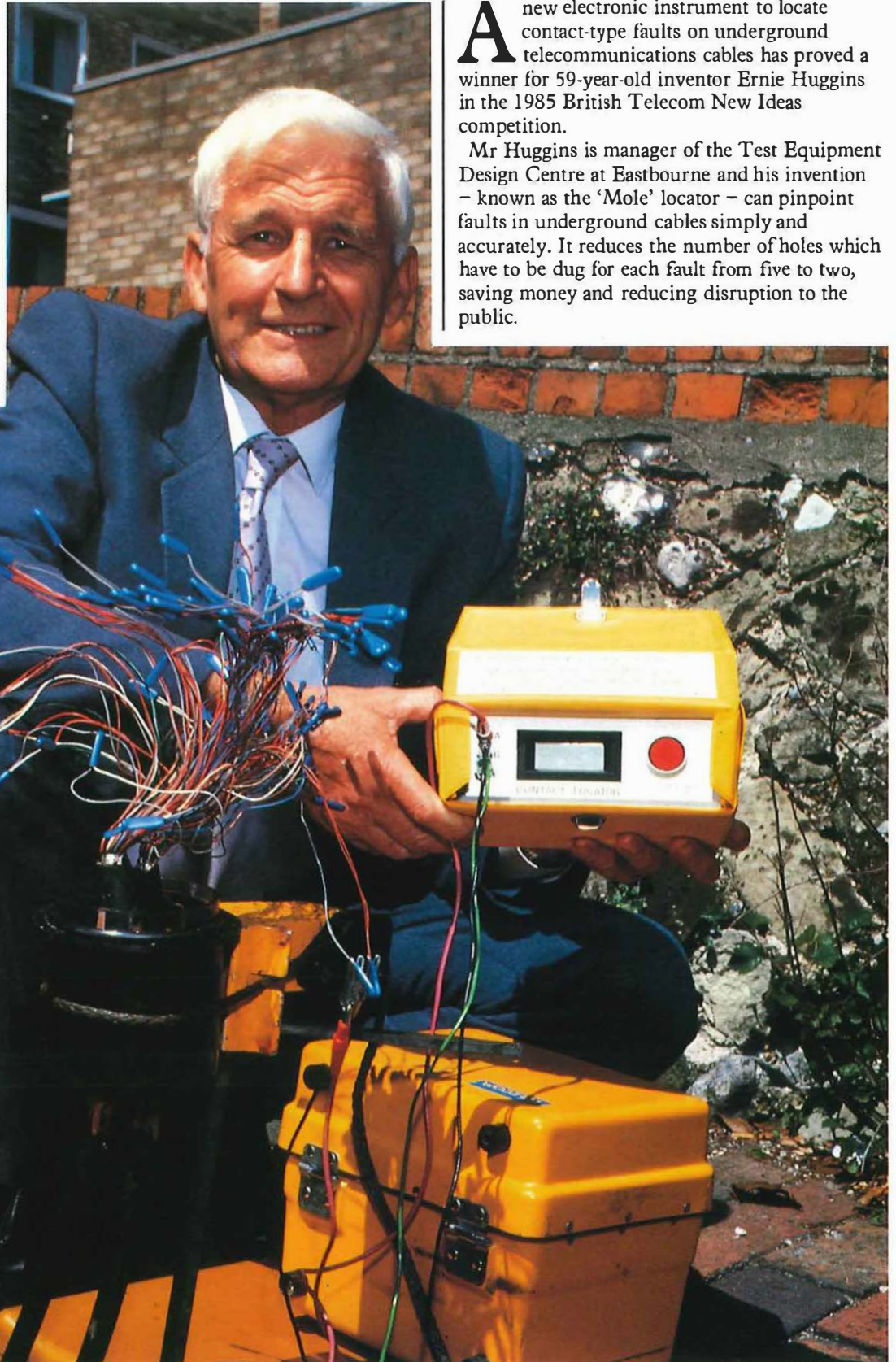
Mr C E Doré is a head of group in LCS/Analogue Exchange Systems Technical Support Division.

# Pay-off for bright ideas

**A £100 device which could save about £10 million a year in maintenance costs has won first prize in British Telecom's New Ideas competition. Several hundred entries were received for the nationwide competition and the 11 finalists' ideas ranged from saving power at satellite earth stations to dealing with pension fund refunds.**

**A** new electronic instrument to locate contact-type faults on underground telecommunications cables has proved a winner for 59-year-old inventor Ernie Huggins in the 1985 British Telecom New Ideas competition.

Mr Huggins is manager of the Test Equipment Design Centre at Eastbourne and his invention – known as the 'Mole' locator – can pinpoint faults in underground cables simply and accurately. It reduces the number of holes which have to be dug for each fault from five to two, saving money and reducing disruption to the public.



Winner Ernie Huggins with his 'Mole' locator.

Previous methods and equipment used for locating these faults proved inaccurate, time-consuming and awkward to use. Many faults occurred in bad weather which affected precision components in the equipment but the high voltage required during testing would sometimes overcome the fault and lead to false readings. It also created many hazards for both operators and equipment.

The new instrument is lighter, easier and safer to operate and there is no need for adjustment or calibration by the operator. The unit uses a lower constant current which measures the distance to the end of the cable and the distance to the fault and provides the operator with a simple-to-read, accurate LCD display.

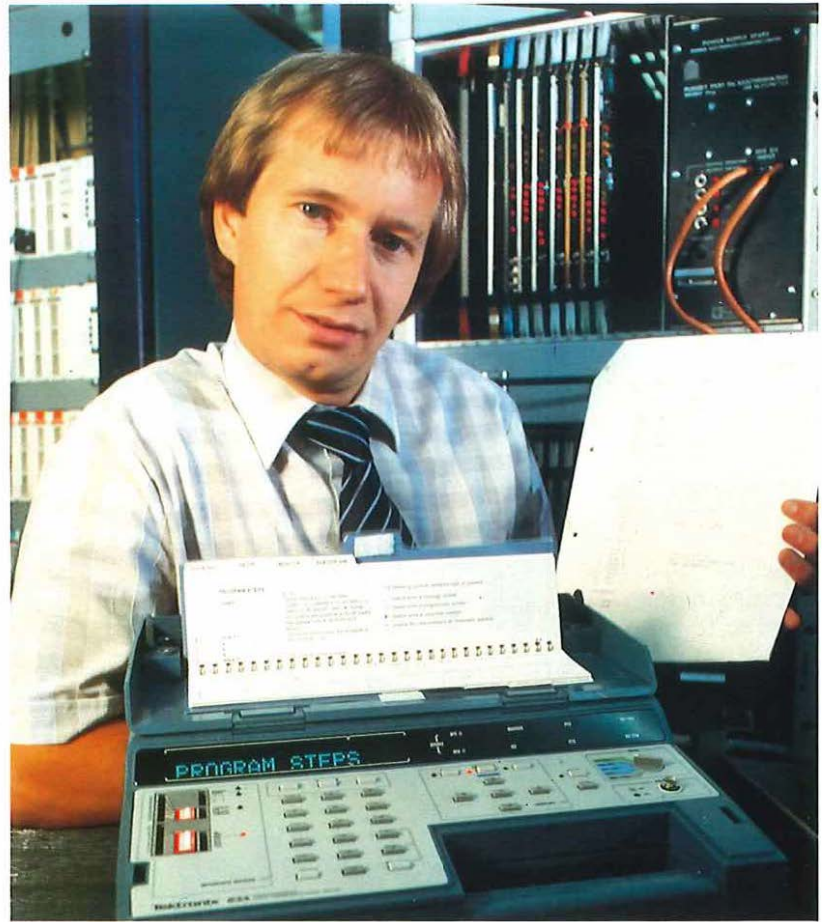
Training for field staff is unnecessary for the instructions contained in the carrying case are sufficient. There are now 3,000 of the units at a cost of £100 each, in use by British Telecom throughout the UK.

The idea has been patented in the UK, Canada and USA and licences are being arranged for its manufacture and sale throughout the world.

Mr Huggins received an inscribed silver-plated salver and a cheque for £2,000.

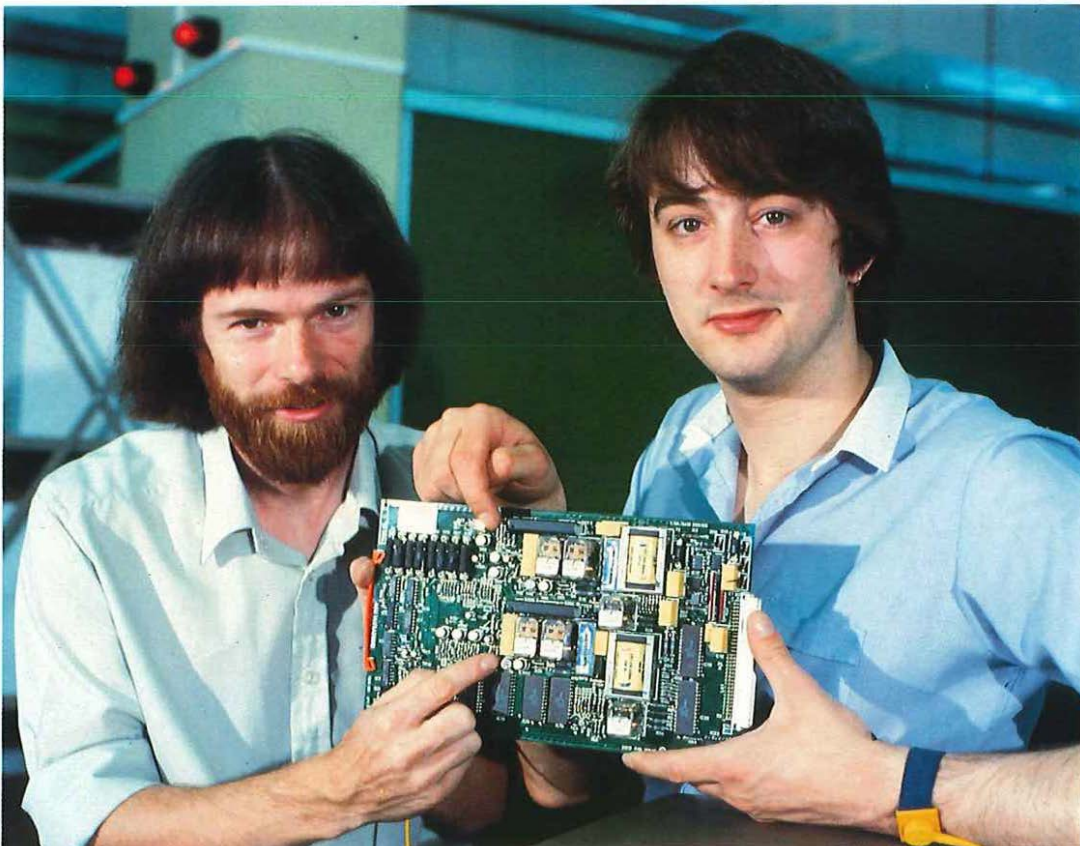
Runner-up was Jed Isbell, of National Networks in London, who suggested an improved testing system for the Packet SwitchStream Service (PSS) used in electronic funds transfer and credit card verification.

He wrote a program which can be entered into a Tektronic 834 tester to thoroughly check wiring and interface conditions. It indicates which particular item is defective whereas previous methods only showed whether the system worked or not. Mr Isbell received £600 and a silver-plated salver.



Highly commended were Perry Bebbington and Peter Moseley, technical officers from Nottingham, for an idea which enhances the compatibility between the Monarch and Herald electronic switchboard systems. They received £200 each. Ⓟ

Runner-up Jed Isbell and his computer program to improve Packet Switch-Stream testing.



Highly commended were Peter Moseley (left) and Perry Bebbington for their idea linking Monarch and Herald electronic switchboard systems.

The Engineering Services Division at BTRL provides a wide variety of practical assistance to the research staff at Martlesham and elsewhere in British Telecom and a recent example has been the development of an injection moulding tool for the Submarine Systems Division which required both mechanical and electronic design skills. The result was the perfection of a tool to meet the customer's needs and which has the potential for further commercial exploitation.

In the past, the moulding process has been controlled manually with the operator

continuously adjusting flowrate and temperature. This resulted in moulds of varying consistency, and required the operator's attention throughout the moulding period – often lasting more than an hour.

The new microprocessor-controlled system comprises a moulding machine which can be connected to a variety of mould casings and a controller. The moulding machine consists of a pneumatically driven piston in a large cylinder, which drives a smaller piston in a narrow cylinder (or barrel). A hopper, containing polyethylene granules, sits above the barrel. The granules fall into the barrel where they are compressed and pushed by the piston towards a nozzle. Before reaching the nozzle they pass through a heated zone and melt.

Control of the piston motion, and the pressure within the mould, is achieved by opening or closing air valves. The length of time for which the valves are held open determines the amount of compressed air which will drive the piston forwards or backwards. Magnetic switches are used to tell the microprocessor of the piston's position – necessary because the piston must pack the granules and move forwards several times to fill a mould.

### Measurements

The controller comprises three circuit boards housed in a robust rack and case together with power supplies. One contains the main processor and the control program, another converts analogue measurements from the moulding machine into digital signals for the microprocessor, and the third board drives the alphanumeric display. A switching box, controlled from the main processor board, distributes power to the various mould and nozzle heating elements. Opto isolating circuitry and screened leads are used to limit the effect of electrical interference likely on a cable ship.

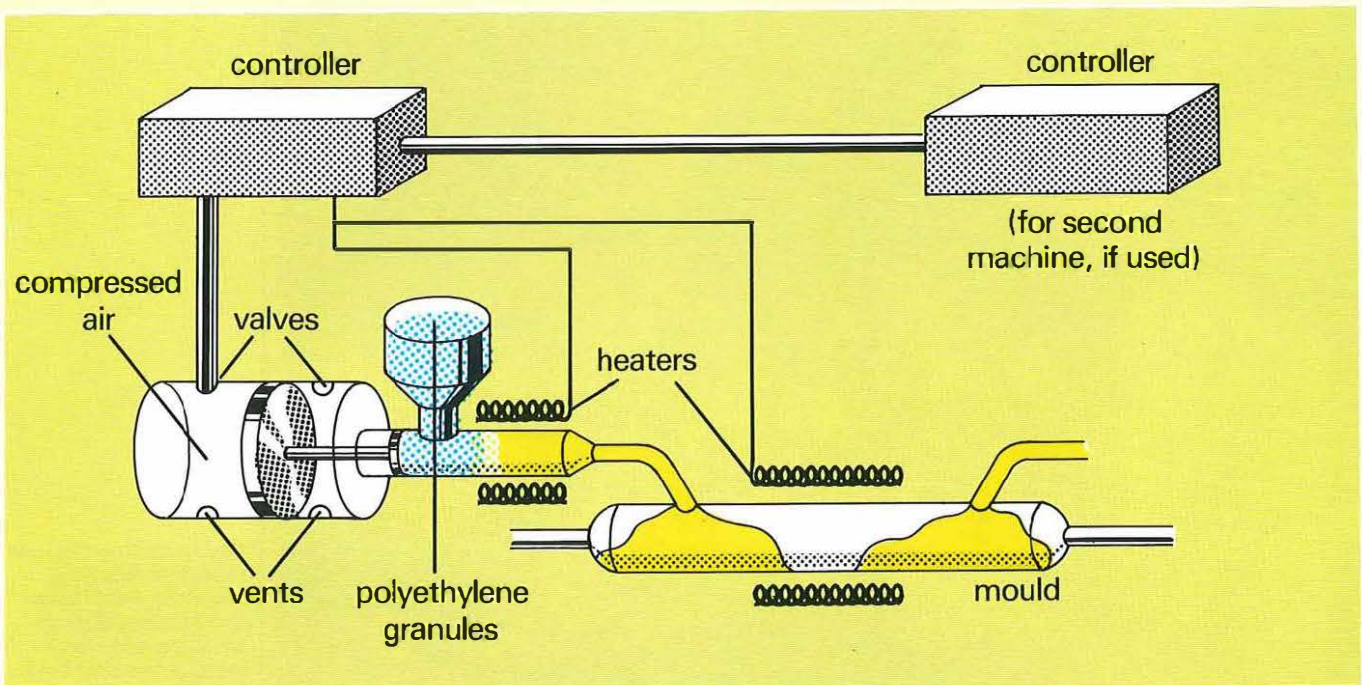
The parameters controlled are:

Injection moulding of polyethylene is used to form the enclosure of submarine cable joints, and a microprocessor controlled injection system has been developed at British Telecom Research Laboratories, (BTRL) Martlesham to meet the exacting standards required.

# In the right mould

Tony Franklin  
and  
Ronan Doorly

The interconnection of controllers, moulding machine and mould





★ the pressure at which the polyethylene is injected, and the pressure to be maintained within the mould when full

★ the temperature at various points within the mould, and the temperature at the nozzle

★ the time for which the pressure is held at operator-defined values.

These factors directly influence the quality of the mould. If the temperature of the polyethylene during injection is, for instance, too low, then the mould may not have uniform consistency. Although the mould must be hot

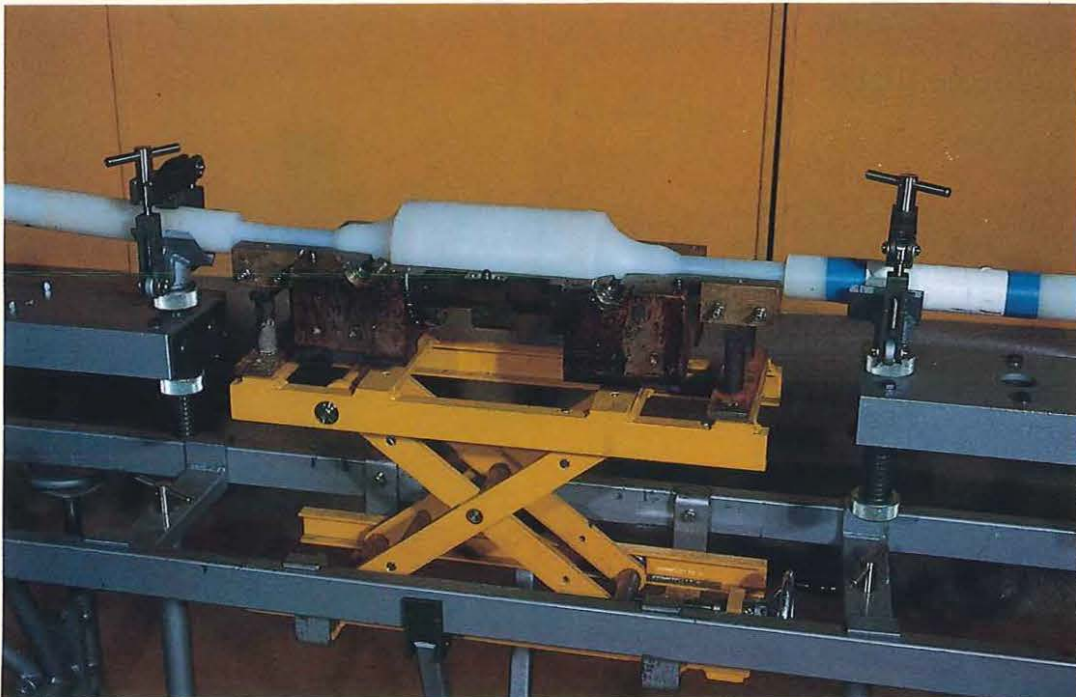
enough to fuse the polyethylene, the fibre splices must not be allowed to overheat. The joint must also be kept central within the mould. If the mould cools too quickly at low pressure, voids may form resulting in premature high voltage breakdown. After the moulding process has been completed, X-ray cameras are used to detect the presence of unwanted voids or inclusions.

The controller performs many complex tasks simultaneously under the direction of the operator who is provided with a keypad and a 64 character display. He enters the values for ▷

Above, left: Co-author Ronan Doorly pours polyethylene granules into the injection machine . . .

. . . before technician Don Judge (above) can start the moulding operation controller . . .

. . . which will eventually produce a completed joint.



pressure and temperature to be maintained during the various stages of the moulding cycle and if the mould is required to be identical to the previous one, these values are simply retrieved and acknowledged by the operator.

During moulding, the display provides a continuous indication of the temperatures and pressures and a printed copy of this information, in both numerical and graphical formats, is also available so that a record can be kept. The operator may intervene if he wishes to terminate the moulding or reduce its duration. An alarm is provided to warn the operator that a component, such as a thermocouple, has failed.

Moulding time can be reduced by using two injection machines operating simultaneously. To make sure that pressure is applied evenly to both ends of the mould, the machines must synchronise their piston motion and the two controllers must be able to talk to each other through a communications link. In this way information is continuously transmitted in both directions from one machine to the other which means that each machine can monitor the other.

### Corrupted

In the event of thermocouple failure on one machine, the measurement from the corresponding thermocouple on the other may be used for control. Errors on the communications link will be detected and if data is consistently corrupted, the alarm will sound and a message will be displayed. The operator then has the option of letting the machines continue independently of each other – with pistons not synchronised – or he may restart the moulding.

From a software point of view, several tasks must be performed simultaneously. Pressure and temperatures are monitored and controlled, the display is updated, the keypad is checked for operator input, and data is passed over the communications link. Each of these tasks is written as a separate software module, the

execution of which is controlled by a special piece of software known as a “multitasking operating system”.

With this operating system, the tasks are placed in a queue and the one at the head is executed for ten milliseconds after which it is placed at the end of the queue. The next task in the queue is then given the same treatment. The tasks are therefore continuously moving along the queue and are given a slice of the microprocessor’s time when they reach the top, although they appear to run concurrently. Fifteen separate tasks exist, of which 13 may be active at any time.

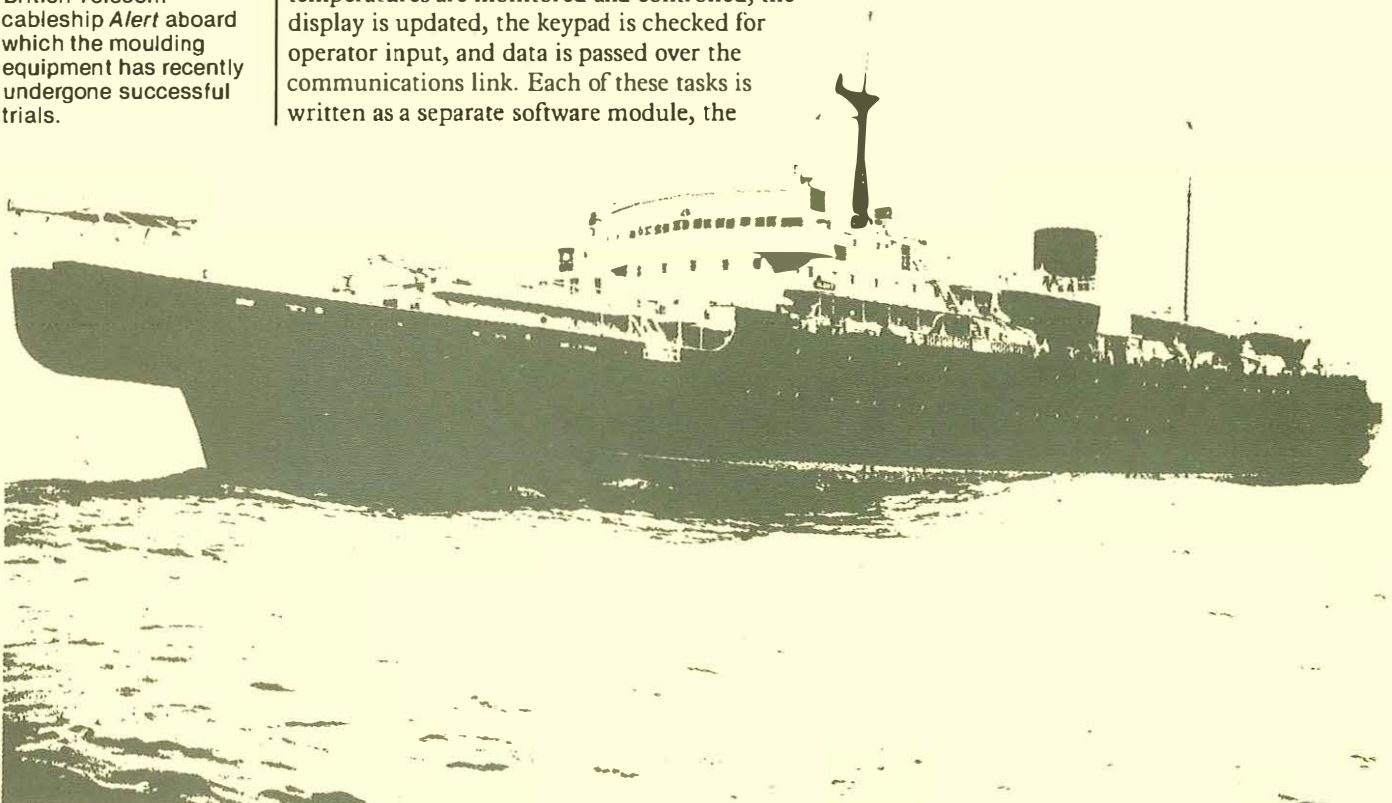
The nozzle operating temperature will normally be set to 200°C, and injection pressures of up to 4000 lb/in may be used. The difference between required value and measured value of temperature or pressure – the error – determines the time for which corrective action is taken. The software must provide stable control and not be prone to oscillations which are a hazard of feedback systems. This is particularly important for the pressure control where a fast response is required over a wide range of operating conditions, from fast flowrate at high or low pressure, to low flowrate at low or high pressure.

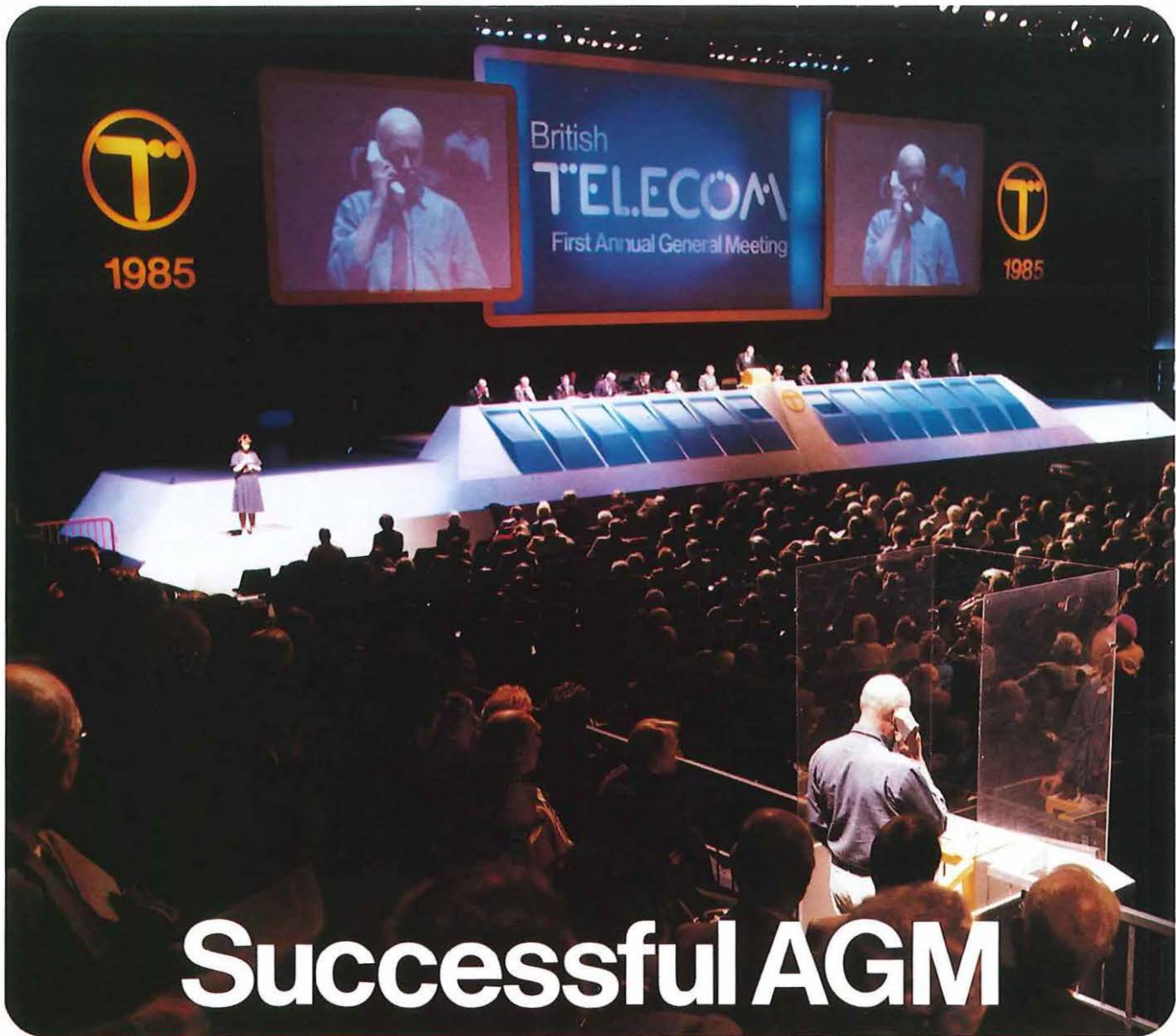
Although the system was primarily designed for use on submarine cable joints – both coaxial and optical fibre – it can also be used for land based cables where a high degree of protection is required. The Mark I version of the controller has been in service since March last year. It has successfully completed trials on board British Telecom’s cables ship *CS Alert* and the Mark II version, incorporating enhanced features such as dual controller operation, listing of mould temperatures and pressure, is now nearing completion. Ⓜ

**Mr A Franklin** is a head of group in Engineering Services Division of System Evaluation and Standards Department at BTRL, Martlesham where the controller was designed and developed.

**Mr R J Doorly** is an assistant executive engineer in the same group and was involved in the software development.

British Telecom cables ship *Alert* aboard which the moulding equipment has recently undergone successful trials.





## Successful AGM

**A** triumph for the planners and organisers and an enthralling day out for the more than 4,000 shareholders who gathered at Birmingham's National Exhibition Centre . . . that was the verdict on British Telecom's first annual general meeting held at the beginning of September.

Weeks of precision planning by British Telecom made sure that the big day went without a hitch even though it was impossible to make accurate forecasts as to exactly how many of a potential 1,700,000 audience would turn up. In the event a MORI poll on the eve of the meeting proved very near the mark.

Shareholders from as far away as Devon and the Shetlands were able to take advantage of shuttle bus services, gallons of tea and coffee, ample telephone facilities and direct Prestel lines. Facilities for the disabled included areas for wheelchairs, special seats and interpreters converting speech into sign language for the deaf.

During the meeting itself, presided over by Chairman Sir George Jefferson and the British Telecom Board, questions ranged from whether British Telecom would be contributing to political parties to the size of the chairman's salary. Questioners made their feelings known via loudspeaking telephones from clear plastic booths with their images displayed on 20-foot screens.

Earlier Sir George had said that British Telecom's results for the three months to the end of June would show that performance and profits had remained satisfactory (pre-tax profits of £443 million were later announced) and that with demand growing at a healthy rate 'another operationally and financially successful year' was likely.

Volunteer staff from Central Midlands District acted as marshals while telephonists from London's Bunhill Row exchange were drafted in to man the special AGM switchboard. ①

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# Changes at the top

Changes in the structure of British Telecom's main board 'to facilitate the further development of the company and to meet the challenges that lie ahead' were announced in October by Chairman Sir George Jefferson.

The main changes are:

- Jim Hodgson, Vice-Chairman, to retire after more than 30 years with the company
  - Iain Vallance, Managing Director, Local Communications Services, to be Chief of Operations for the company as a whole
  - Michael Bett, Corporate Director for Personnel and Corporate Services to be Managing Director, Local Communications Services. (Mr Bett will continue to be responsible for corporate personnel activities pending a further announcement.)
  - John King, Corporate Director for Marketing and Corporate Strategy to be Managing Director, Overseas Division (Contracting) of the newly created Overseas Division with executive responsibility for British Telconsult.
- Commenting on the appointments, Sir George, who will now take over responsibility for corporate strategy, said that Iain Vallance had already proved that he was a most able and

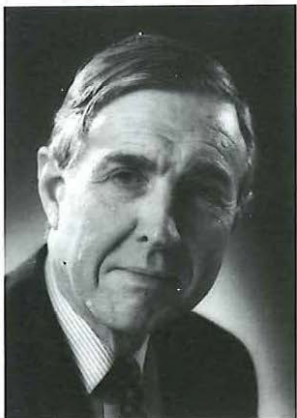
vigorous top manager and would bring real drive and dynamism to his new, wider responsibilities.

Michael Bett was a man of great experience, combining ability as a manager with skill in industrial relations which would be of immense value in his new role. Mr King's new division would concentrate on seeking contracts in consultancy and in the construction and operation of local telecommunications in overseas countries.

Ron Back and Tony Booth continue as Managing Directors of National Networks and British Telecom International respectively and will report along with Mr Bett, Mr King and John Alvey, Managing Director, Development and Procurement and Engineer-in-Chief, to Iain Vallance as Chief of Operations.

Sir George added: "The changes are a further step in the development of the board and the company. I am confident they will be beneficial in the interests of shareholders and customers alike. The changes will leave me with more time to concentrate on the strategic issues facing the future of the company and on shaping the company to enable it to meet the challenges and opportunities both here and overseas as a leader in Information Technology." Ⓟ

## Jim Hodgson



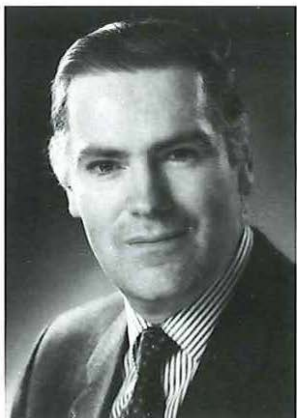
60 in October, was appointed Vice Chairman of British Telecom in October 1983, after two years on the board. He joined the Post Office in 1950 and after a period of secondment to the Cabinet Office from 1961 to 1964, returned to the Post Office as Head of Telephone Operating Division of GPO Headquarters and then as Vice Director of External Telecommunications Executive. From 1969 to 1983 he was responsible for all international and maritime telecommunications services. He was also a non-executive director of Cable and Wireless Limited from 1970 to 1977.

## Michael Bett



50, has been responsible for Personnel and Corporate Services since 1981. He also has responsibility for broadband services. He became British Telecom's first board member for personnel in 1981. He was previously the director of Industrial Relations of the Engineering Employers' Federation from 1970 to 1972, the personnel director of GEC from 1972 to 1977 and the personnel director of the BBC from 1977 to 1981. He was appointed a member of the Manpower Services Commission in January this year.

## Iain Vallance

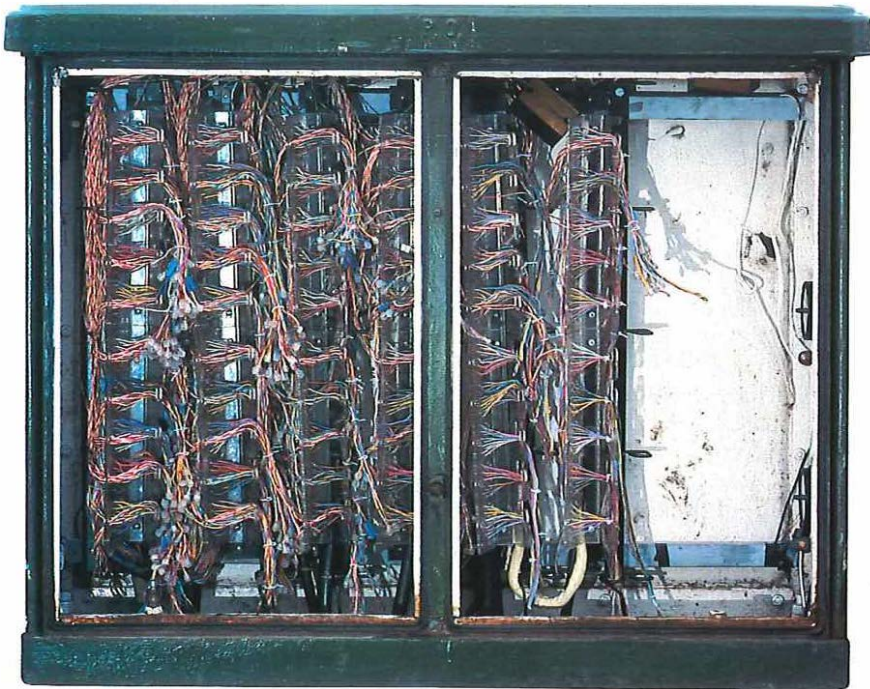


42, became Managing Director, Local Communications Services in 1983. He was appointed in 1981 to the board of British Telecom as member for organisation and business systems and subsequently became deputy managing director, Inland Division. He joined the Post Office in 1966 and has held a number of executive positions since then. He is a trustee of the British Telecom Staff Superannuation Scheme and a director of Postal Investment Management Limited.

## John King



52, was appointed to the Board of British Telecom in January 1984. After 20 years in data processing, largely with IBM, he entered the telecommunications industry on joining ITT Business Systems UK as Marketing Director in 1976. Subsequently, he was a director of the ITT Business Systems and Communications Group in Brussels and, prior to joining British Telecom, was a director of Philips International, Telecommunications Systems Division, based in Holland.



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

# MS<sup>2</sup> Cross Connect System.

The new cabinet cross connection illustrated has been designed and engineered by Austin Taylor.

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numerous reference  
files in addition to the  
stock database itself.

ASM was first implemented in Bristol Telephone Area in September 1983. It is now in use throughout the new Severnside District and in the North Downs and Weald and South Downs districts. It will soon be introduced in the Mid Yorkshire, Mid Anglia, East of Scotland, and North Wales districts.

The North of Scotland Hydro-Electric Board will be licensed to use ASM at its own stores installations and to adapt the system to its own requirements.

### Catalogue of help

The extensive range of British Telecom's products and services of special interest to disabled customers has been brought together in one comprehensive catalogue for the first time.

The guide, which details 70 products and services, will help customers who have difficulty using the telephone, as well as those who work with the disabled.

Compiled by British Telecom's Action for Disabled Customers (BTADC), the 36-page book is divided into four main sections for people with impaired hearing, speech difficulties, visual handicaps or impaired mobility.

It also describes how the telephone can be linked to viewdata and electronic mail systems which can be used by severely deaf or speech impaired people for sending messages.

Other information includes homebanking and shopping facilities, payphones and alarm systems.

The guide is being widely distributed to organisations who work with handicapped people, including hospitals, advice bureaux and social services departments. It is also available from local British Telecom sales offices.

### Informal meetings

BTL informal meetings for the coming winter season are:

- 13 November - 'Telcare' - Bryan Cozens, LCS/OPSI
- 10 December - 'Our International Business' - Jim Campbell, BTI
- 14 January - 'Why System Y?' - Roger Pine, LCS/NSD3
- 12 February - Materials management in BTL - John Wyett BTL/MM
- 13 March - The role of the Stock Exchange - a member's view

All meetings will be held in the staff restaurant, Camelford House, Albert Embankment, London SE1 7TS starting at 5pm. ▷



### Boost for exchanges

A further 130 TXE4 electronic telephone exchanges are to be improved by British Telecom at a cost of £50 million.

A contract for the work has been awarded to STC Telecommunications Ltd and covers the installation of common-channel signalling and call-logging equipment on 130 exchanges serving 2.5 million customers by the end of 1988.

It follows a £40 million contract placed in January this year for similar equipment on 96 TXE4 exchanges to be completed over the next two years.

Common-channel signalling will enable high-speed call set-up and call-logging equipment will pave the way for itemised phone bills.

### Computer system sold

The North of Scotland Hydro-Electric Board will soon be using an advanced computer system developed by British Telecom for controlling engineering stores.

The system, known within British Telecom as area stores module (ASM), was developed by the company's Information Systems Department for use in local telephone areas and in the new district organisations.

ASM operates on-line to provide a wide range of facilities, which fall into four main categories:

- *stock control*, covering stock orders (with automatic replenishment), receipts, issues, transfers and 'ear-marking'
- *job planning*, dealing with all aspects of stores needed for specific jobs, including a standard bill of materials, and pre-packaged kits made ready for collection when required.
- *stock visibility*, providing an electronic tallycard and handling enquiries for items, jobs and stock

## Face-lift for Tower

Modern dish antennas are being installed 400 feet up the Telecom Tower in central London.

Nine new dishes - seven 3.7m and two 2.4m in diameter - will support digital circuits carrying both speech and high speed data transmissions and will form a vital link in Britain's fast-expanding trunk network.

An operation to mount the new dishes on the tower cost more than £100,000 and involved 60 men working for British Telecom and contractors. Five cranes, the largest weighing 350 tonnes, were used to lift the aerials while associated lifting equipment was brought to

the site on 30 lorries. Nearby roads were closed while work progressed.

The new microwave dishes are replacements for the distinctive horn aerials installed as part of the 20-year-old tower's original equipment to carry analogue circuits. The old aerials, each 27 feet high, are unsuitable for digital systems, and the new dishes take up about half the space.

Because the old aerials are impossible to retrieve in one piece, they are being cut apart in situ and lowered down in bits. They have no scrap value. The first new aerial will be in service next May and the rest by April 1987.

## New Tallis service

A consultancy service offering customers impartial and confidential guidance on all aspects of the secure design and operation of computer and transmission networks and data systems is now available from British Telecom.

The new service, known as Tallis Security, has been established as an independent operating unit within British Telecom's National Networks division.

It is integrated into British Telecom's existing Tallis organisation which comprises a telecommunications consultancy and a systems software house, known as Tallis Consultancy and Tallis Systems.

Tallis Security offers consultancy on privacy, authentication and access control. Its expertise covers the provision of security systems on existing networks as well as the design of new systems and networks.

It is especially skilled in encryption and key management, and it covers computer security as well as the protection of data transmission links.

The unit can also assist in the specification, design, and provision of specialised security equipment. For further information telephone Ipswich (0473) 225260.

## Washington deal

The US Department of State has signed a contract with British Telecom International (BTI) for SatStream service but the deal depends on the appointment of a carrier to provide an appropriate service arrangement in the US.

Subject to local planning permission, a SatStream antenna, 12 feet in diameter, will be installed on the roof of the US Embassy in Grosvenor Square, London, and will transmit directly to a satellite dish in Washington via Intelsat. The link is expected to be fully operational by Summer 1986.

Using Intelsat Business Service (IBS), the high-speed 24-hour digital communications service for business, transmissions between London and Washington will be made at a speed of 1.5 Mbit/s (megabits per second).

The link will be capable of providing to the US State Department voice and data communications as well as videoconferencing.

● SatStream North America opened in February 1984 to Canada and was extended to the USA in June this year with the Financial Times as the first customer. SatStream Europe opened in May this year.

## Easy booking

Individual Prestel users can now book their rail tickets, seat and sleeper reservations from anywhere to anywhere on British Rail using British Telecom's Prestel service.

Details of train times and fares have been accessible from Prestel

for some time but now British Rail also provides a telebooking service through Euston Travel Centre.

This is available seven days a week and enables Prestel users to book their rail ticket, sleeper or seat reservations – provided they hold either Visa, Access, American Express or Travel Key.

To book, the user selects the key from the BR index page for the transaction required. He will then be asked to supply credit card details and to complete the page to supply travel requirements.

At Euston Travel Centre, Prestel is checked regularly for bookings which are then passed to the correspondence section who make the necessary reservations and issue tickets. A confirmatory message is sent to the customer using the Prestel Mailbox.

## Business directory

The London business community now has a new marketing aid published by British Telecom. Known as Business Pages the London edition of this new directory brings together in one volume details of companies which operate in all the major areas of commerce and industry in the London area. The book contains 14 sections, each covering a specific area of business activity.

To ensure that entries are found as easily and quickly as possible, there is a classification index as well as an alphabetical section containing all the listings. Advertisers can economically target their services at the business community, because the new directory is sent to carefully selected businesses, rather than consumers.

Business Pages which now covers the most important commercial and industrial areas in the UK, including Bristol and South Wales, East Midlands, West Midlands, West Pennines, Yorkshire and the North East and now London will be sent to 750,000 businessmen free of charge this year.

## New from Merlin

British Telecom is now offering a smaller version of its popular MERLIN DX phone system. Designated the Merlin DX-M, the new switch can serve up to 240 extensions. The smaller size does not mean reduced features. Extension users of Merlin DX-M have access to the same features as those found on the full size Merlin DX.

Housed in a single, free standing cabinet, Merlin DX-Muses a single control processor and is thus more economic for smaller installations. It will also serve as a satellite or remote unit for organisations requiring a network of Merlin DX switches serving geographically dispersed locations.

The Merlin Tonto personal information centre can now be connected directly to local mainframe computers, local area

networks or data communication networks via a data communications adaptor.

The adaptor, together with a VT Link for mainframe access over dial-up circuits, will extend the Tonto's already powerful communications features. Available from Telephone Area sales offices, the adaptor costs £240 if ordered with Tonto and £265 as an upgrade on existing installations. The VT Link costs £75 or £90 as an upgrade.

## Cellnet goes north

Cellnet is now firmly established in Scotland. During the last few months the British Telecom-Securicor enterprise has provided service in Edinburgh, Aberdeen and Glasgow and is also maintaining its lead in other areas of the UK.

Currently there are more than 16,000 Cellnet subscribers with 600 new customers a week.

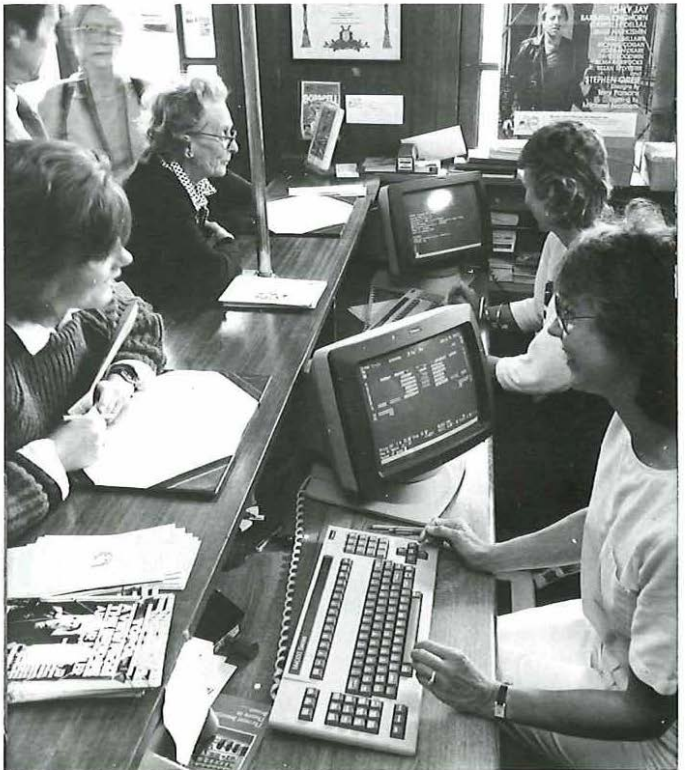
## Celldata launched

A further extension to Telecom Gold's portability has been added with the launch of Celldata, a new facility offered by Cellnet, which enables subscribers to transmit and receive data from any location, using a Cellnet cellular telephone, portable computer and a modem that uses an interface box designed by Cellnet.

Whether on the move, or stationary, in the car, on the train, or even in a boat on the Thames, this new capability opens up a broad range of applications from use by service engineers or staff in temporary offices on motorway and construction sites, to travelling sales representatives.

Telecom Gold's comprehensive on-line facilities, including telex, radiopaging, and access to databases, are geared to the needs of executives on the move. ▷

# EDUCATING RITA



**A computerised administration and ticketing system for theatres has been launched as a joint venture between the Royal Shakespeare Company and British Telecom Business Systems.**

**Called RITA – Real-time Integrated Ticketing and Administration – the system has software created by the RSC and runs on the Merlin M4000 microcomputer.**

**RITA can be tailored to the needs of individual theatres, and its modular design allows growth to keep pace with the continuing expansion of a**

**theatre's requirements. The minimum configuration uses just one Merlin terminal and multi-terminal installations are linked with an Arcnet local area network.**

**The system is expected to set new standards for the computerised box office and a suite of other programs are available to handle accounts, membership database, direct mail, management information, microcomputing and word processing.**

**The first box office to use RITA was the Theatre Royal, Bath (pictured above).**

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| IBM System Base & LID        | Viceroy Console/PCB Kit            |
| IBM System Tray              | Kinsmon/Regent 245/247 Console Kit |
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| Herald 'C' PCB Diagnostic    | Regent PCB Diagnostic Kit          |
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## Rapid fax growth

The growing importance of facsimile in the information technology industry is highlighted in the new UK Facsimile Directory published by British Telecom International.

Engineering industry, which includes information technology, is now one of Britain's largest single users of facsimile, second only to manufacturing (19%) and legal and accountancy services (25%).

There are now an estimated 43,000 facsimile installations in Britain which has the largest population of fax users in Europe – over 25%. The installed base of facsimile world wide is now approaching 1.5 million – for the first time equal to that of telex.

Growth in the information technology industry has been notably rapid for Group 3 machines – the latest fast digital fax which can transmit an A4 page in under one minute.

The new directory contains 15,000 entries – more than double that of last year – and costs £7 from local British Telecom directory supply sales offices. BTI can also supply fax directories for 19 overseas countries. Further enquiries to Facsimile and Datel Marketing, British Telecom International, Holborn Centre, 120 Holborn, London EC1N 2TE. Tel: 01-936 2187.

## Contracts

**Teradyne Ltd** have received an order worth about £5 million for 4TEL Automated Subscriber Line Test Systems which will be installed in South Downs, Central Midlands and Severnside Districts by the middle of next year.

The equipment ordered includes the distributed version of the 4TEL Central Office Line Tester, known as the COLT Computer Unit/COLT Measurement Unit, which will go into service in a Central Midlands System X exchange.

**GEC McMichael** have been awarded a contract from British Telecom for £3 million worth of video codecs. The codec is the result of a joint development with British Telecom and has been designed to exploit a new market for national and international full-motion colour videoconferencing, made possible by widespread availability of new digital telecommunications networks.

**Ebonestos**, a division of Crystalate Electronics Limited, has won a further order from British Telecom worth almost £1.4 million for telephone line jack units.

**THORN EMI Instruments** have won a contract for the supply of 19,200 multi-testers – combined multimeters and insulation testers. Deliveries began in September. The multi-testers are designed and

manufactured by THORN EMI Instruments to British Telecom specifications. They are battery operated, multi-range analogue instruments and will be used by linesmen for making measurements on subscribers equipment, in telephone exchange networks and on peripheral British Telecom equipment.

**Wimpey Construction UK Ltd** have won a contract worth £2.75 million to build a single storey warehouse and two storey office block for British Telecom at Exeter. The work is scheduled for completion next summer.

**Focom Systems** have won an order worth £272,000 from British Telecom's East Midlands District for fibre optic multiplexers. The equipment will provide point-to-point multiplexing for main office sites at Nottingham, Leicester, Derby and Northampton.

**Feshon Systems Limited** have won an order from the Maritime and Aeronautical radio executive of British Telecom International (BTI) for electronic matrix switches worth about £500,000. The switches will be installed in all BTI's UK coastal radio stations and each can handle up to 400 lines of traffic or control signals.

**STC Telecommunications**, Electronics Division, based at Newport, Gwent, has won an order worth about £500,000 from British Telecom for the manufacture and supply of pulse concentrator cards.

Pulse concentrator equipment was designed by British Telecom as part of a system to improve assessment of local call data. The pulse concentrator card is an integral part of this equipment.

## Memory Slimtel

A ten-number memory version of the Slimtel telephone has been launched by British Telecom.

Called Slimtel 10 the one-piece, push-button instrument features last number re-dial and the ability to store ten numbers of up to 16 digits. Available initially in off-white, it costs £34.95 to buy or £3.25 per quarter to rent.

## Link-up helps shops

A new service for retailers to speed up the processing of credit and charge-card transactions has been launched by British Telecom and Cresta Communications Ltd.

The system uses Cresta's newly developed terminal, Teletran, which will allow businesses and retailers to validate most major cards while simultaneously recording the sale, simply by wiping the card through the terminal. Information is then sent down telephone lines to British Telecom computers and then on to the card companies.

The service, aimed especially at

retail outlets with a high volume of card sales, such as petrol stations, hotels, DIY and department stores, begins in London and will be gradually introduced throughout the rest of the country.

Cresta Communications will be marketing and supplying the Teletran terminal on a rental and transaction fee basis, and will also undertake its maintenance.

British Telecom Enterprises Value Added Systems and Services (BTE/VASS) will be responsible for the provision, under a formal supply agreement, of the computer and database services, and Cresta for the communications networks.

## New appointment

Mr Hugh Merrill has been appointed first Investor Relations Manager in British Telecom's Corporate Finance Department. He is responsible for planning and co-ordinating the company's communications with stockbrokers and investors. He will also work with the Corporate Relations Department in co-ordinating relations with financial journalists.

Mr Merrill was previously with Charles Barker City, the financial public relations company.

## BT joins EEA

British Telecom has joined the Electronic Engineering Association, the leading trade association of the electronic capital goods industry. The Association's membership, which includes sub-system and software companies, has increased from 38 to 60 companies during the last two years and now represents

most of the major and many of the smaller firms in the industry.

## Telex calls easier

International telex calling has been made easier for the majority of British Telecom's 100,000 telex customers as a result of exchange modernisation.

Telex users served by electro-mechanical exchanges, previously had to remember two procedures – one for calling most of Europe and North Africa and another for calls to the rest of the world. But with the modernisation of international exchanges, they are now able to use a single method for all international calls.

British Telecom International (BTI) has written to customers to inform them of the change. In addition, BTI has produced a new booklet to help customers get better value from their telex communications.

'The International Telex Guide' costs £3 and copies should be ordered by telex from British Telecom on 67492 SUPPN G.

## Farmlink take-over

British Telecom has taken a majority shareholding in Somerset-based Farmlink Services Limited following the successful launch of the Prestel Farmlink farm management service.

The service, which is about to become national after trials in the West Country, allows farmers to access a range of up-to-date factual, advisory, and commercial information from authoritative sources.



Europe's first international videoconferencing service, enabling groups of people to see and speak to each other face-to-face by TV, has been launched between the United Kingdom and the Federal Republic of Germany.

The new digital service from British Telecom International augments existing videoconferencing services between the UK and Canada and the USA.

It is currently available from British Telecom's public videoconferencing rooms in

London, Bristol, Birmingham, Glasgow and Martlesham. Further studios will be brought into use soon.

In addition, British Telecom can supply videoconferencing equipment, and offer consultancy, to enable users to set up videoconferences from rooms in their own premises without any special-room treatment.

The aim is to cut costs and to stimulate trade.

The hourly charge for a link between Britain and West Germany is just over £600.

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Exchange  
FAULT

A neon sign in the shape of a cross with a downward-pointing arrow. The word "Exchange" is written in blue neon along the top arm, and "FAULT" is written in pink neon along the right arm. The arrow is also pink.

STATION  
FAULT

A neon sign shaped like a telephone handset. The word "STATION" is written in yellow neon along the top edge, and "FAULT" is written in red neon along the bottom edge. The handset's receiver and base are outlined in purple.

Cable  
FAULT

A neon sign with a white rectangular border. The word "Cable" is written in red cursive neon at the top. Below it is a graphic of a cable with several colored lines (yellow, blue, red, green) emerging from its end. The word "FAULT" is written in green block neon at the bottom, with a green arrow pointing downwards from the letter 'T'.

# ALL THE SIGNS SHOW THAT 4 TEL REALLY WORKS

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For the full story contact Teradyne. Telecommunications Division, Teradyne Limited, The Western Centre, Western Road, Bracknell, Berks. RG12 1RW. Telephone: Bracknell (0344) 426899. Telex: 849713.

The logo for Teradyne, featuring the word "TERADYNE" in a stylized, blue, blocky font. The letters are interconnected, with the 'T' and 'E' being particularly prominent.

# PLESSEY INNOVATIONS FOR COMMUNICATIONS

## With System X, Hull now has bridged the digital future.

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Hull, the only independent telephone company in mainland UK, chose System X from a list of internationally available systems.

System X will give Hull the capability of extending a full range of modern communications services to over 130,000 subscribers, and will link into British Telecom's growing Integrated Services Digital Network. System X also offers facilities normally associated with electronic PBXs, such as short code dialling, push-button tone signalling, incoming calls barred, call diversion, last number repeat and three-party conversation.

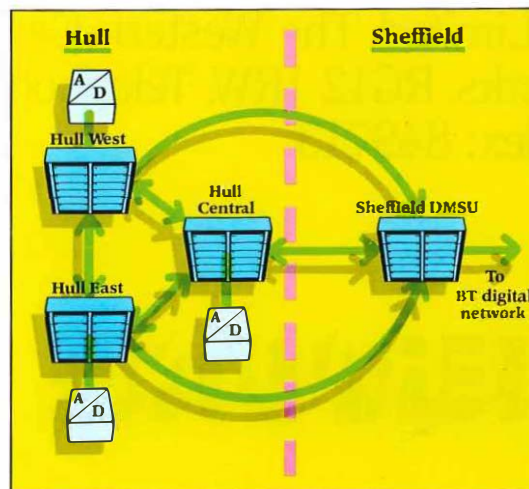


## Interconnection with the BT network uses common channel signalling.

The first three Hull exchanges, covering some 16,000 local lines, are now interconnected with the BT digital trunk network using common channel signalling based on CCITT No. 7 standards. Common channel signalling has many advantages to both subscribers and operating authorities.

It provides direct connections between exchange computers and thereby increases the signalling capability of the network. The consequent increase in facilities which can be offered enhances operation and maintenance of the network and provides routing flexibility and a high degree of security.

The introduction of System X digital



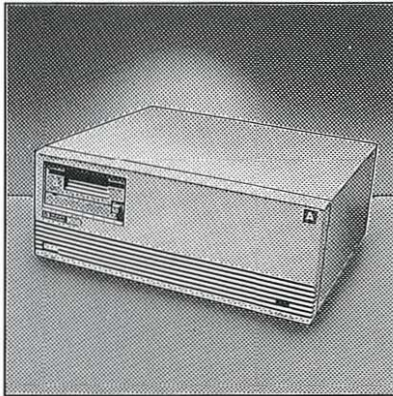
switching together with common channel signalling between the Hull and BT networks (as illustrated in the diagram) is now providing two digitally interconnected but independent administrations with improved transmission qualities, ISDN capability and faster call set-up times, all in a new environment of computer control.

For further information, contact Peter Gordon, Plessey Major Systems Ltd, Edge Lane, Liverpool L7 9NW. Telephone: 051-228 4830. Telex: 629267.

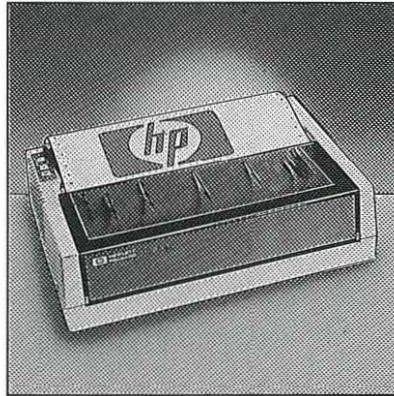


# PLESSEY

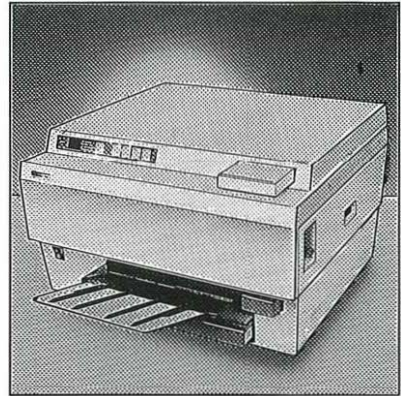
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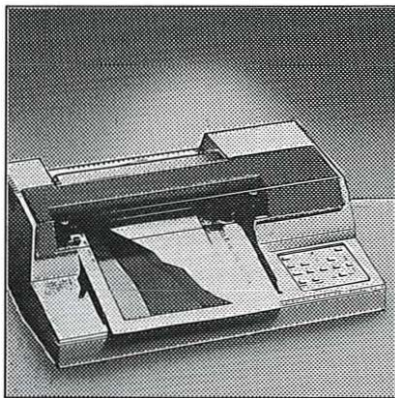
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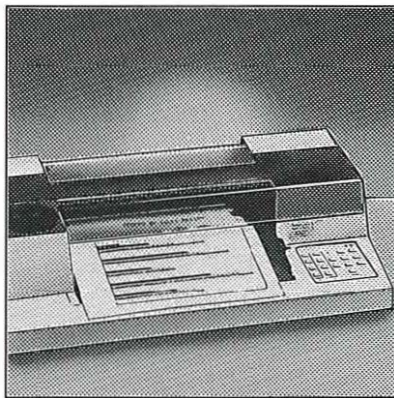
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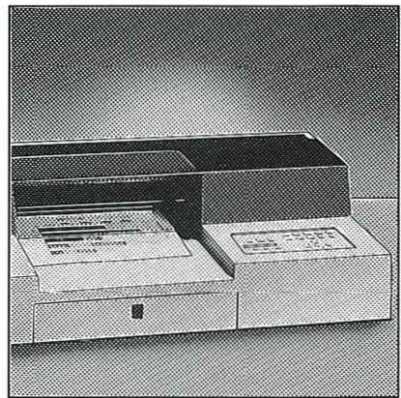
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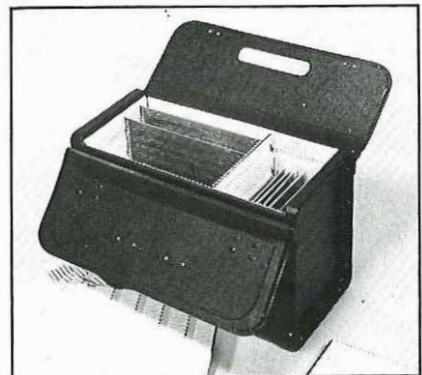
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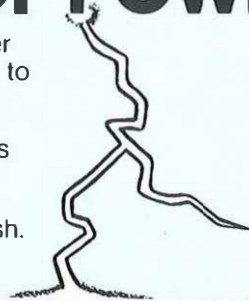
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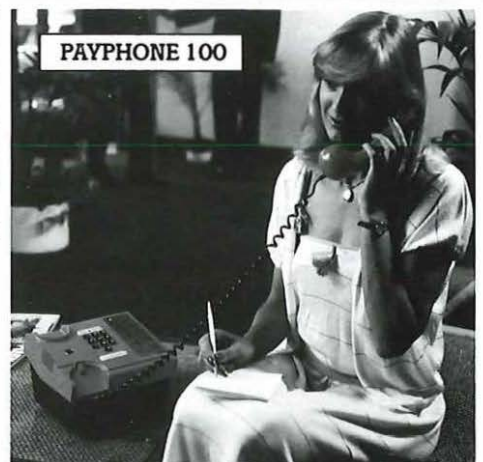
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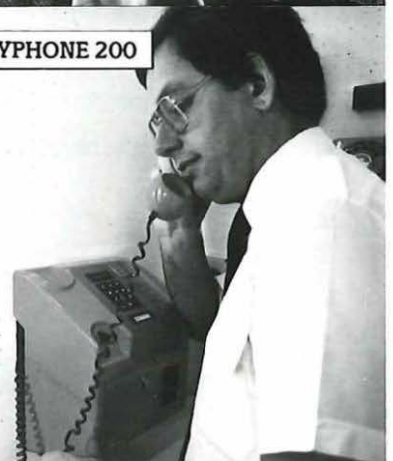
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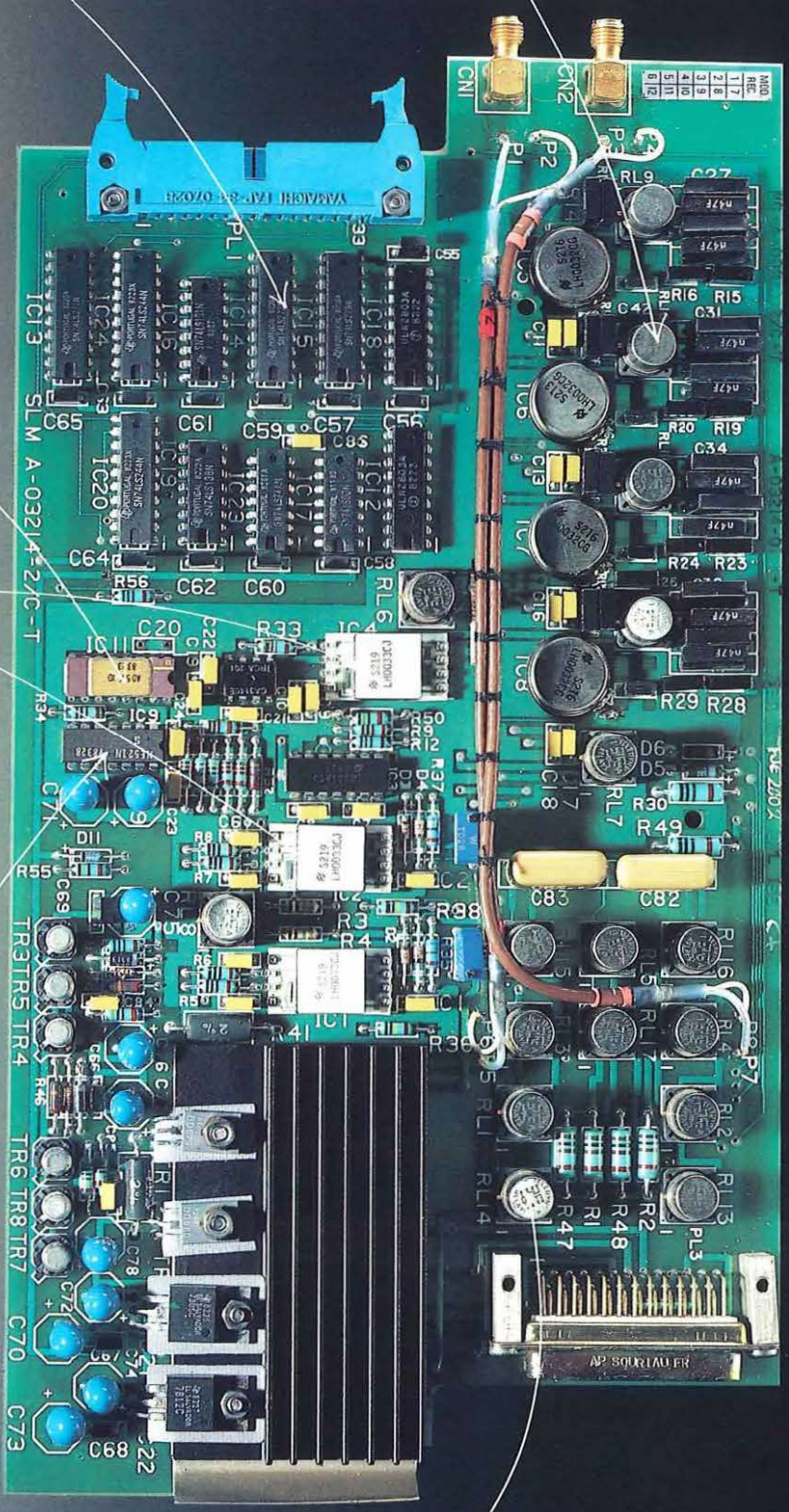
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Each instrument or ATE function is represented as a software 'profile'. The test engineer just sets the required parameters. This is then automatically inserted into the test program. What could be easier? Or quicker?

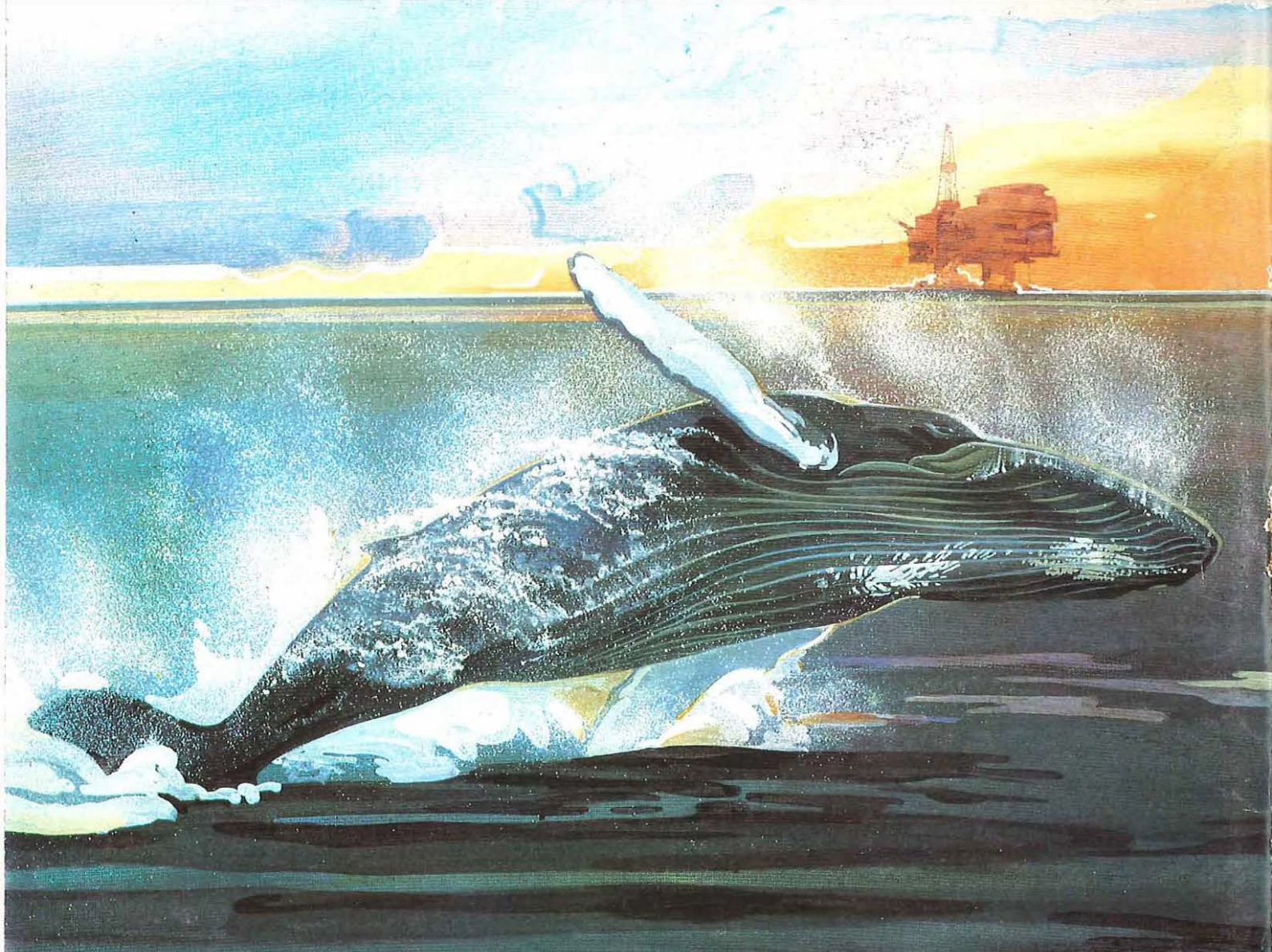


This powerful test system will handle the most complex boards you have. It will also handle them from day one – because the system is delivered with your first test program already written – so throughput can begin immediately.

To see what System 8080 can do for your business – ask for the brochure.



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Ferranti communications technology overcomes the barriers of geography, terrain and climate. You will see our systems in deserts and tundras, in jungles and where the salt spray flies. Not just surviving but providing efficient, cost effective communication.

That's why Ferranti systems are specified by PTT authorities, public utilities, defence ministries, air traffic controllers, port authorities and private users world-wide. Talk to us about your needs.

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Ferranti communications products include:

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Turnkey communications packages including radio from HF to SHF, multiplex, supervisory, telephone exchange and SOLAS equipment.

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