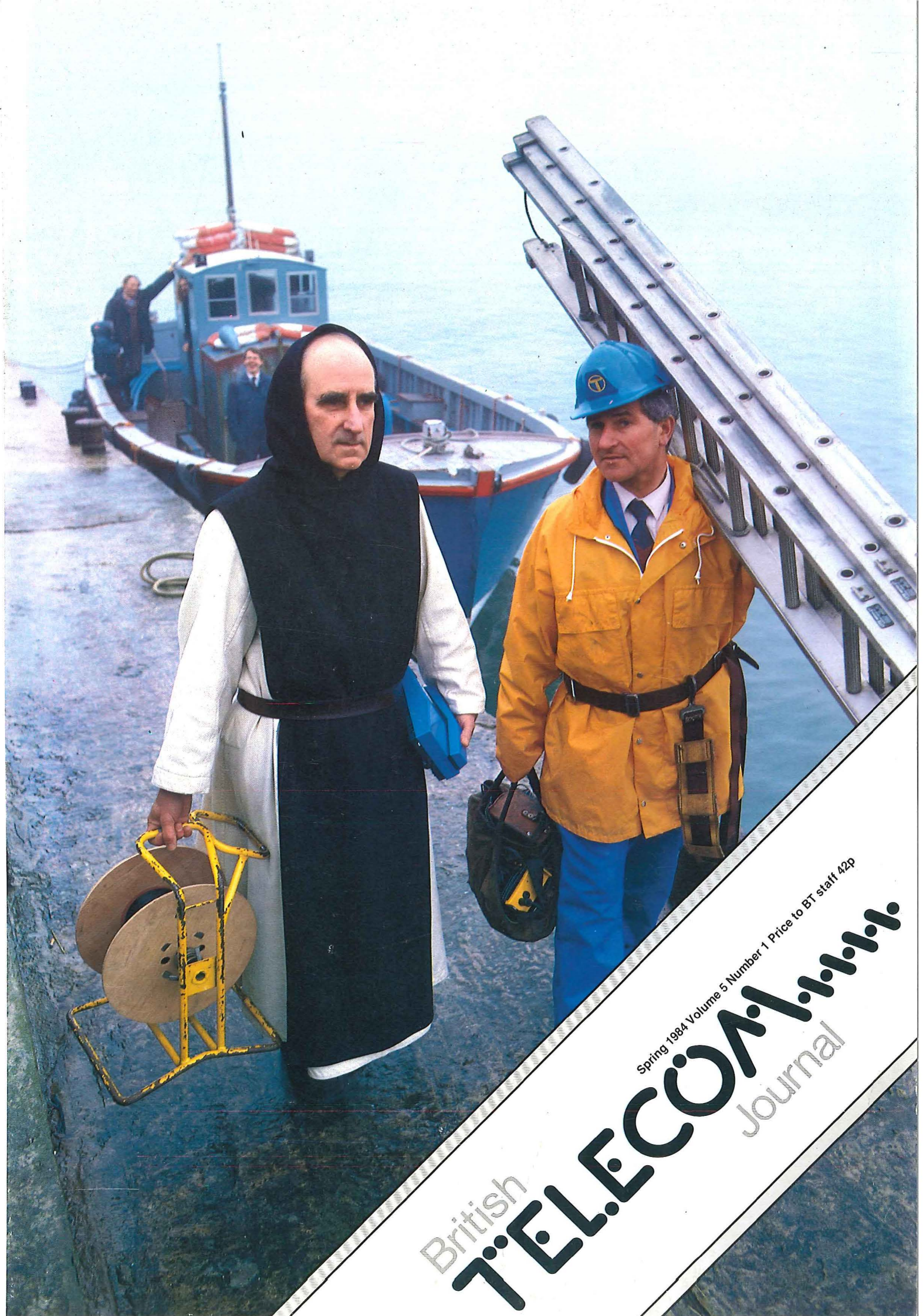


Spring 1984 Volume 5 Number 1 Price to BT staff 42p

British TELECOM Journal

Making light conversation on the phone.

Working at the speed of light is nothing new for Plessey.

Plessey scientists, designers and engineers have been developing new fibre optic telephone transmission for over a decade, combining the technologies of digital multiplexing, line systems, opto-electronic devices and optical fibre connectors to create optical fibre transmission systems second to none.

In putting its unsurpassed fibre optics expertise to work, Plessey has scored a number of notable firsts.

They include the first optical fibre system put into normal traffic service in the UK. Also the first long wavelength optical fibre system in normal traffic service in the world. Plessey was responsible, too, for Britain's longest optical fibre link.

And now British Telecom has awarded Plessey the contract for a 565Mbit/s system between Nottingham and Sheffield – believed to be the first of its kind ordered anywhere in the world for commercial use. It's capable of carrying 7680 telephone channels on a single fibre.

This leadership in technology has won Plessey more than half of British Telecom's optical fibre system contracts for the UK public network.

To find out more, contact: Transmission Division, Plessey Telecommunications Limited, Beeston, Nottingham NG9 1LA. Tel: Nottingham (0602) 254831, Ext. 3542. Telex: 37201.

PLESSEY
telecommunications

SEMITRON

The next generation of transient protectors

Modern electronic circuits and equipment need better protection against voltage overloads and especially from high-energy transients. The Semitron foldback diode is the most up-to-date answer to transient protection, with its outstanding clamp capability. A simple, two-terminal construction, it is now widely used, especially in telecommunications equipment.

The unique Semitron design enables the reverse biased junction to avalanche normally. Enhancement from the forward-biased side of the chip lowers avalanche voltage by about thirty per cent when conducting 100mA. The voltage level is maintained even when the avalanche current exceeds this.

Semitron achieves cost savings by enabling the designer to use a narrow band between stand-off and clamp conditions, permitting the use of lower voltage transistors or circuits. Moreover the all critical turn-on time is very fast, typically as short as 1 ns – fast enough to protect tomorrow's high speed digital circuits.

Semitron foldback diodes are of simple construction, encapsulated in the majority of popular diode packages, glass-to-metal and plastic, and of 1 to 75W continuous dissipation.

For further information write to Semitron Cricklade Limited, Cricklade, Swindon, Wiltshire SN6 6HQ.
Tel. (0793) 751151. Telex: 44848.

Semitron – Putting protection into perspective

Why Mitel telephone switchboards can meet your needs so precisely.

Whatever your business, however big or small, you cannot run it at peak efficiency without efficient communications. And the starting point is an efficient telephone system. Saving your time, space, energy, and money.

That's precisely what the revolutionary Mitel Superswitch™ advanced electronic telephone switchboards give you.

Because, right from their inception, they have been designed specifically to provide more efficient communications and to outperform comparable systems on the market.

They offer more facilities more reliably. They're easier to install, operate and maintain. They save your time, space, energy, money.

Meeting your needs

No matter what type or size your business, there's a Superswitch to meet your needs.

Take just two examples: the SX-200—typically providing 24 exchange lines and 150 extensions, and the SX-20—with up to 12 exchange lines and 48 extensions. They have flexible, modular construction, so can be sub-equipped to match your needs today—then be enhanced to grow as you grow.

Impressive range of features

They are packed with an impressive range of time-and cost-saving features. For instance, they will automatically call you back if the extension you dial is 'busy,' you can put calls on 'hold,' make conference calls, arrange for your calls to follow you within the building . . . and many, many more. All programmable to suit your exact requirements.

World-beating technology

All this is achieved by innovative design, using digital control and our own world-beating semiconductor technology.

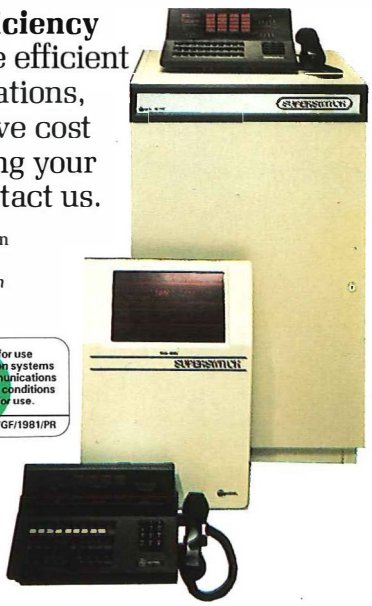
World's largest

We're the world's largest manufacturer, by volume, of electronic telephone switchboards.

Better business efficiency

If you want more efficient business communications, coupled with effective cost control— and meeting your precise needs— contact us.

™—Trade mark of Mitel Corporation
* *British Telecom registered name. These products are available from your local British Telecom sales office.*



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MITEL Building Better Communications Worldwide

All sales enquiries to: Mitel Telecom Limited, Severnbridge Estate, Portskewett, Gwent NP6 4YR. Tel: (0291) 425123/423355. Telex: 849808 or Mitel Telecom Limited, Slough. Tel: (0753) 76121.

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.

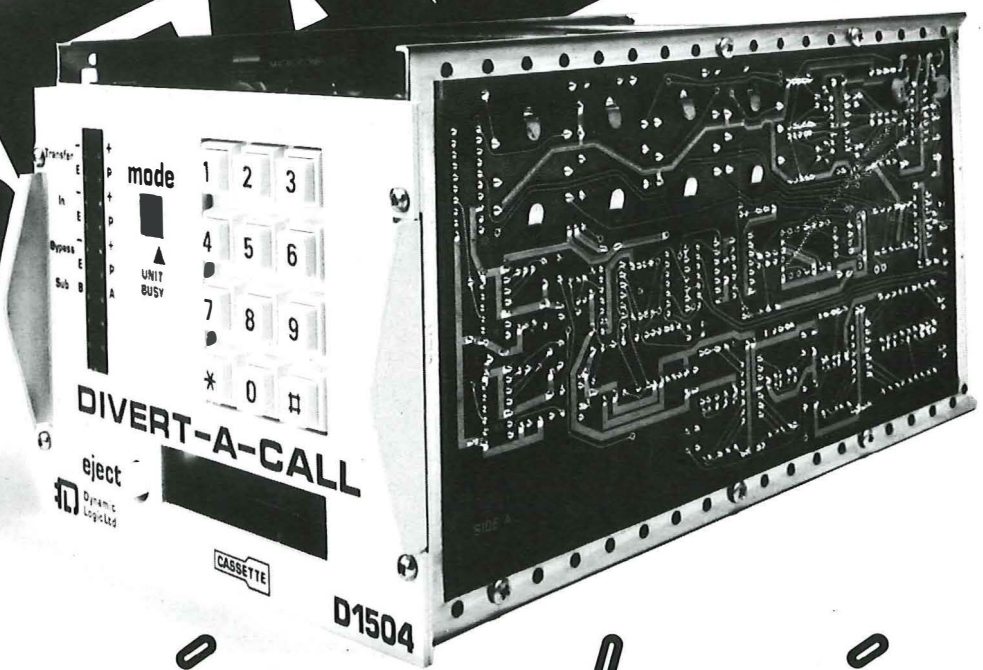
The subscriber can select or change destinations from any location within the telephone network using a synthesised speech facility which is protected by a security code.

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.

PHANTOM OFFICE BECOMES A REALITY



dynamic logic

*See the article 'Phoning the Phantom Office' by Ken Cox. Autumn '83 issue.

Dynamic Logic Limited
Doncastle House Doncastle Road Bracknell Berkshire RG12 4PE England
Tel (0344) 51915 Telex 849433 Cables Dynamic Bracknell

Built on better understanding

Feedback Data products are made in the U.K. and sold throughout the world to major corporations and government bodies. This is because we at Feedback have remained one step ahead of market requirements, for new techniques, technologies and customer support.

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IT'S AN INTEGRATED, MULTIFUNCTIONAL, NETWORK-LINKED, PUBLIC-DATA, DESK COMMUNICATION TELEPHONE.

(BUT THAT WON'T PUT ANYONE OFF.)

True, Executel is a pretty smart piece of technology. But to the executive, it's just an invaluable business aid.

He won't give a fig for its microcomputer features. He'll simply be impressed that it has a 20 year electronic diary, directory, notepad and calculator all in one neat desktop unit. And that he can cross-reference with ease.

He won't care tuppence about its state-of-the-art telephone technology. It's just much more efficient to dial directory numbers at the touch of a button. And to have the number redialled when he wants.

APPROVED for use with Telecommunications Systems run by British Telecommunications in accordance with the conditions in the instructions for use.

He's not likely to think of it as an on-line data terminal. But receiving Viewdata without moving from his desk will help him become much better informed, much more quickly.

In short, nothing about Executel (and there's more) is going to stop him wanting one. Especially after we've spent £500,000 in a national advertising campaign directed at top executives.

We're launching Executel right now.

And it's being centrally purchased through BT Consumer Products.

At STC Telecommunications, we've got a raft of technical data and product information about Executel. But don't let that put you off calling us now on Burnham (06286) 65411.

Executel **NOT JUST ANOTHER TELEPHONE.**

STC TELECOMMUNICATIONS LTD

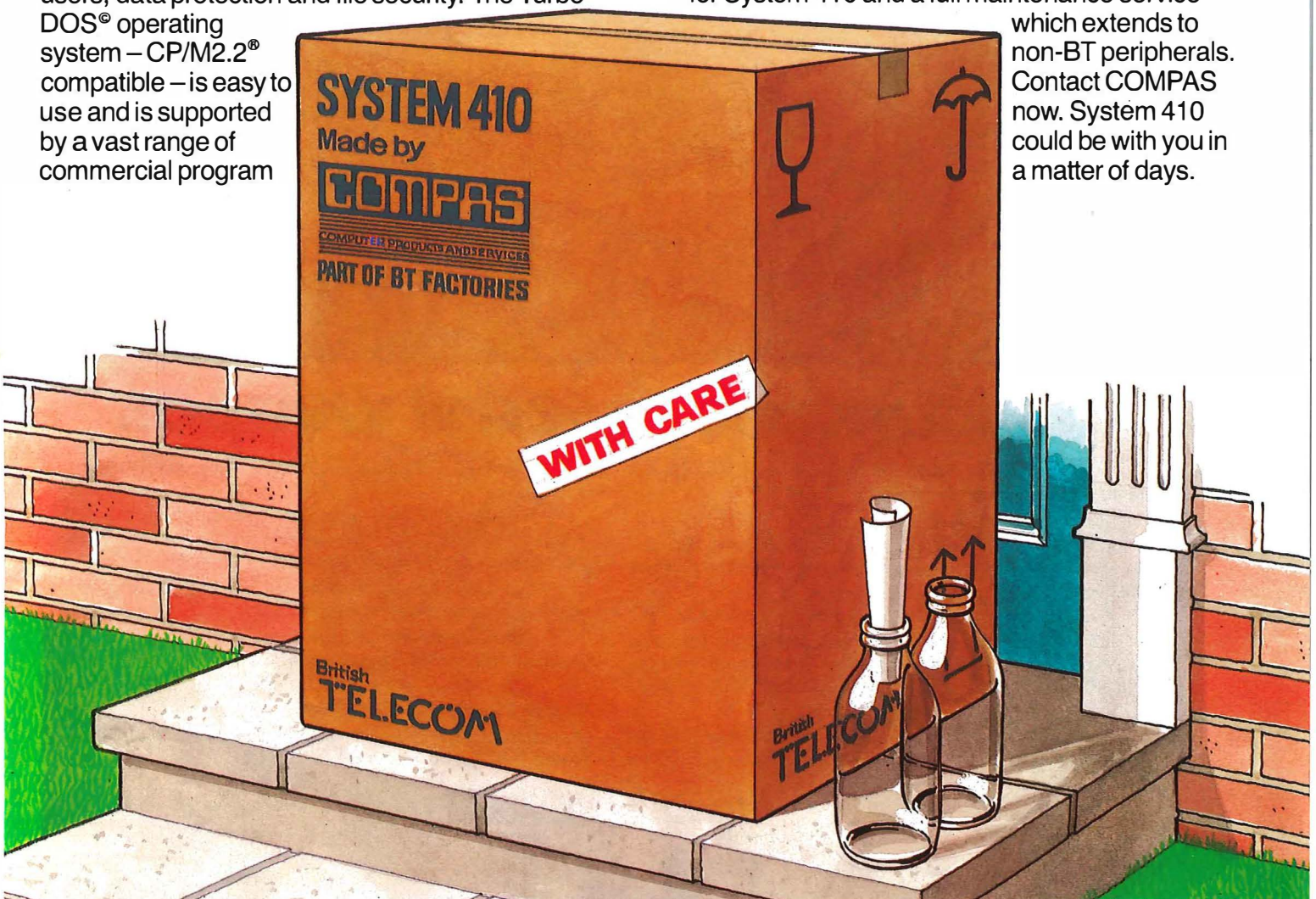
Which cost-effective, multi-user computer is right on your doorstep?

System 410. Available NOW exclusively to British Telecom managers, this multi-processor small business computer is as sophisticated as any of its costly rivals. Customised, if you want, at your place or ours, with easily arranged purchase, delivery and maintenance. And all for about two-thirds of the price you'd expect to pay. (We'll be glad to give you a quotation.)

Fast, flexible System 410 is suitable for a wide range of personal and specialist applications. It offers simultaneous remote access for up to 10 users, data protection and file security. The Turbo DOS© operating system – CP/M2.2® compatible – is easy to use and is supported by a vast range of commercial program languages and packages. System 410 can also transfer files and communicate with other systems.

Limited needs? System 410 is practical even for one or two users, but is at its most cost-effective for four or more. And with extra processors and accessories also available on your doorstep, expanding your system is as easy as placing your initial order.

System 410, already well proven in use, is made and marketed by COMPAS, British Telecom Factories' computer products and services business. COMPAS offers a full turnkey package for System 410 and a full maintenance service which extends to non-BT peripherals. Contact COMPAS now. System 410 could be with you in a matter of days.



British Telecom
Factories

24 hour brochure request service on 0272 279969 or clip the coupon.

To: Compas, BT Factories, Bovay Place, London N7 6PX. Please send full colour brochure on System 410.

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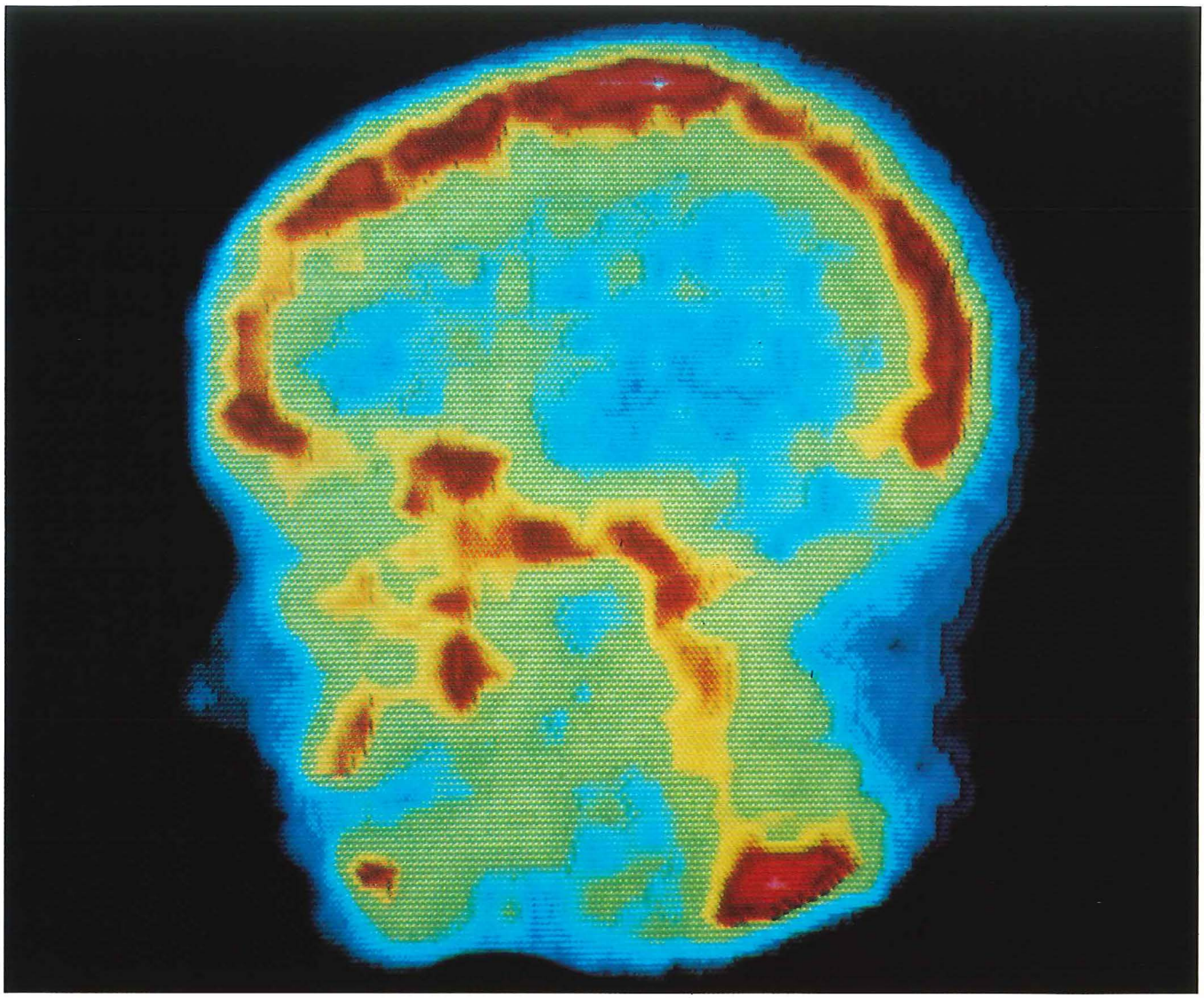

British industry's secret weapon

The panacea for Britain's future is a lot closer to home than most people think.

It's called brainpower.

Experience shows that when British industry seriously turns its mind to it, no peak is unscaleable. And no problem unfathomable.

If anyone has any doubts, they only have to look at STC.

One of our policies is to upgrade dramatically the status attached to original thinking in product marketing and design. We're also determined to take calculated risks in backing them.

The results are often surprising.

For example, we've not only produced the world's first electronic pocket pagers with a single-chip radio circuit, but we export them to Hong Kong. (Rather like selling vodka to the Russians).

And although we've also developed into such new areas as hospital, airport and meteorological systems, we've extended the frontiers of telecommunications even further.

Our latest phones have a VDU to link-in direct with teletext, computers and word processors.

The point is: when the future of things that matter looks grey, you only have to use your grey matter.

If you would like to take a closer look at how STC is shaping the future, please write to:

Peter Earl at Standard Telephones and Cables plc, STC House, 190 Strand, London WC2R 1DU.

Making sure the future has a future.

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The new Sherpa Minibus

More people will catch the bus

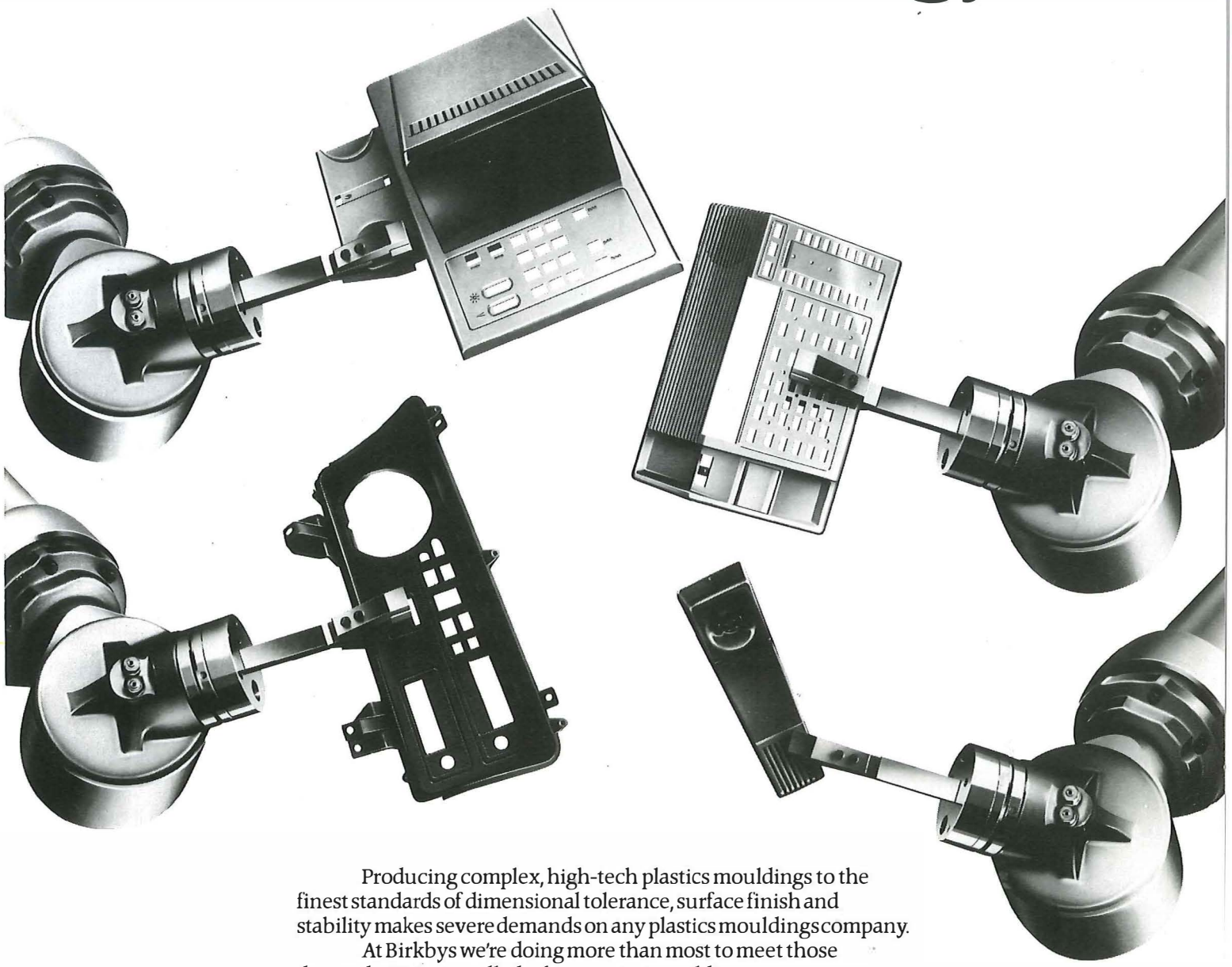
Extra length and width give extra capacity and make a big difference to the new 310 LWB Minibus.
Now even more passengers can travel in comfort.
With a choice of seating formats, the new Minibus can accommodate more passengers making it ideal for voluntary groups, charity groups and private use.
The new 310 Minibus power units include the fuel efficient 2 litre petrol engine or, alternatively, the newly developed Land Rover 2.5 diesel engine – both fitted with 5 speed Land Rover gear boxes.
So now you can buy a Sherpa Minibus with 13, 15, 17 or 18 seats (including driver). There's also the 250 Sherpa Combi which accommodates up to 9 passengers (including driver); and the 250 Sherpa Crewbus which takes 15 passengers including driver.

The new Sherpa Minibus

FREIGHT ROVER

For more details of this vehicle and other models in our range contact: Tyburn Road, Erdington, Birmingham B24 8HJ

Better equipped for the demands of the new technology.



Producing complex, high-tech plastics mouldings to the finest standards of dimensional tolerance, surface finish and stability makes severe demands on any plastics mouldings company.

At Birkbys we're doing more than most to meet those demands. We've installed robots on our moulding presses so we achieve higher quality, more cost effectively, in less time.

But our service doesn't just stop there, as we will also handle your assembly, finishing, printing and delivery schedules (and how many other suppliers can say that?).

Bringing in new technology is a big investment. But, as our customers agree, it's a wise one.

Birkbys Plastics Limited, PO Box 2, Headlands Road, Liversedge, West Yorkshire WF15 6QA. Telephone: Heckmondwike (0924) 403721. Telex: 55332.

Birkbys Plastics

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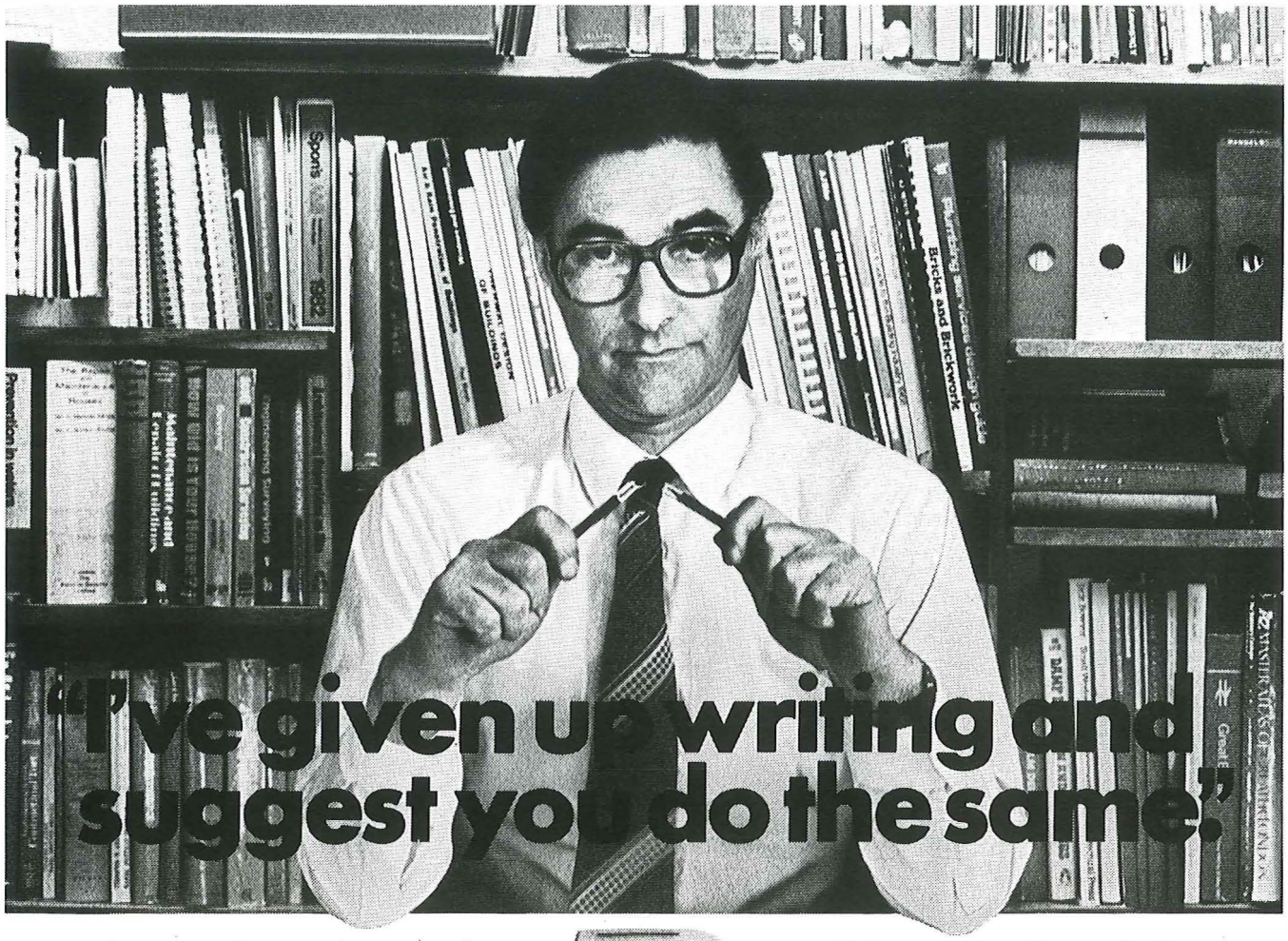

As a consulting architect, Lyall Addleson can find enough problems in a few feet of bricks and mortar to warrant several acres of paperwork.

But now he's written his last report and dictated his final letter.

Typewriter, note-pad and pens have been consigned to the junk heap for good.

No it's not the end of a career.

It's the debut of the Microwriter.

A machine that dramatically cuts the slog of writing and re-writing.

And one that happily works all hours. (Unlike the average secretary.)

All he has to do is place the fingers of one hand on combinations of 5 keys.

Then write onto the display at the top and have his words stored in the memory at the back.

To learn to use the Microwriter took him barely an hour.

And before he knew it, he was Microwriting faster than he could write longhand, without even looking at the keys.

Now he can review, tabulate, edit and punctuate.

He can have perfectly typed copy simply by plugging it into an electronic typewriter or printer.

He can write onto a television, audio cassette or computer.

And because of its size, he can take it anywhere in the country his work sends him.

If you'd like more information about how the Microwriter can transform your business, fill in the coupon.

It could be the last time you use a pen.

microwriter

To: Microwriter Ltd., 31 Southampton Row, London WC1B 5HJ.
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☐ Please send me more information about the Microwriter.
☐ Please put me in touch with my nearest Microwriting Centre.

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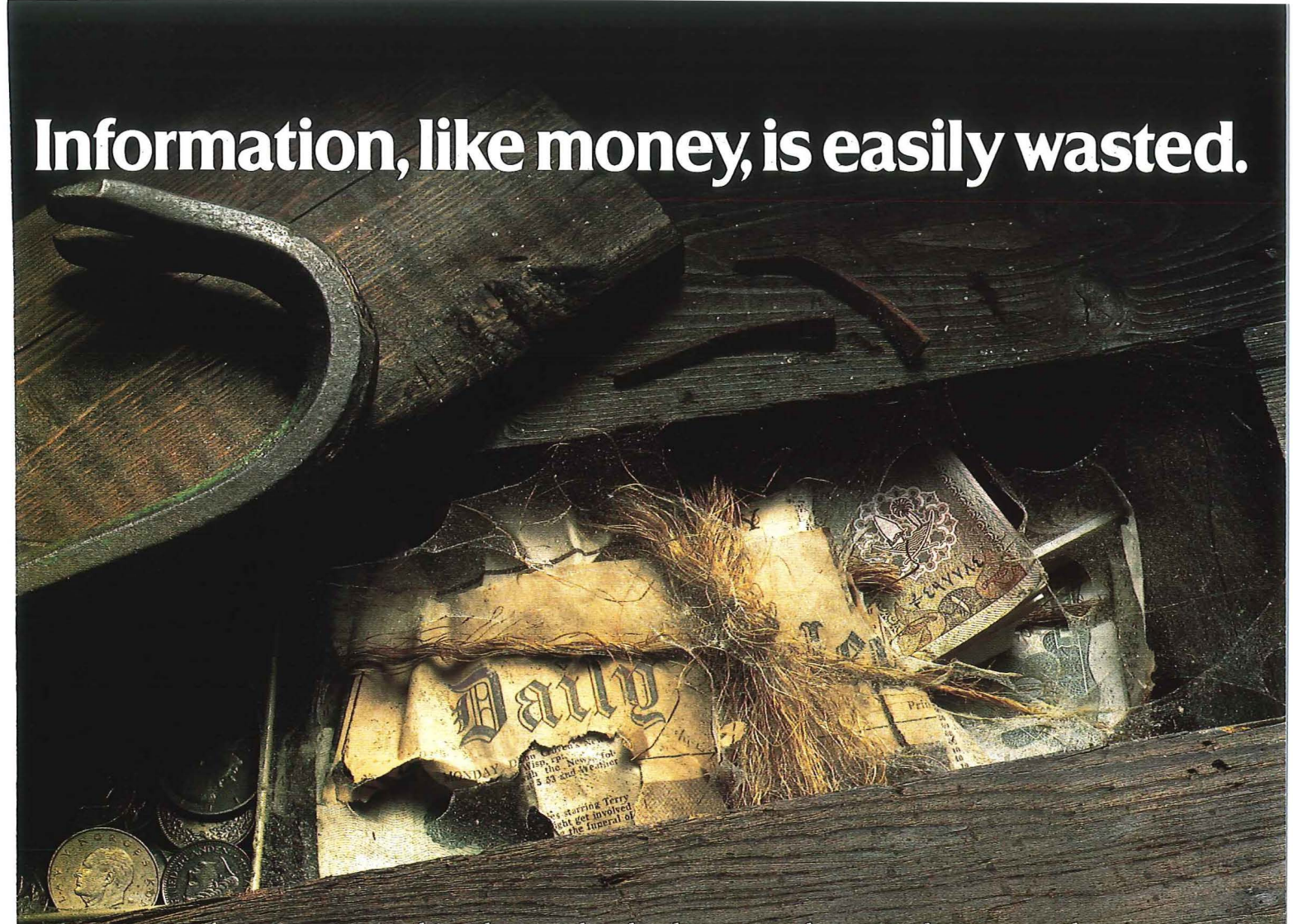
BJ4/84

THE MICROWRITER W-P IS ALREADY USED BY THOUSANDS OF PROFESSIONAL PEOPLE. IT CAN COST AS LITTLE AS £10 PER MONTH OR CAN BE PURCHASED FOR £299 + VAT.
31 SOUTHAMPTON ROW, LONDON WC1B 5HJ. TELEPHONE: 01-831 6801. AN ASSOCIATE COMPANY OF THE HAMBRO LIFE GROUP OF COMPANIES. THE MICROWRITER IS RS232C COMPATIBLE.

Information, like money, is easily wasted.



Information trapped inside your data bank is as much a wasted asset as cash lying buried under the floorboards.

Like money, information needs to be put to work to realise its full value.

And that's what Ferranti data communications is all about. Putting information into the hands of those in an organisation who need and can use it.

Ferranti communications systems include store and forward, message switching, packet switching, protocol conversion and networking.

There are already hundreds of PT7 programmable terminals controlling thousands of Ferranti displays within British Telecom.

Now there's the Ferranti Argus Pro-personal Computer, which can be linked together with our PT7 terminal system to the new Teletex network with a Ferranti Teletex Adaptor.

Don't forget either, the Ferranti Voice Manager, an intelligent storage and distribution system designed to eliminate waste and delays in telephone calls.

From a company that's used to working alongside British Telecom – a cost-effective total Data Communications package.

For more information contact:
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Information Systems Sales, Simonsway,
Wythenshawe, Manchester M22 5LA, England
Telephone: 061-499 3355, Telex: 668084

Information Systems expertise you can bank on.

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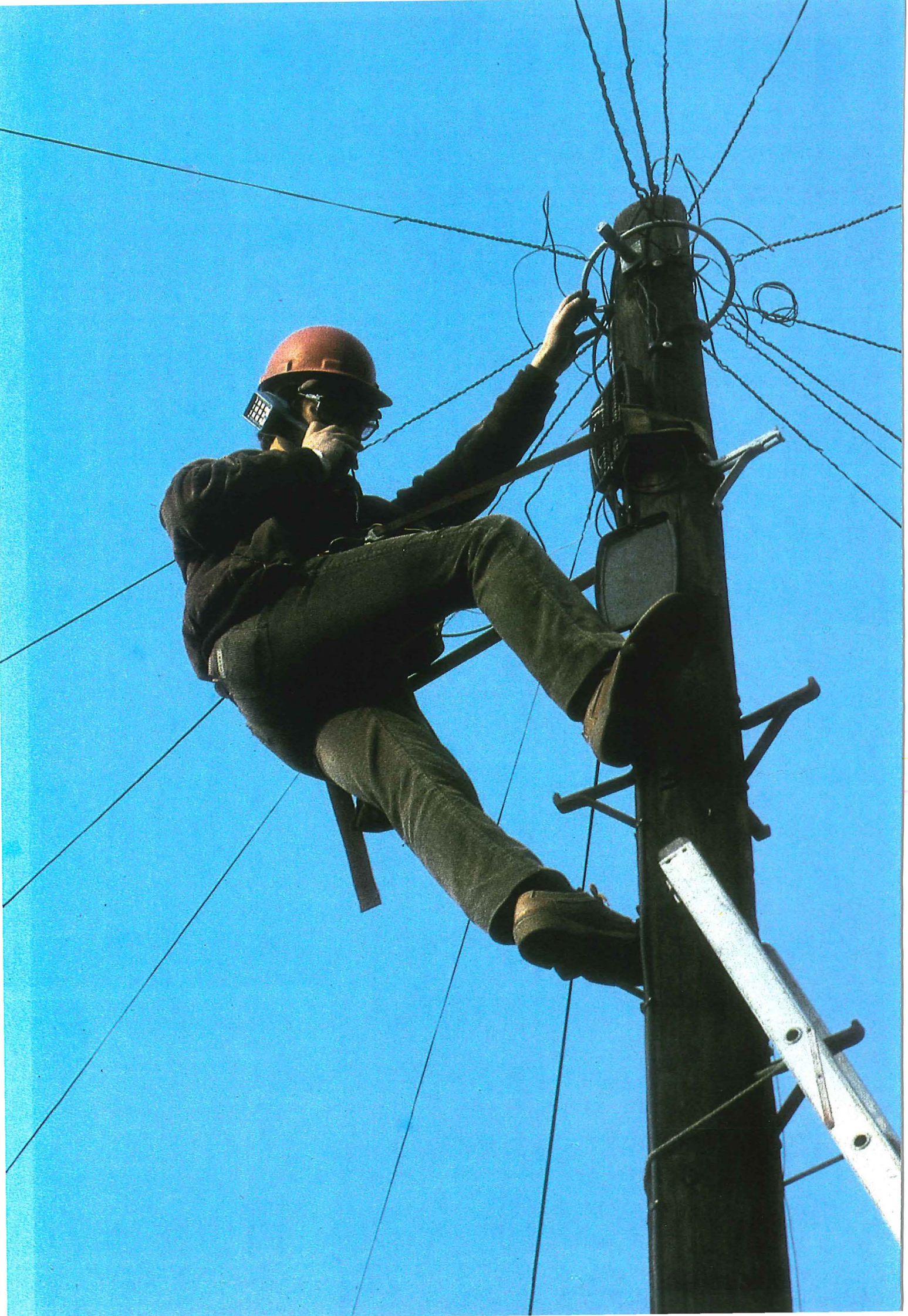


NOW 4TEL TALKS BACK.

Now you can test phone lines anywhere in your local network from virtually any phone at any time, day or night. Just by picking up the receiver and talking to 4TEL's new Voice Response System (VRS).

Since its invention, 4TEL has been the fastest and most effective subscriber line test system available. And now it's also the most convenient. VRS is a digitised electronic voice that enables 4TEL to actually talk over the phone to testers, supervisors and faultsmen – up to eight at a time.

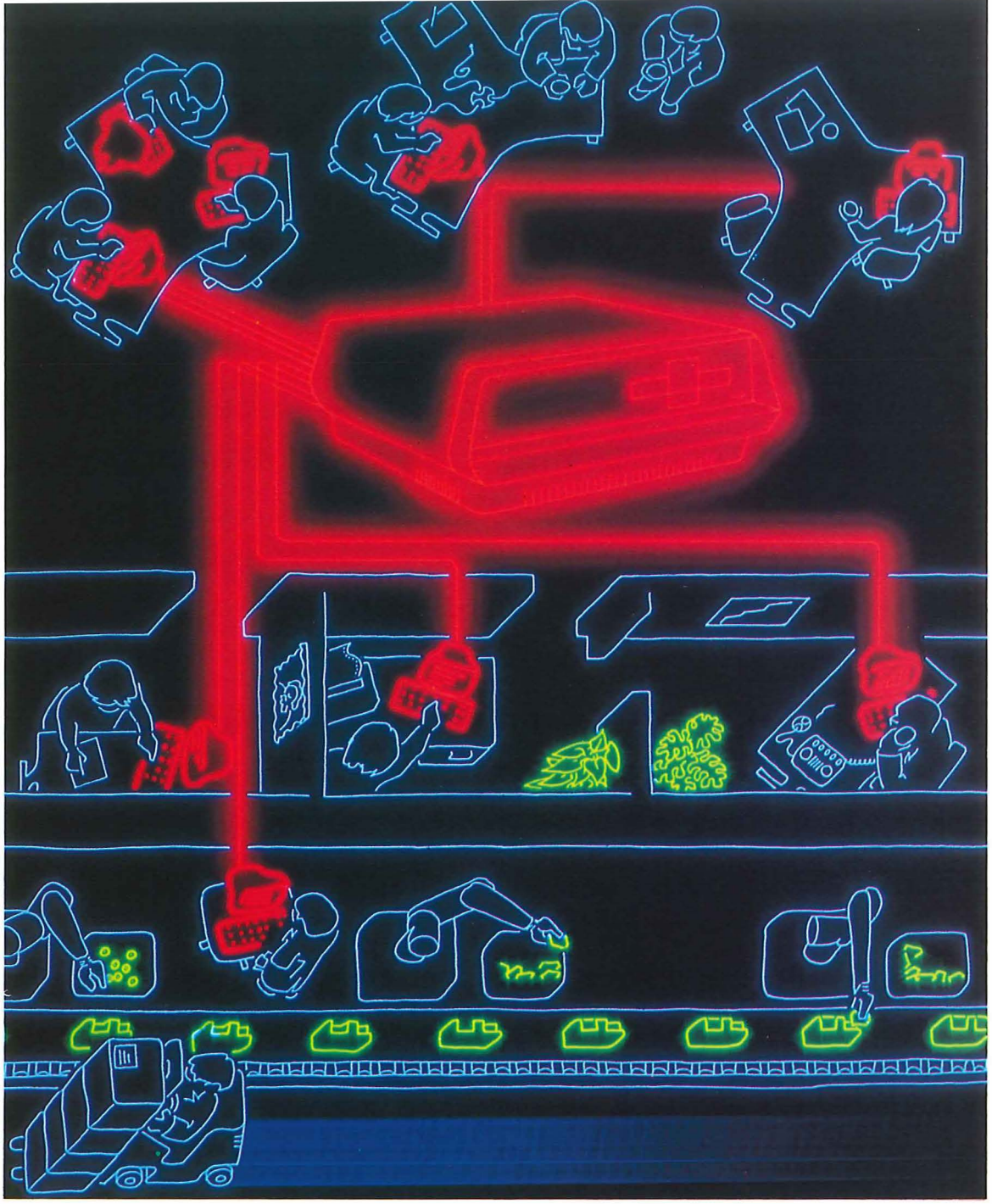
And it's not just talk. VRS engages the complete 4TEL system. That means you can use it to find faults quickly and accurately, perform line tests, do special diagnostic testing and correctly dispatch the proper faultsman to pinpointed trouble areas.

If you already have 4TEL, VRS will help you get added benefits from your investment. If you've never seen what 4TEL can do, maybe it's time to look into the test system that's at the forefront of technology and ensure you meet your quality of service objectives.

In either case, VRS is a good reason to call Alan Garrett. He'll help you understand how VRS can make your phone a direct line to the world's leading subscriber line test system.

Call or write: Teradyne Ltd., The Western Centre, Western Road, Bracknell, Berks. RG12 1RW.
Tel: Bracknell (0344) 426899. Telex: 849713.

TERADYNE



Altos brings the electronic office within your reach.

Once you experience what computerisation can do for your business, you'll want to run more and more jobs on your new computer. Unfortunately, with the wrong system, you would soon end up with a huge bottleneck and a queue of frustrated people.

The Altos electronic office avoids that problem by giving you a microcomputer with ample power to drive several screens at once.

This way, you can site computer power around the office – exactly where you need it. And your staff can run their own different tasks (word processing, spreadsheet analysis, information processing, accounting, etc.) when and where required.

Because Altos provides a central filing system (held on a large capacity disk), up-to-the-minute information is always at everyone's fingertips.

Surprisingly, the per-user cost of a multi-screen system is usually less than the price of a personal computer. So now, the reliable and efficient electronic office really is within your reach.

Contact us now and we'll put you in touch with one of our experienced dealers who will show you the Altos range and advise you on your software needs.

MBS Microtex

The UK Altos distributor
MBS Microtex Ltd 119/120 High Street Eton Windsor
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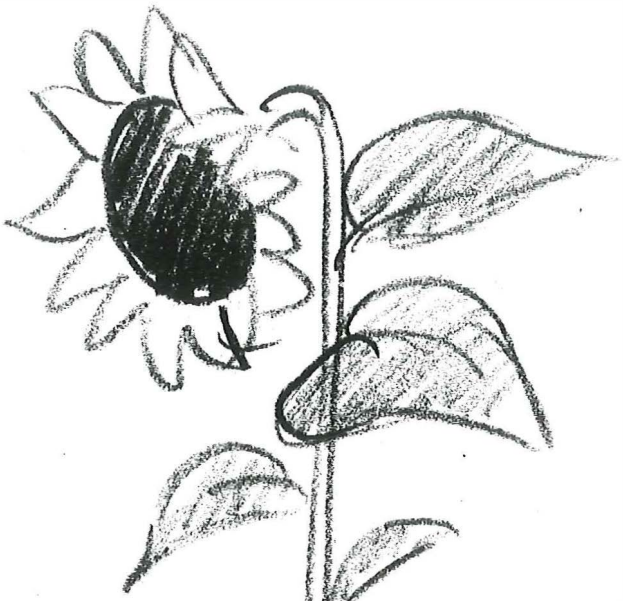
For the technical. 16-bit systems... Processor: 8086.
Memory: 256Kb to 1Mb. Floppy disks: 1 or 2 x 1Mb drives.
Hard disks: 10, 20 or 40Mb. Users: 1 to 10. Communications:
ALTOS-NET, Ethernet, 2780/3780, 3270, PSS/X25.
Languages: BASIC, COBOL, FORTRAN, PASCAL, C.
Operating systems: XENIX[1], CP/M-86[2], MS-DOS[3].

Registered trademarks [13]Microsoft Corp. [2]Digital Research.



WITH OUR SYSTEMS YOU CAN START SMALL AND GROW

When you're choosing a microcomputer system, you need to think not just about your needs today, but what they're going to be tomorrow. In other words, you need room for growth. And that's precisely what you get with WICAT systems.

FAMILY OF SYSTEMS

Because WICAT has a family of systems, each designed to meet a range of requirements. So you can start small and grow.

There's the WICAT System 150—for up to 6 users; the System 160—for up to 12; and the System 200—for between 8 and 32. All with a real-time, multi-user, multi-tasking operating system.

EXTREMELY POWERFUL

They're all extremely powerful—offering minicomputer performance at micro prices.

All are based on the Motorola 16-bit 68000 processor, with 32-bit data operations.

Memory capacity ranges from up to 1.5 Mbytes on the System 150 to 5 Mbytes on the 200. The capacity of the main storage is what you'd expect to find only on much larger systems. Up to four drives provide a maximum of 160 Mbytes on the 150, and 1896 Mbytes on the 200.

WIDE VARIETY OF OPTIONS

The wide variety of options available include:

- Operating systems: MCS (WICAT proprietary operating system), UNIX, BOSS.
- Communications: local area networking, IBM 2780 and 3780 protocols.
- Languages: FORTRAN 77, APL, CIS-COBOL, RM-COBOL, C, Pascal, Assembler, SMC BASIC.
- Hardware: graphics CRT, video disk interface, additional RS-232C interfaces, tape streamer, tape cartridge, low-cost VDUs, printers.
- Applications software: financial modelling, word processing, sales order processing, stock control, sales/purchase/nominal ledger, incomplete records, job cost ledger.

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And they're all backed by our nation-wide network of customer support centres and service organization—giving you the kind of support and service only a major distributor can provide.

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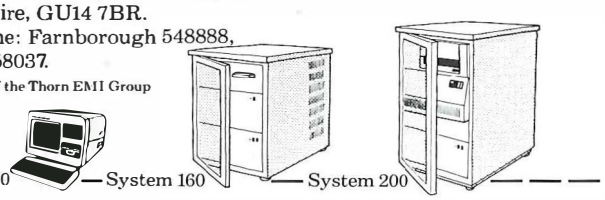


System 150 — System 160 — System 200

☐ Please send me the full story of the WICAT Systems family.
☐ Please arrange for my local dealer to contact me.
☐ I am interested in joining your OEM/dealer network.

Name

Position

Company

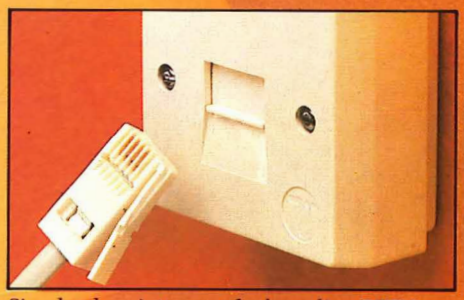
Address

Telephone BT J 5/84

21 Invincible Road, Farnborough, Hampshire, GU14 7BR.
Telephone: Farnborough 548888, Telex: 858037.

5 digit custom LCD, displays call cost, accumulated charges and programming information.

16 digit multi-function keypad for user commands and data entry.



Simply plugs into any telephone line, PSTN or PABX; requires no exchange meter pulses.

One of a series of Innovative Telecom Products designed, developed and manufactured by Rathdown Industries for British Telecom Enterprises, Consumer Products Division.

PHONE TAB

The microprocessor solution to call cost monitoring.

Automatically displays call costs as they occur and keeps an accumulated total charge.

- 5 digit custom LCD
- 16 digit multifunction keyboard
- 24 hour clock
- Security key
- Software security code
- Easily user programmable
- Displays current call cost
- Displays accumulated charge
- Displays last call cost on demand
- Displays disconnection alarm
- For use on any PSTN or PABX line
- Battery powered

PHONE TAB is exclusively distributed in the UK by British Telecom as the SHERWOOD call cost monitor and as such is

APPROVED for use with telecommunications systems run by British Telecommunications in accordance with the conditions in the instructions for use

INNOVATIVE TELECOM PRODUCTS.

RATHDOWN INDUSTRIES LIMITED

Goodwood Works, 17 London Road, Ascot, Berks. SL5 7EP England.
Tel: Ascot (0990) 23400 International +44 990 23400 Telex: 849163 RATHDN G.

But then, most word processors ask for it.

They might as well spend their time in solitary confinement in the office word processing department, because that's all they can do: process words.

Not so with ICL's DRS word processing systems. They have another string to their bow.

They can communicate.

This vital ability has enabled ICL to create the DRS Document Storage System. Linked into a Local Area Network, every single DRS word processor - wherever it may be situated - can call up, store, and update information held in a central electronic file.

But this ability to communicate is not limited to other word processors. DRS word processing systems also link the users with office systems like phototypesetters, optical character readers, and telex. They provide access to the BT Gold electronic mail system, and can connect with other computer systems like IBM, Honeywell, DEC, and Olivetti. And, of course, they can communicate with all ICL distributed office systems through IPA—ICL's Information Processing Architecture.

Even by themselves, DRS word processing systems can run a host of DP applications on CP/M86.* So combine the flexibility and resilience of a stand-alone system with all the operational benefits of shared resource working and communication, and you can see why DRS word processing systems are far more than word processors.

It's criminal what some people do to word processors.

They are information processors.

For more information, dial 100 and ask for Freefone ICL. Or send coupon to ICL Infopoint, ICL House, Putney, London SW15 1SW.

Name _____ Position _____

Company _____

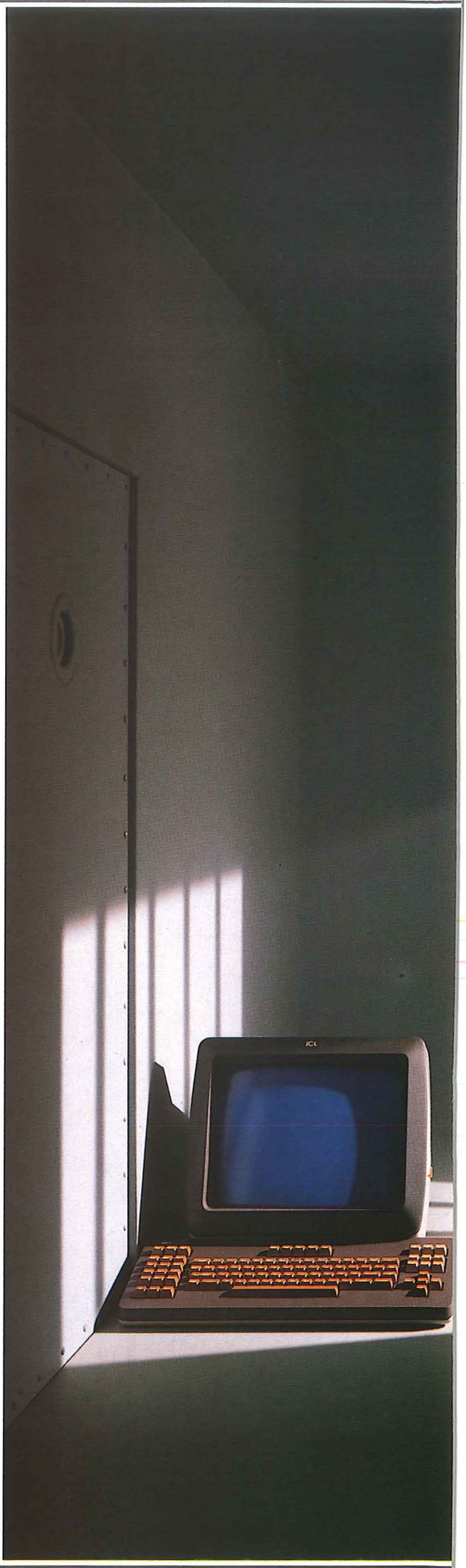
Address _____

_____

_____ Phone _____

ICL

We should be talking to each other.



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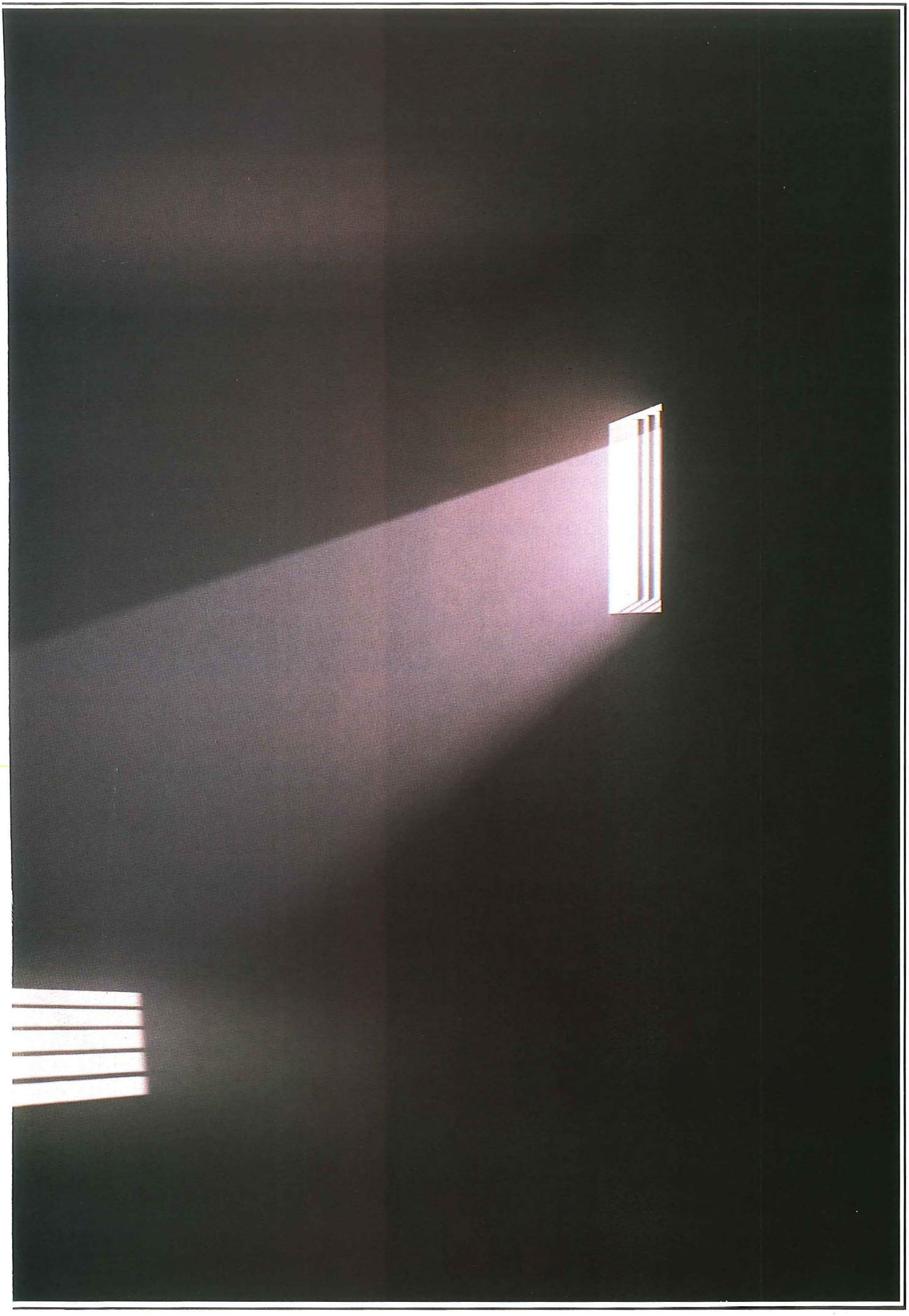

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Teletrade can offer you just about anything from a telephone to a telephone exchange, including telex terminals, answerphones, callmakers, payphones, even spare parts for maintenance.

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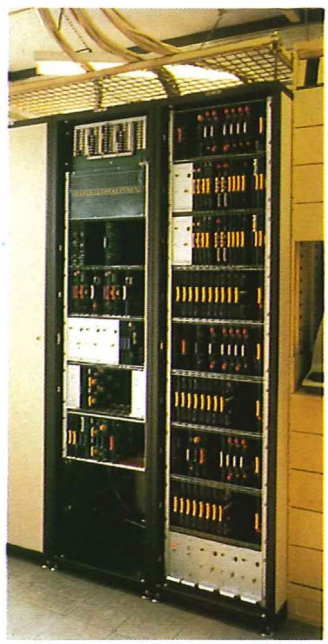
The overseas equipment marketing unit of British Telecom

CITY BUSINESS SYSTEM The revolutionary communications system for finance houses and foreign exchange dealers. Touch-controlled from the screen.

DIGITAL SPEAKING CLOCK The new microprocessor controlled speaking clock with a digital voice recording.

SCEPTRE 100 Electronic Telephone with call-timer, clock and number store.

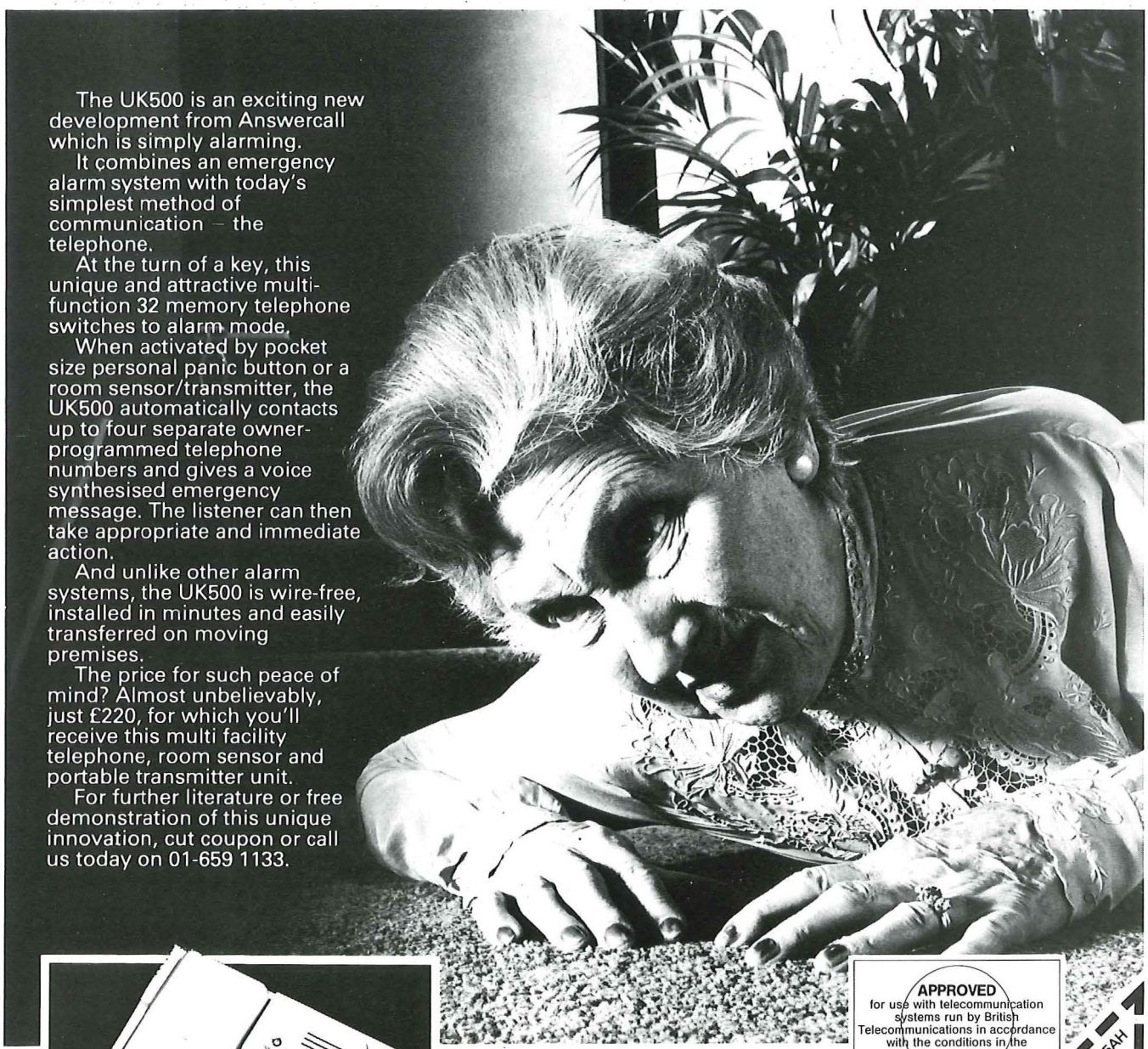
700 SERIES The classic British Telecom dial phone in a range of colours.



UXD5. British Telecom's new rural digital exchange.

PUMA A fully electronic teleprinter using microprocessors to provide advanced facilities. It has its own memory.

Thirty seconds after she fell, her telephone was calling for help



The UK500 is an exciting new development from Answercall which is simply alarming.

It combines an emergency alarm system with today's simplest method of communication – the telephone.

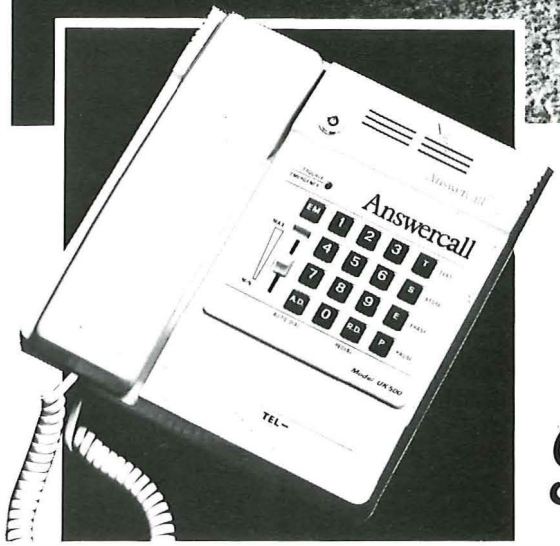
At the turn of a key, this unique and attractive multi-function 32 memory telephone switches to alarm mode.

When activated by pocket size personal panic button or a room sensor/transmitter, the UK500 automatically contacts up to four separate owner-programmed telephone numbers and gives a voice synthesised emergency message. The listener can then take appropriate and immediate action.

And unlike other alarm systems, the UK500 is wire-free, installed in minutes and easily transferred on moving premises.

The price for such peace of mind? Almost unbelievably, just £220, for which you'll receive this multi facility telephone, room sensor and portable transmitter unit.

For further literature or free demonstration of this unique innovation, cut coupon or call us today on 01-659 1133.



APPROVED
for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

Answercall UK500

Telephone & Alarm System

Simply Alarming

Answercall Ltd, Zegna House, Kangley Bridge Road, London SE26 5AH
BTJ/18/B/17

☐ Please send me your UK 500 literature
☐ I would like a FREE demonstration

Name

Tel No

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BRITISH TELECOM APPROVED
Pressac range of line jacks and plugs

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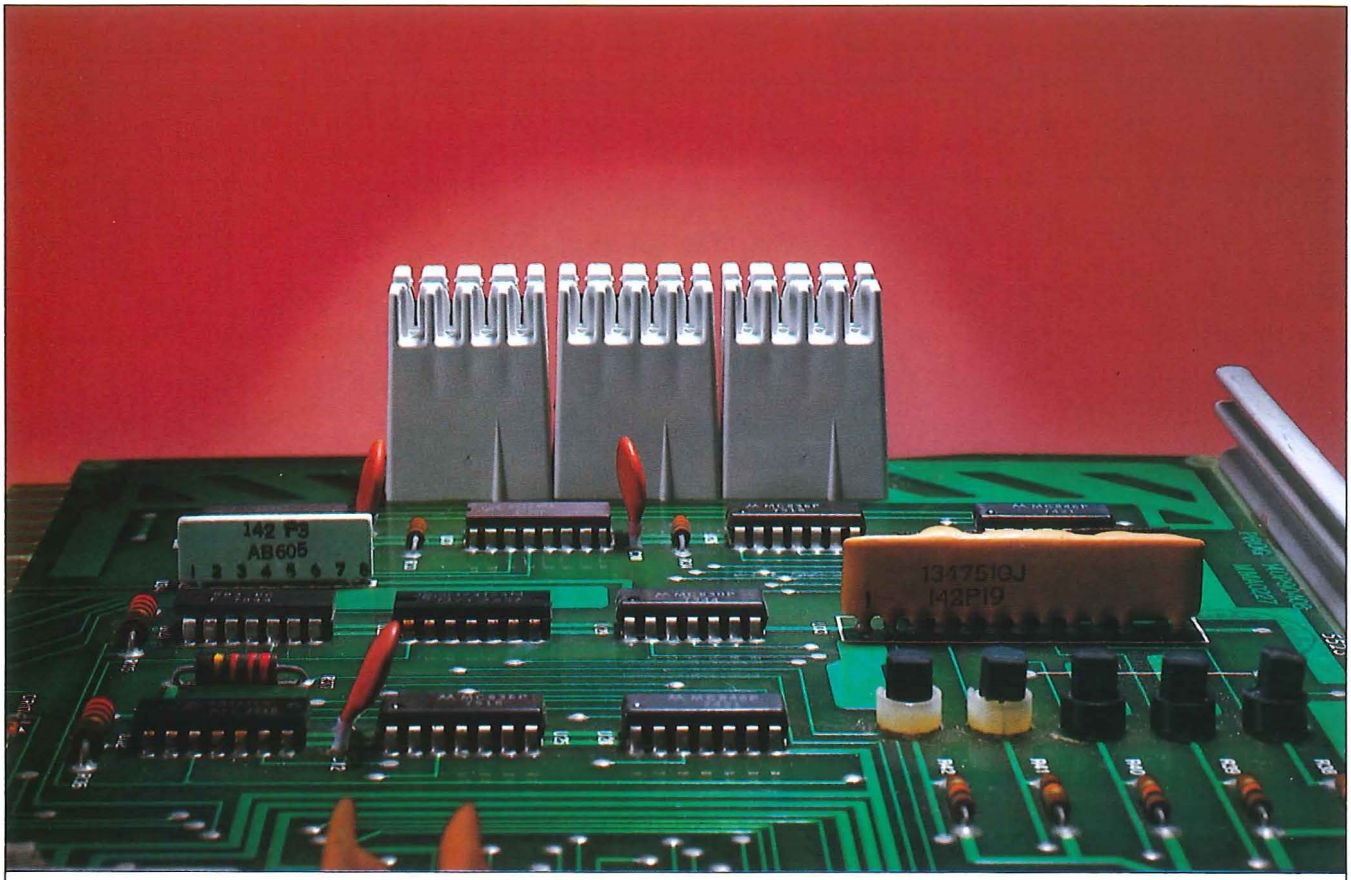
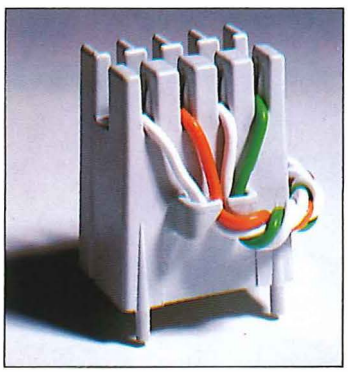


A GREAT FAMILY'S NEW ARRIVAL



NEW! for COMMS '84 STAND No.E70 Hall 5

When KRONE'S -LSA-PLUS Quick Connection system was introduced to the U.K. Telecommunications market – it took off.

British Telecom adopted it as the basis for its Rapide operation and many companies in the private sector were as quick to appreciate its advantages.

But having turned the problems posed by Insulation Displacement technology into solutions, KRONE didn't stop at the LSA-PLUS Strips and Connectors, despite the fact that it is *still* unbeatable.

Success bred Success.

The family grew.

KRONE'S latest addition to the LSA-PLUS family of Insulation Displacement Modules (now BT coded: Strips Connexion 244) is a further high quality unit for use on PCB's.

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For details of this, and any other member of our fast growing family, see us at Comms '84 –

We'll be proud to show our pedigree.

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KRONE

KRONE (U.K.) TECHNIQUE LIMITED
Runnings Road, Kingsditch Trading Estate,
Cheltenham, Glos GL51 9NQ
Telephone: Cheltenham (0242) 584900
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A subsidiary of
KRONE GmbH, Berlin, West Germany

Accounting for change

British Telecom's £462 million profit for the six months to September 1983 was £77 million lower on a like-for-like basis than the figure for the same six months of 1982 – despite the fact that business in the period increased by seven per cent.

But the profit dip was caused by special factors – holding tariffs steady for a two-year period and cutting some call charges – and is expected to be short-lived. At a press conference to announce the figures, Chairman Sir George Jefferson pointed to continued business growth and forecast stronger profits for the second six months of 1983–84.

Indeed, turnover for the six-month period was up by £218 million to £3,308 million. This increase came mainly from growth in:

★ Exchange connections (up by three per cent to 19.7 million)
★ Local calls (up by 5.1 per cent to 9,172 million)
★ Trunk calls (up by 8.5 per cent to 1,924 million)
★ International calls (up by 13.2 per cent to 178 million)

The half-yearly figures were greeted by financial commentators as a sign that British Telecom will be one of the most profitable companies on the Stock Exchange after it is launched as a public limited company later this year.

The main innovation was the change in the way British Telecom presented its accounts. Sir George said the effects on actual profits were "almost totally neutral" – that is, profits would not have been significantly up or down if the accounting basis had remained the same. But the changes have knocked off £933 million from the 1 April 1982 opening reserves.

The accounting change contains two main elements. Figures are now presented on a historical basis; and British Telecom has ceased its policy of supplementary depreciation. The corporation's asset base has been restructured, shortening the lives of some fixed assets and charging some others to the profit and loss account rather than capitalising small items like telephones.

Sir George said that the new accounting methods were to bring British Telecom into line with other public limited companies and took into account the effects of increased competition and rapid technological change.

He said: "As a nationalised industry monopoly it fell to us to decide which type and level of services and which types of equipment met customers' needs best and therefore how long our plant and equipment should be used. In future, the customer will decide whose equipment and services he will choose,"

That, of course, is the biggest challenge British Telecom is facing . . . Ⓣ

Cover: One of British Telecom's most remote outposts is Caldy Island off the Pembrokeshire coast where there are just 16 telephones. On his way to install new equipment at the island monastery, faultsman/jointer David Tinker is met at the quayside.

British Telecom Journal costs 42p per issue for staff. External subscribers pay £12 for two years including post and packaging. Full details on page 42.

In this issue

British Telecom Journal
Spring 1984 Volume 5 Number 1

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

British Telecom Journal
Spring 1984

With British Telecom a partner in five of the 11 pilot projects approved by Government, installation teams such as this may soon become a common sight.

Leading the field

Michael Wheller

The Cable and Broadcasting Bill is soon to become law. It will regulate the operation of broadband cable systems now being installed to provide an extensive range of television and other services. British Telecom is at the forefront of this new business.

It is now two years since public attention was first focused on cable by a report of the Government's Information Technology Advisory Panel which highlighted the industrial, economical and social opportunities of cable. Its call for quick action was heeded and within six months, the Government had commissioned and received an independent report on the implications for broadcasting and had set up a working group to determine technical standards.

Further progress came with the publication in April last year of a White Paper on Cable Systems and Services in which the Government outlined a strategy under which cable development should be privately financed, market led and regulated as lightly and flexibly as possible. At the same time, the Government announced that it was prepared to authorise ten or 12 pilot projects in advance of legislation and invited applications. To understand this surge of interest it is necessary to appreciate the nature of the new cable systems.

First, broadband cable has virtually unlimited carrying capacity. Individual coaxial cables already have a bandwidth around 500MHz, allowing 30 or more television channels to be carried simultaneously. Future developments in fibre optics will make even that seem modest. On top of this, cable systems can be augmented by installing extra cables. Secondly, switches have recently been developed which allow cable systems to be designed for two-way communications, extending their versatility far beyond television. Thirdly, the television screen is now so familiar that it is uniquely acceptable as the interface with the new technology.

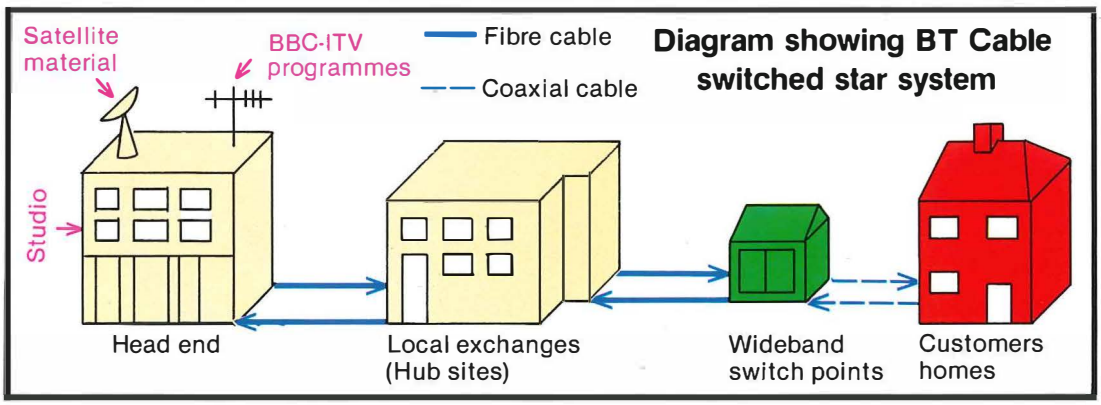
With this combination of capacity, versatility and ready public acceptability, cable is unmatched in its potential to become a major communications medium. But it will be the market which decides whether that is realised.

Initially, at least, television will be the dominant market influence. The demand for home entertainment is already huge and likely to grow as people enjoy more leisure time. There is also pressure for a greater choice of programmes, all of which points to room for growth in an area which should be highly profitable.

Telecommunications traffic shows a similar pattern of growth and profitability. This is most marked in data communications as people (and machines) demand more and more information. New cable systems will be able to accommodate this growth.

Public demand for a greater variety of services creates another market force. Consumers are becoming increasingly attracted to the convenience of shopping from home by ordering goods displayed on their television screens. Banks are examining ways of serving customers in their homes. Businesses of all kinds are becoming increasingly interested in electronic mail. Home computers need software.

There is, therefore, clearly a buoyant market



for cable and this will naturally give rise to growth in associated activities. Major new systems will need to be manufactured and installed; many more programmes will have to be provided and distributed; advertisers will be offered new routes to the market place.

Against this background it was decided that British Telecom should be at the forefront of the new cable business. Apart from the substantial growth opportunities and the prospect of developing an important new business activity, there was also seen to be a long-term benefit in installing local networks able to carry a range of integrated services. Not least, it was recognised that broadband cable systems would play an important role in the new environment.

One important early decision was that British Telecom should not constrain its interests artificially by concentrating on any one activity to the exclusion of others. As cable provider, British Telecom would install and maintain the systems needed to carry the new services. It would continue to act in its traditional common carrier role but would also take part in supplying services over the system by acquiring shares in the consortia formed for this purpose. British Telecom would also offer a variety of services to operators, facilities for delivering programmes terrestrially or by satellite to cable systems, and services directly to subscribers.

Expertise

This approach has proved extremely successful and British Telecom is now the major force in cable in the United Kingdom. Factors accounting for this include:

Superior competence in technology: Combining its established expertise with an extensive study of existing systems in North America, British Telecom offers systems particularly adapted to British requirements, including a completely new switched system designed in its research laboratories at Martlesham.

Commercial credibility: British Telecom's historic strengths are a great advantage when brought to bear on cable – to the Government, who wish to see fast but orderly development; to suppliers, operators and other partners, who welcome the reassurance of dealing with a soundly-based organisation and above all to customers, who need a reliable service.

Financial realism: Cable systems are expensive and British Telecom is ready to provide them on a long-term investment basis.

Co-ordination and control: All activities have been pulled together through one dedicated British Telecom unit, Broadband Services, which deals with policy and central promotion. Technical planning and development are in the hands of Local Lines Services Department and British Telecom Research Laboratories while detailed installation is being carried out in the regions.

British Telecom's commitment has paid off, and has secured five out of the 11 pilot projects authorised by the Government. Together these cover 500,000 homes. In each case British ▷

A taste of things to come . . . many families could soon be viewing a range of tv programmes from British Telecom Cable.

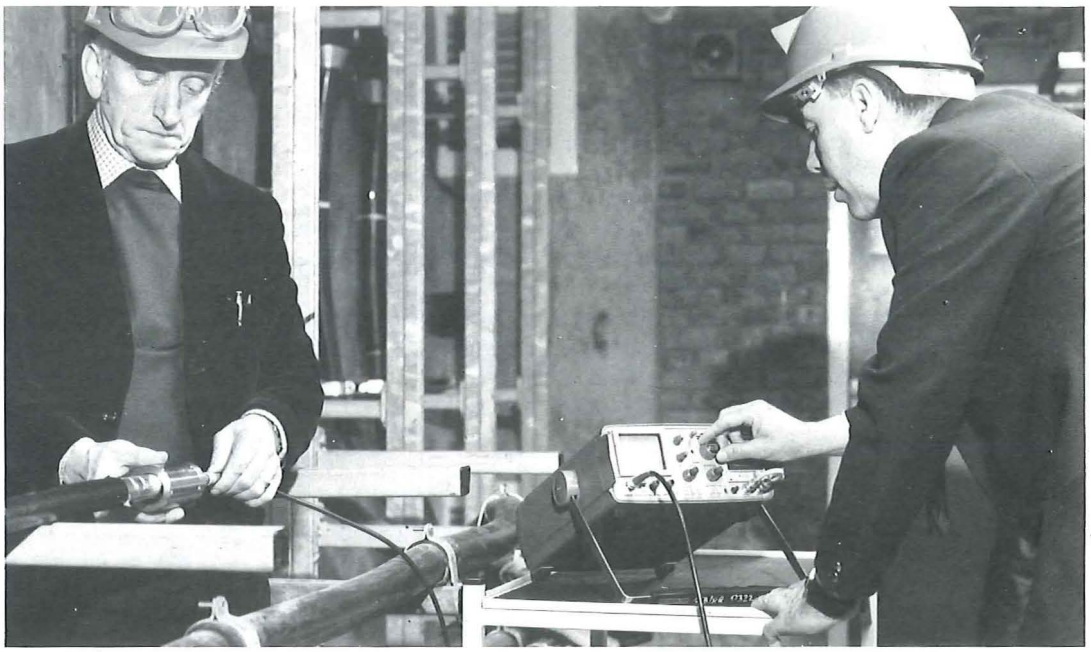
An example of the services which customers can expect

Basic Service
Customers will pay £7 per month
BBC1
BBC2
ITV
Channel 4
Out-of-area BBC/ITV
DBS (when available)
General entertainment — From satellite
Women's channel — Health, homemaking, careers
Children's channel — Features, cartoons, shows, games
Sports channel — UK and overseas
Community channel — Local news, local access
News and weather
Music channel — Video + news, reviews, interviews
Classic films
Education channel — Open university etc
FM stereo sound channels
Programme guide and user directions

Premium Service
Customers will pay basic charge +£7 per month
Movie channel(s)
Disney
Culture channel — Concerts, ballet, opera, arts

Video Library
Customers will pay basic + premium + £2 per film
Movies, instruction, education on demand

Special Services
Customers will pay according to use
Videotex
Teleshopping
Telebanking
Telesoftware
Electronic games
Electronic mail
Customers will pay individually (Pay-per-view)
Sporting events
Concerts
Special events



Testing signals at the cable terminal is an important aspect during installation work.

Telecom will provide the system and share in the cable operation.

Belfast, Liverpool and Westminster are each to get the switched-star system designed at Martlesham while Aberdeen and Coventry will be the subject of a different approach in which non-switched systems will be installed initially, in such a way to allow conversion to switched operation in future.

British Telecom has many partners in the cable operating consortia, ranging from major industrial firms to local businessmen, and has tailored its arrangements to meet their needs and the particular requirements of each project.

Cable operators are being supported through market analysis financial models and arrangements for the international delivery of programme material from satellites and for its national distribution. And a wide range of interactive services available on the new systems is currently being worked out.

Market needs

The one common thread which runs through all these activities – market needs – will remain as the key to further development. Market opportunities will continue to shape planning and the new systems will be specifically designed to offer economical and popular facilities. Publicity surrounding cable projects will sharpen the need to meet installation targets, but it is the service to customers, more than anything else, which will determine the future of cable. Customers will be both aware and critical, and will have no hesitation in switching off poor quality or bad service. Similarly cable must meet the commercial demands of cable operators who want high quality billing, administration and maintenance.

Given a high level of service, cable will create a range of new job opportunities. Building and installing a system over a comparatively short period – usually three years – will require a great deal of effort, after which there will be a continuing need for smaller numbers of staff to run the system for the licence term of up to 20 years, as well as any follow-up licence. More staff would be needed if the system were extended. The system will generate other jobs, notably in sales and marketing and the provision of services. Beyond this, cable will give rise to increased activity in manufacturing and programme production.

Strategy

Currently, everybody in cable has two overriding concerns. The first is to implement successfully the plans laid down for the pilot projects and approved by the Government. The second is to build a strategy for the future which is firmly based on experience so far.

By next spring customers will be connected to new British Telecom systems and receiving new television channels including sport, music and the latest movies, as well as FM sound channels. They will also have access to videotex and other information services and will be able to play games over the system and get software downloaded to their home computers. Customers on the Martlesham switched-star system will be able to call up a video library and have the film of their choice played on demand.

Later, more services will be offered – home shopping, home banking and security services are examples. Picture videotex will greatly enhance information services and an electronic mail facility will enable messages to be sent throughout the system.

Future developments will include high-definition television with stereo sound, an expansion of data-carrying capabilities and videoconferencing facilities. Beyond this, it can be confidently predicted that this new broadband medium will give birth to much innovation in services.

Already cable means more than just wall-to-wall Dallas. Rather, it signals a new departure in communications . . .

Mr M L Wheller is chief commercial officer, Broadband Services, with special responsibility for cable provision and operation.

ISIS takes over

Brian Grover

British Telecom Journal
Spring 1984

With the phasing out of Telecommunications Instructions, British Telecom's major operating divisions are developing their own replacement systems. By far the largest of these is ISIS, the Inland Services Information System, which began last October on behalf of Local Communications Services and National Networks.

Up until the beginning of last year, the role of Headquarters Departments in providing rules and regulations, instructions and guidance on almost every aspect of running British Telecom had steadily increased. The centralised system of Telecommunications Instructions (TI) had grown into an industry in its own right generating some 1,500 new or revised TIs each year. This meant distributing nearly 30 million pages of information to more than 130,000 file holders (see *British Telecom Journal,* Autumn 1982). This proliferation of instructions had tended to create bureaucratic procedures and stifle initiative and led to the Chairman's Policy Committee decision to cease the TI system.

An analysis of nearly 12,500 TIs in existence at the end of 1982 showed that Inland Division – now LCS and NN – was responsible for the contents of about 10,500. Nearly 2,500 of these were cancelled by the end of March and the rest should go by the end of the year. Meanwhile, any information essential to retain will be converted to the new Inland Services Information System (ISIS).

If managers and staff in LCS and NN are to be free to use initiative there must be a clear distinction between formal or 'obligatory' instructions and information published for guidance. As its name implies, ISIS is intended primarily to supply information and guidance rather than become a collection of formal instructions. Some formal instructions are necessary, however, and for this reason the contents of ISIS will be divided into two main categories:

**Directives* – containing procedures for implementing corporate policy, business standards and national agreements which must be followed without variation:

**Practices* – containing technical, operational and administrative information for the guidance of management and staff.

House style

To ensure that information in ISIS is attractive yet conforms to a recognisable house style, an advisory team has been set up to help authors present their material. Authors will be encouraged to make more use of diagrams and illustrations including colours and to specify different typefaces and page layouts where they are appropriate.

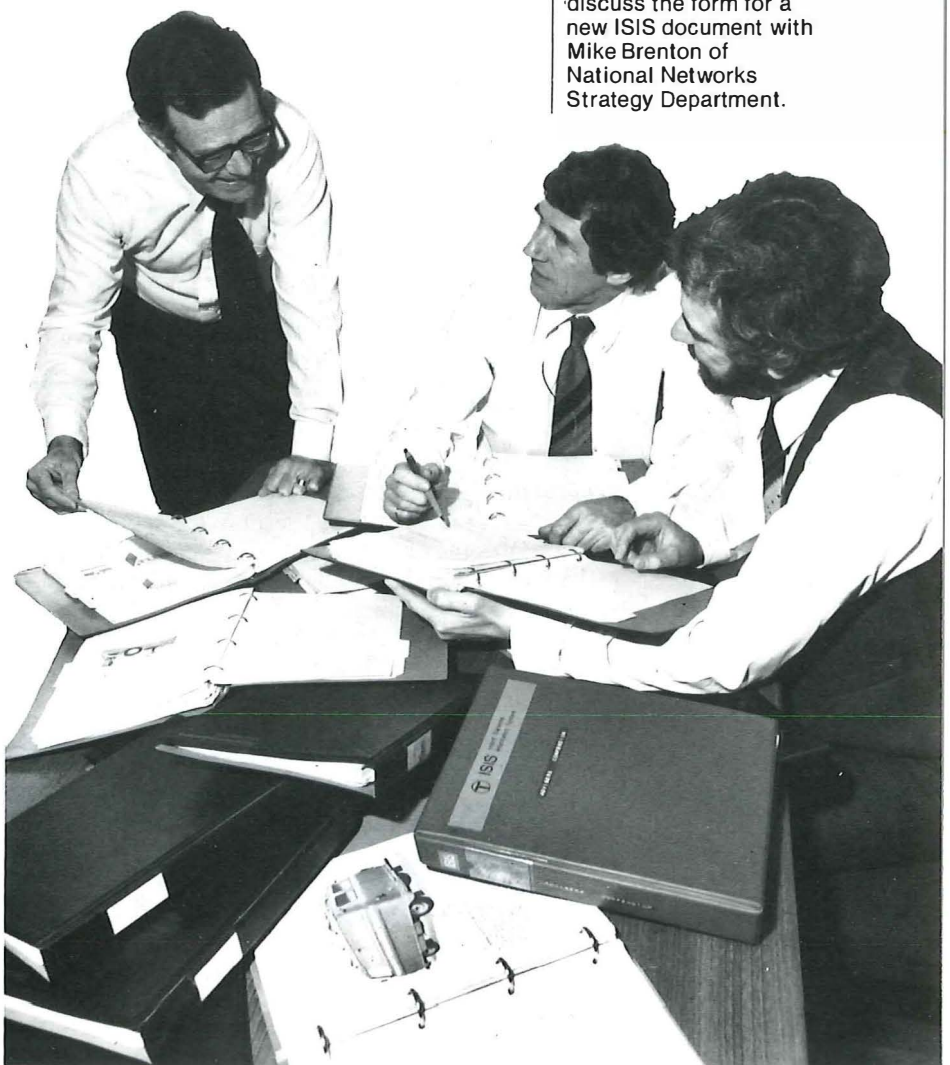
The first and most pertinent question the advisory team will put to authors, will be – "Do you need to say anything at all?" followed by "Who are you writing for; what is their particular need for information and in what form?"

Much of the information converted from the TI system will continue to need two or three sheets of A4 size paper. To save the expense of producing new loose-leaf binders, plastic labels showing the ISIS logo are available for fixing to the one and a quarter million TI binders which will become spare when the TI system is finally withdrawn. Wherever practicable, however, information will be restructured so that all related information is gathered together within comprehensive stand-alone manuals or handbooks.

Any large collections of information need a filing system or classification to assemble the information in recognisable order as well as a detailed index to enable specific items of information to be found. The file classification chosen for ISIS is a three-part structure based on subject matter in the form:

Discipline/main subject/specialism and document number.

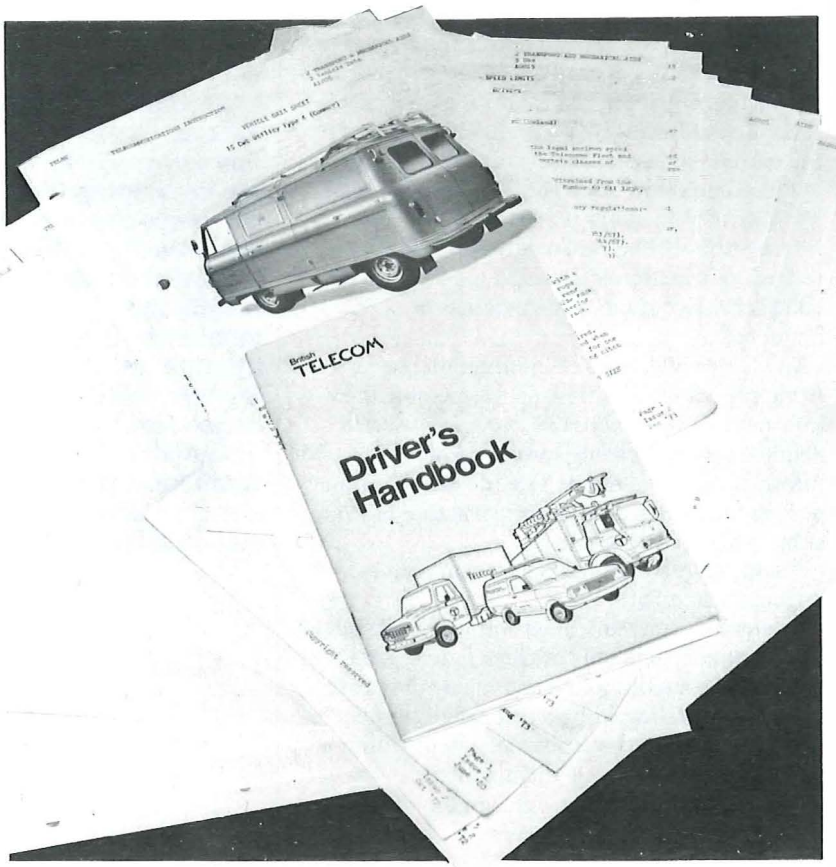
Mnemonics (memory aids) and well-understood abbreviations, generally of three letters, are used to identify each discipline and main subject. A single letter, followed by a three-digit number is used to identify a particular document within a specialism. For example the notation TMN/OFS/B123 means Transmission/Optical Fibre Systems/Planning document number 123 ▷



Brian Grover (left) and Brian Jones (right) discuss the form for a new ISIS document with Mike Brenton of National Networks Strategy Department.

in the planning series. Similarly OPS/FAC/C234 means Operator Services/Facilities/Staffing document number 234 in the staffing series.

To avoid having two separate filing systems, Directives and Practices share the same file classification but are clearly marked to show what they are. In some instances it may be more convenient to include obligatory or Directive-type paragraphs in a Practice. These too will be clearly marked.



One of the first documents in ISIS is the 44 page driver's handbook which incorporates information previously contained in 32 TIs. This booklet should be carried by each of British Telecom's 56,000 vehicles.

An alphabetical index will be created for each main subject and will be compiled from key words in the titles of ISIS documents or descriptions of their subject matter. An overall master index, combining all main subject indexes, will eventually be developed.

At this early stage, ISIS is based on 25 disciplines, 150 main subjects and 400 functions or specialisms but these numbers can be increased if necessary as the contents of the system expand and are more clearly defined. In the longer term, trainng information may also be included and filed adjacent to the appropriate Directives and Practices. The intention of this is that all up-to-date information available on a particular subject will be filed together for the convenience of the reader.

To avoid sending information to people who neither want it nor need it for their work, the locations and contents of individual ISIS files held by staff – which may range in size from a single handbook to a large proportion of the total information within ISIS – will be determined by local management. The distribution of Directives and Practices to these individual files will be through ISIS distribution centres located in main offices throughout the UK. These centres will receive ISIS material in bulk direct from the printer, based on estimates of likely demand already made against each of the initial 400 specialisms. They will also be able to amend their estimates or order one or more additional copies of individual documents as required.

Comprehensive

ISIS distribution centres outside LCS and NN Headquarters will each maintain a comprehensive file containing all material issued within ISIS including a copy of the ISIS master index. Separate arrangements are to be made for distribution centres serving Headquarters units to share the use of a few strategically placed comprehensive files and master indexes.

All the pertinent information on the costs of printing and distributing ISIS documents will be held on a computerised database and local management will be kept informed of the costs of the material they receive.

In the present climate of technological innovation the continued use of printed paper might be regarded as unimaginative. Other methods have been tested including on-line interrogation of computerised information files, facsimile, electronic mail, teletex and microfiche, but none, as yet, completely solves the problem of how to provide a wide range of information, involving both the written word and complex illustrations, to nearly 200,000 staff in widely spread locations and in a great variety of working conditions. ISIS has been designed with future flexibility in mind and will be able to adapt to new information technologies as they become more widely used.

The success of ISIS will depend largely upon the willingness of authors to recognise the particular needs of their readers and to present their information in the most appropriate form. Managers must also ensure that their staff have access to the information they need to do their job efficiently but at the same time not accumulate large amounts of information that has no relevance to their work. A great deal of effort and change of attitude towards presentation and use of information will be required over the next year or so and it is important that ISIS can respond quickly to the many challenges which face it.

Mr B D C Grover is a head of group in ISIS responsible for advising authors and LCS/NN staff on use of the system.

ISIS Inland Services Information System

In the National interest

British Telecom Journal
Spring 1984

The fifth and final article in our review of British Telecom's major divisions looks at National Networks set up to operate the trunk service and to provide total capability for major business customers.

British Telecom has always been accustomed to working in a changing environment but in the early 1980s the pace accelerated following technical advances and political decisions. The present Government together with financial analysts saw the telecommunications-related businesses as promising high potential growth – not just in the immediate future but sustained to beyond the year 2000.

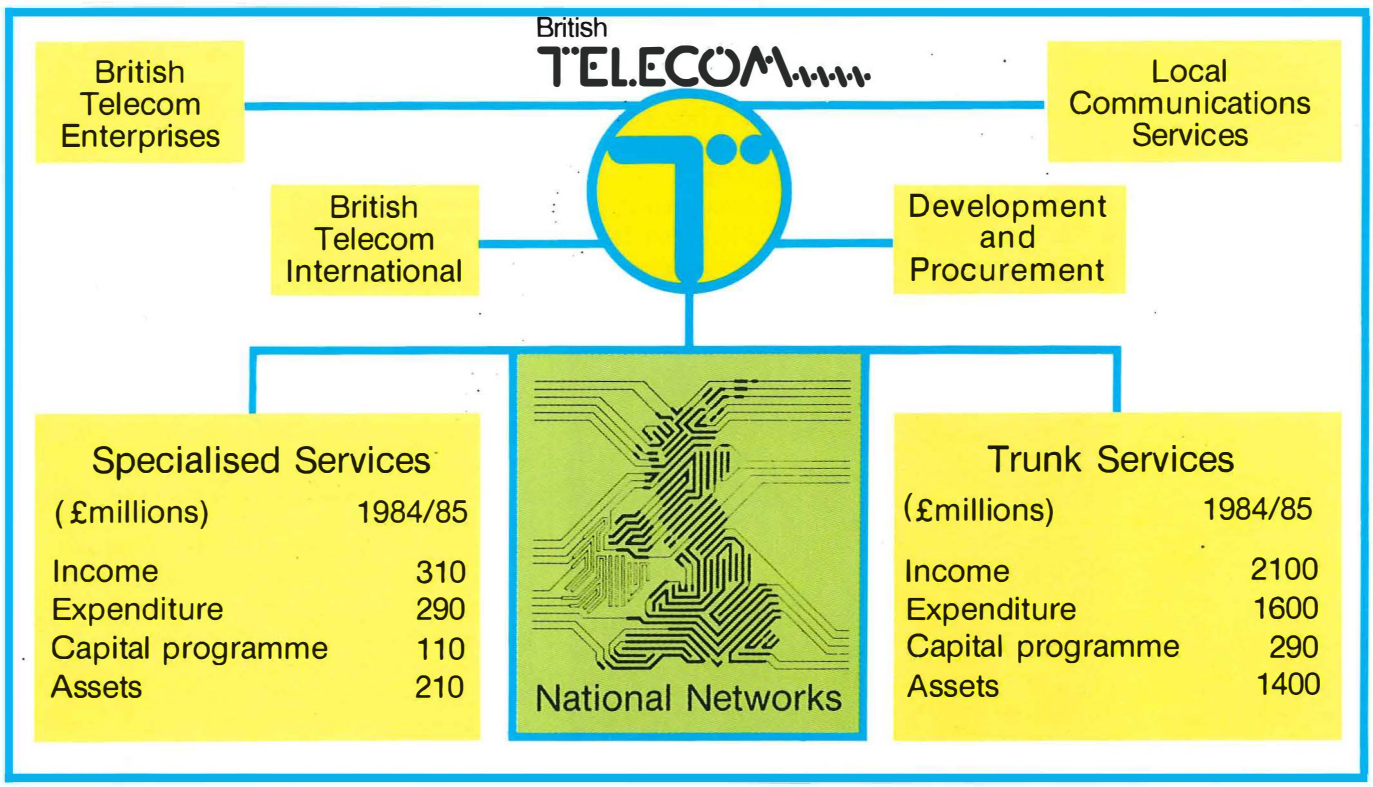
To realise that potential, the Government decided to liberalise telecommunications by removing British Telecom's monopoly and allowing competition. The problem was that the proposed competition was not aimed at British Telecom's total business but rather at selected highly profitable segments. The trunk network currently accounting for about 25 per cent of turnover, was a typical example.

It was important, therefore, that British Telecom reacted quickly and positively to meet this challenge. After due consideration the British Telecom Board decided that from the existing skills and expertise within Inland Division it would create a new organisation to meet competition on a more equal footing.

To this end, the Board authorised the splitting of Inland Division into two independent profit accountable business units – Local Communication Services (LCS) and National Networks (NN). LCS would concentrate on the local customer and continue to operate within telephone areas while NN would take over the long-distance trunk network and other nationally orientated networks. The new organisation became operational some months later.

NN's organisation does not use the traditional tiered area, regional and THQ management structure. Instead a vertical management hierarchy has been developed so that lines of communication are short and information can pass rapidly throughout the division. Within a particular skill, such as exchange construction, the senior manager has the responsibility of ensuring the agreed programme is carried out together with the resources, manpower and materials to do the job. In this way, direct accountability is now possible. The objective is to achieve a fast, flexible response to customer needs and satisfy their demands which is the way to ensure British Telecom's continued dominance of the market.

To achieve this aim, NN is deployed into two formations – Trunk Services (TS), and Specialised Services (SS) – each being a separate profit centre. They are supported by a commercial arm which evaluates the competitive scene, formulates market strategy and advises on needs for new product and service development. ▷



Above: The advent of the electronic office means big business for National Networks.

Above right: A stored program control (SPC) exchange at Keybridge House in London keeps the telex user up with the latest technology.

Far right: Packet SwitchStream (PSS) is suitable for most data transfers such as electronic funds transfer, credit card verification (above) and Prestel gateway services.

Specialised services

SS develops and provides a wide range of networks for business customers. It is a nationwide operation working closely with LCS providing large corporate communications networks which link a customer's individual local sites together. It aims to satisfy the total communications needs of British Telecom's large customers.

Telex is the largest text communications network in the UK and SS is investing large sums to maintain excellence of service. The existing Strowger-based network is undergoing extensive modernisation. New stored program control (SPC) exchanges will offer a wide range of additional facilities which will help to keep telex attractive and provide new sources of revenue. These include automatic re-try, short code selection, call redirection, date and time insertion, advice of call units, recorded announcements, prerecorded messages and many more.

And, of course, there is the digitally-based family of advanced network services developed by SS and marketed as X-Stream. These employ digital switching and transmission and offer significant improvements in facilities, performance and economy over analogue services.

Packet SwitchStream (PSS) is a switched data service providing an efficient transmission system for most types of information transfer. PSS is particularly attractive for traffic with short discrete transactions such as electronic funds transfer, credit card verification and Prestel gateways. Demand for PSS is growing rapidly and SS is investing in more exchanges and other facilities. An important aspect of PSS's success has been its links to other packet switched networks around the world.

KiloStream provides digital capacity in the main network. It gives extensive national coverage more economically than analogue private circuits, particularly at higher data rates, together with rapid circuit provision and built-in diagnostic facilities.

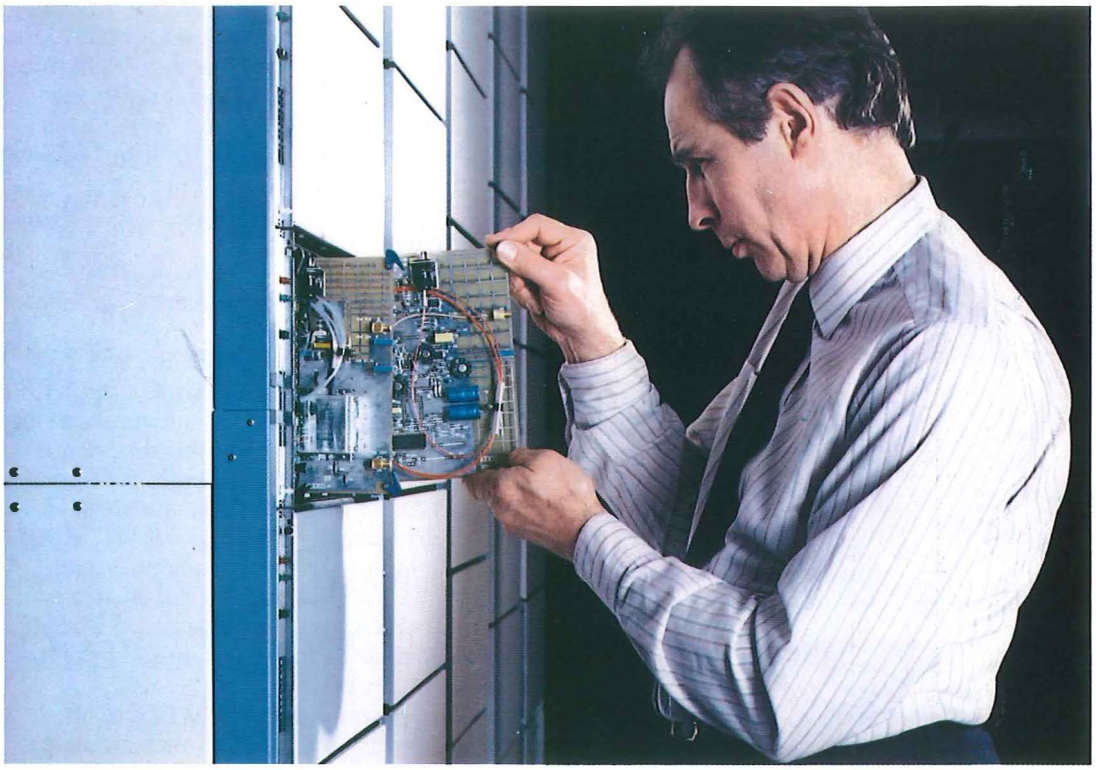
MegaStream offers high capacity digital point-to-point service at data rates of 2Mbit/s and above. It is ideal for connecting together PABXs, large computers in corporate networks and can provide links for digital video conferencing services – marketed as VideoStream. SS also provides long-distance analogue private circuits and a range of specially-engineered facilities for radio and television networks.

In its role of exploiting NN facilities to the full, SS is currently developing further network services to offer customers. Within SS there are a number of divisions responsible for planning developments and managing the individual services. Much of the day-to-day field engineering and operational work is done by TS or LCS on an agency basis. SS engineers man key network management and control facilities.

SS has responsibility for national major account managers (MAMs) who service British Telecom's largest accounts. The MAMs advise these large customers on all British Telecom products and services and are supported by network specialists working for both SS and LCS who provide technical, engineering and implementation support. SS also markets a range of equipment such as multiplexors to terminate its network services and has an independent consultancy unit with staff skilled in customer network analysis and design.

Telecom Tower staff continually monitor national television programmes carried over National Networks circuits.

British Telecom Journal
Spring 1984
In the National interest



The 140 Mbit/s optical fibre system now in service at Baynard House can carry up to 1920 speech channels.

Trunk services

A single organisation operating throughout the country, TS is responsible for planning, providing, operating and maintaining all transmission systems and switching centres which make up the main trunk network. This includes both analogue and digital plant and equipment. Its services will be sold to other parts of British Telecom as well as to external commercial customers.

District staffs have been formed from those in regions and areas with the necessary trunk skills. By April all nominated area staff had joined TS. The aim is that the new organisation is as independent as possible from the start but there will still be a need to use some LCS facilities in the early years. NN as a whole will employ some 12,000 staff throughout the country, most of whom will be joining TS.

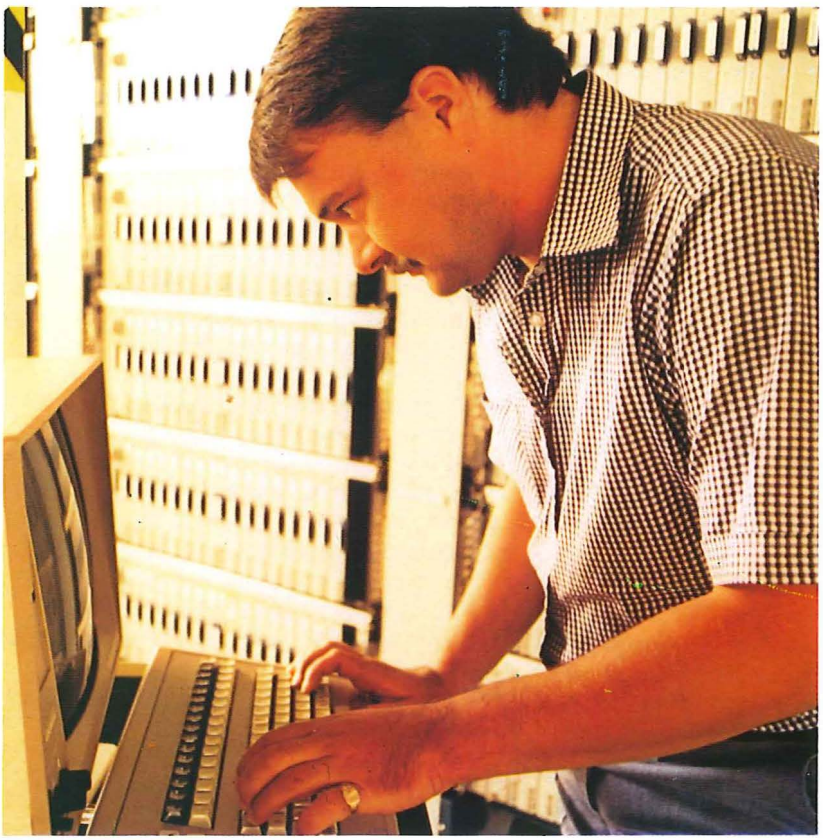
TS is organised into eight divisions – four for planning and works, two for operations and maintenance, one for commerce and one for personnel matters. Each has a specialised responsibility and most have district staff.

The trunk network currently comprises more than 410,000 trunk circuits controlled from 435 trunk maintenance control centres. There are over 400 group and transit switching centres served by 600 repeater stations and 200 radio stations which represents an asset base with a value exceeding £1.6 billion. It is also a network which is still growing and absorbing new technology. While the existing analogue network will continue to function until the late 1980s, a digital network will gradually grow alongside – eventually taking over from it.

The digital network with its continuing development and exploitation will be an important facet of TS operations in the immediate future. The plan is to modernise and rationalise rapidly the trunk network by installing digital SPC exchanges interconnected by digital line and radio systems with a growing use of optical fibre cables. A challenging target date of 1988 has now been set to have this plant installed and in service.

Many digital transmission systems are already operational and the first production digital switching unit (DMSU) opened at Coventry last December. There will eventually be 60 large, fully interconnected, DMSUs capable of ▷

System X in operation at Coventry Spires exchange.



National Networks is responsible for trunk maintenance and many aspects of development.

providing enhanced STD services and allowing introduction of new competitive services.

An example of how TS will operate in future is illustrated by considering the development of the Derived Services Network (DSN). Early last year, market intelligence indicated that there was a large untapped market for an automated Freephone service. Typical potential customers would be companies offering viewdata, phone-in, direct response to tv advertising, mail order, radiophone, radiopaging and car breakdown services. The North America Freefone service was worth $1.5 billion in 1981, and recent estimates predict an income of some £300 million by 1990 for a similar service in the UK.

If TS did not move quickly to satisfy this potential market then someone else would. Plans were agreed, based on an overlay network of eight fully interconnected switching points, and authority to proceed was sought and obtained from the British Telecom Board. Work has already begun in installing the exchanges and completion will be achieved in April next year by which time NN will be selling the service.

This type of approach makes sense because the customer gets the right service at the right price, while British Telecom gets a new source of revenue and satisfied customers. At the same time its staff are working for a growing business that can maintain employment prospects.

A new approach

There will continue to be close cooperation between NN and colleagues in the other four BT Divisions.

NN has been set up to provide the long distance inland communications services in the new competitive environment and results so far are encouraging and confirm that the original Board decision was correct. Feedback from sales staff indicates that current products are good, and show where improvements need to be made and what customers future requirements are likely to be. This information will be used to ensure the right products are available when the customer needs them at a quality and price that he is willing to pay.

The investment programme is forging ahead and the first fruits of modernisation are already appearing in the switching and transmission fields. But the pace of technological change will not slacken and all those involved with NN must be prepared for further changes in the future. NN is an ambitious organisation and has set itself a challenging programme which must now be achieved.

Long distance communications is a growth industry operating at the forefront of technology. The advent of competition has added a new dimension and has made NN more alive to the needs of the market. By seeing and grasping profitable opportunities as they arise and ensuring customer satisfaction with the services it offers, NN will retain its position as market leader in national telecommunication markets.

Right: Staff in National Networks' trunk network operations division at Oswestry prepare circuit provision forms known as A886s, and which provide the authority to work on the network.

British Telecom Journal
Spring 1984

The need for structure

Chris Panton

Structured programming is playing an increasingly important role in computer-based technology throughout British Telecom. This article looks at what is involved and how a special course is helping.

Most British Telecom staff involved in computer programming probably consider that they write structured programs . . . but do they really understand what 'structured' means? If pressed they would probably come up with a variety of definitions ranging from modular programming to what is termed 'functional decomposition'.

The trouble with 'structured' techniques which break problems down into sub-functions – based on the idea of divide and conquer – is that they rely on inspiration and/or intuition on the part of the programmer to decide whether the best breakdown should be in terms of time, similar tasks or datastreams.

The need, in fact, is for a structured technique which provides step-by-step rules so that all programmers applying the method to a particular problem would arrive at essentially the same design.

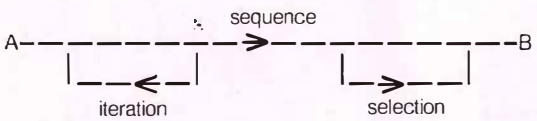
The reason for this can be summed up in one word – maintenance. It has been estimated that up to 80 per cent of the lifetime costs of a project can be assigned to maintenance. One of the main reasons for this is that a programmer maintaining a program which he did not write finds it difficult to understand the originating programmer's work.

If, on the other hand, a program has been produced using fixed rules of design which everyone can understand, that program will be easier and cheaper to maintain. Not only that, but by concentrating at the design stage on producing a rigorous and well-defined structure, significant savings can be made in the implementation timescale, and a more robust program produced. Indeed, the emphasis in structured programming must be on 'design'.

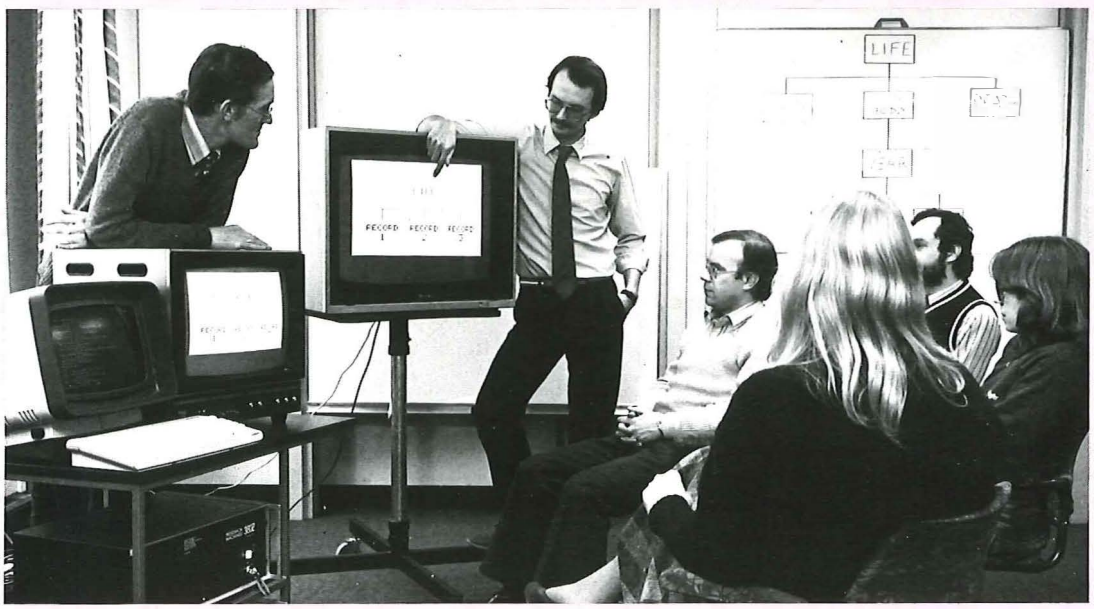
Spending time on making a thorough job of the early design stage is becoming common practice within British Telecom on many projects. Furthermore, a special course run by British Telecom Computing Training on structured design is available and relevant to anyone in British Telecom working on programming. The method of structured programming taught on the course is now so widely used by outside companies that it is fast becoming an industry standard.

A program or system can be viewed as a model of a 'real world' system and ideally the computerised model should have the same structure as the 'real world' system so that changes there could be reflected easily in the model. As the computer program's only view of the 'real world' is through the data presented to it, it would seem reasonable to base the structure of the program on the structure of the data.

Fortunately the structures of the data and of the program can be represented in terms of the same three simple components. For instance, if a program is viewed as a line running from A (the start of the program) to B (the end), with the instructions executed one after the other in the order they are written, then clearly that is a sequence.



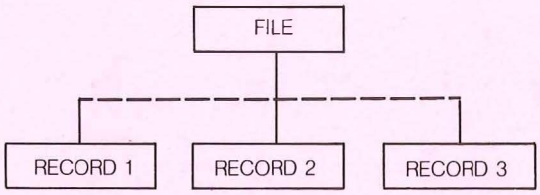
If this line is left at any point, it is possible only to rejoin it before or after it was left. ▷



Instructor Martin Camble takes a group of students through the initial steps of program design at British Telecom's Computing Training Centre in London.

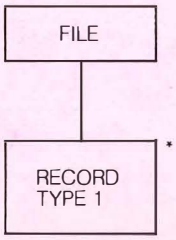
When the program is rejoined earlier than the departure, the result is an 'iteration' – the same instructions are executed a number of times. When the program is rejoined later than the departure, the result is a 'selection' whereby a different set of instructions in given circumstances was obeyed.

As sequence, iteration and selection are the only possibilities so data structures can be represented by these same simple components. Firstly, in data structures there may be a 'sequence' thus:



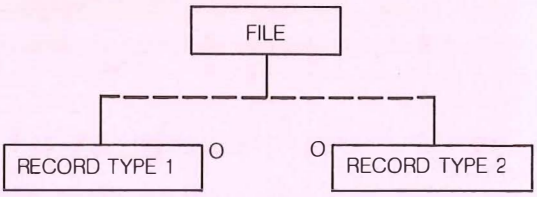
which shows that the file is made up of three records – record 1 followed by record 2 followed by record 3.

Alternatively there may be an 'iteration'. For instance the file may be made up of an unspecified number of occurrences of the same record type.



An iteration is indicated by the use of an asterisk beside the box.

Finally there is selection where a choice has to be made between two or more sub-components, only one of which will occur in any instance.



Here there is a file which contains either a record type 1 or a record type 2, but not both, and this choice is indicated by an 0 beside each of the possible boxes.

These structures may, of course, be extended through many levels, redefining the inner structure of any box at the next level down. This hierarchial structuring technique is powerful because large and complex structures can be created by the use of small and simple components.

As indicated earlier, structured programming consists of three well-defined stages.

*Drawing structure diagrams of the data to be processed;

*Combining these data structures into a program structure;

*Listing the elementary operations and allocating them to the program structure.

A simple example is a program which reads a file and produces an output print report. The input file consists of bank transactions, each of which may be either a debit or a credit. Apart

Figure 1

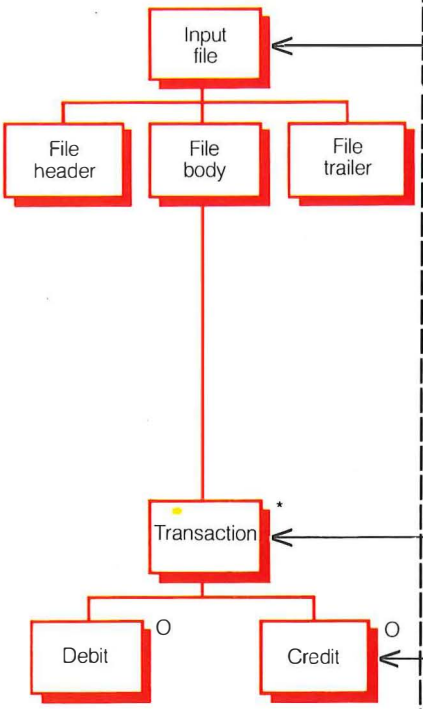


Figure 2

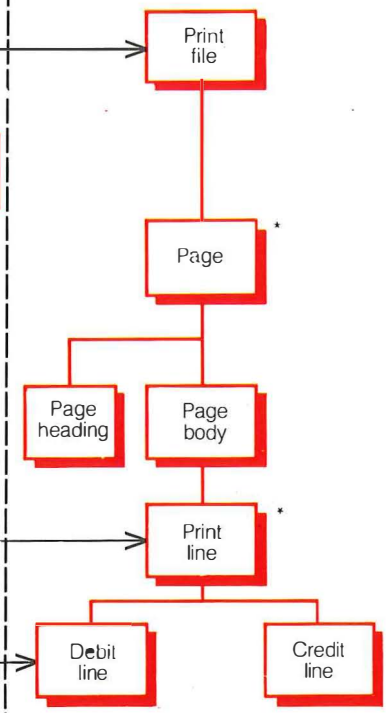
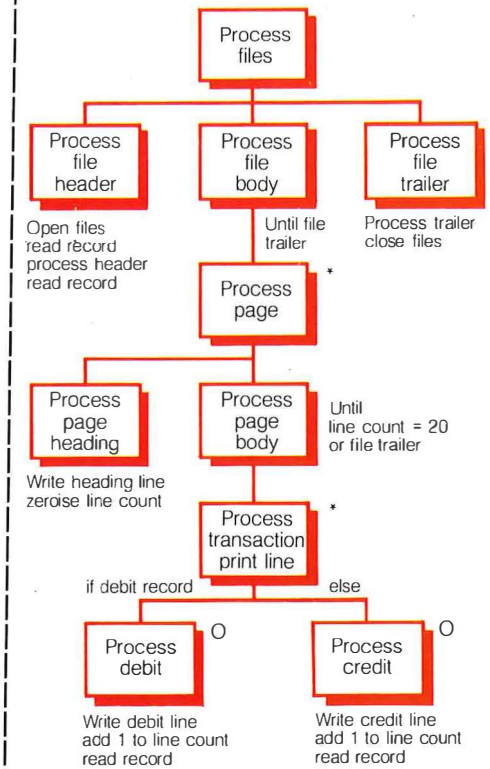


Figure 3



from these transactions, the only other records on the file are a header record at the beginning and a trailer record at the end. The structure diagram of this input file is show in figure 1.

But how was this arrived at? The way to create a data structure is to start at the most general level – in this case the file. Next step is to ask whether the box called 'file' is made up of a sequence, an iteration, or a selection or perhaps it is so elementary that it requires no further subdivision.

In this case the answer is a sequence, because the file header and file trailer occur only once in fixed positions at the start and end of the file respectively. A box in the middle of the sequence representing the rest of the file is then left and this is conventionally called a 'body'.

Working top-down, the process is then repeated for each of the components defined. As they represent single records, the header and trailer records are elementary, but the middle box clearly needs further subdivision. This file body must, in fact, consist of an iteration of transaction records.

It is tempting to stop at this point, since the record level has been reached. But this would not represent all the relevant relationships within the file, and so an extra selection level is added which expresses the fact that each transaction may be either a debit or a credit.

It now becomes clear that the perceived structure of a file depends to some extent on what is required of it. For instance, if only the number of records on the file were wanted, a structure consisting merely of an iteration of records would do. But if it were necessary to differentiate between the records (as is normally the case) a more complex structure is required.

In this case, it is important to differentiate between debit and credit records because the program is intended to produce a print file output of debit and credit lines. The output print file will consist of pages, each of which will contain 20 debit/credit lines, plus a page heading line. The structure diagram for this file is shown in figure 2.

Relationships

Having created structure diagrams for each of the files used in the program, the next task is to produce a program structure – the design upon which coding will be based. This is done by merging the data structures so that the program structure represents all the relationships inherent in the data structures.

First step is to look for 'correspondences' – one-to-one relationships – between components in each of the data structures. For instance, at the top level it is obvious that one output file is produced for each input file. Therefore these boxes can be merged into a single program structure box called 'process files'. Likewise for each transaction input there has to be an output print line. These boxes can therefore be merged into a single program structure box which processes an input transaction and produces a print line.

But not all the components have one-to-one relationships. For instance, there is no equivalent input box for the output page, because the input is not grouped into sets of 20 records each preceded by a header. Similarly, there is no equivalent sequence on the output file to the input level consisting of header, body and trailer.

All the original data structures must be retained in the finished program structure, so non-corresponding boxes must be slotted in, maintaining their relationships with the other components. The two data structures are thus merged together to produce the program structure as shown in figure 3.

Operations

The main part of the design work is now complete. The remaining task is to list the elementary operations necessary to produce the correct output from any given input, and allocate them to the program structure. This is done simply by asking of each operation how often it must be performed. For instance, the operation of writing a page heading line clearly must be done once (and once only) per page, and so this operation is allocated to the box called 'process page heading'. All the elementary operations necessary have been allocated to the structure in figure 3.

And finally, having completed the design work, there is the job of coding which is now a fairly mechanical task of transcribing the program structure into whatever programming language is required.

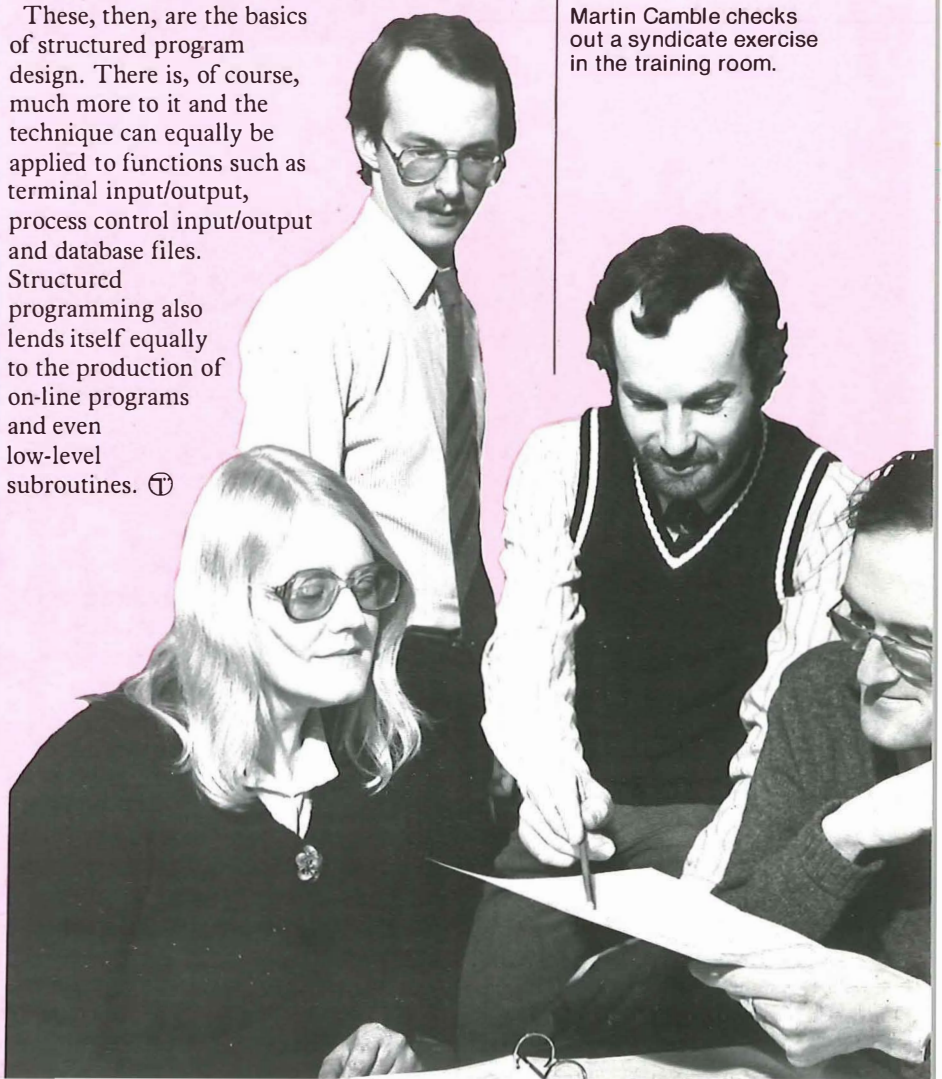
These, then, are the basics of structured program design. There is, of course, much more to it and the technique can equally be applied to functions such as terminal input/output, process control input/output and database files. Structured programming also lends itself equally to the production of on-line programs and even low-level subroutines. ⓣ

British Telecom Journal
Spring 1984
The need for structure

A one-week course called Structured Program Design is currently being run by British Telecom Computing Training at High Holborn. Anyone interested in the course should contact Keith Bryan on 01-404 0005 x 207.

Mr C G Panton is a lecturer at the British Telecom Computing Training Centre.

Martin Camble checks out a syndicate exercise in the training room.



British Telecom Journal
Spring 1984

How Voteline works

Caller

Exchange

Announcer

Line terminating equipment

Votes on the line

Alan Birch and Roger Green

Early last year, a new British Telecom service called 'Televote' was introduced. It enabled a radio, television or press audience to vote by telephone using equipment at eight major centres throughout the country.

After discussion with local radio station Mercia Sound, Coventry Telephone Area accepted that Televote could be adapted to meet local need. This challenge was taken up by two technical officers who between them developed 'Voteline' – a service which provides:

★ Digital display of votes cast at the radio station.

★ Separate displays for each option with up to four options such as Conservative, Labour, Alliance and Don't know.

★ Reliable and comparatively cheap microprocessor-controlled circuitry.

★ Four-wire link only between exchange and station – one pair for data, one pair for control.

★ High-capacity with the system handling up to 66,000 calls an hour, the limiting factor being the public exchange equipment.

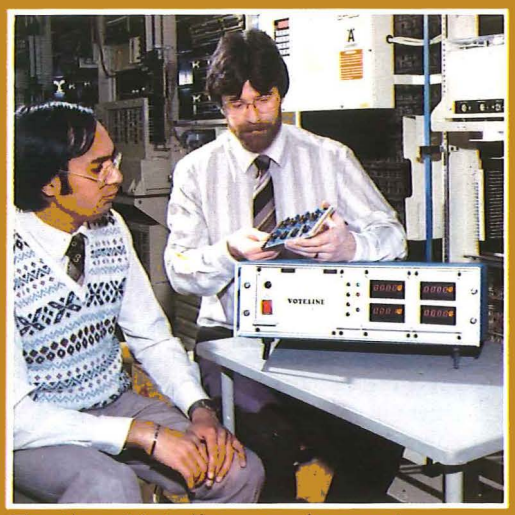
The Coventry service began just before last year's General Election and on that day more than 2,000 calls were registered. Since being introduced, calls have been received at a rate adding up to about 50,000 a year. Political and sporting polls have proved the most popular.

The Voteline equipment is divided between the telephone exchange and the studio console at Mercia Sound. This enables the programme presenter to control the system from the studio via a panel on which are mounted four electronic totalisers recording the votes cast by callers. There are four voting options each having an associated telephone number.

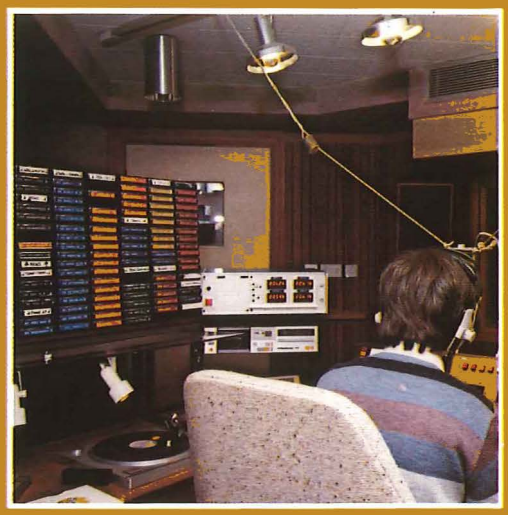
Signal

When the presenter invites listeners to vote he indicates the telephone numbers to dial for each option used. He then sends a 'count start' signal which takes an engaged condition off the lines and brings in the facility for connecting an announcement to inform callers that their vote has been recorded. Each registered vote is recorded on the totaliser associated with the number dialled so the presenter has an immediate indication of the state of the poll.

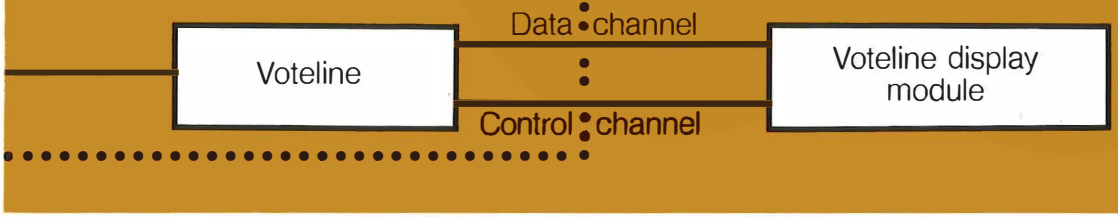
The system is operated by four simple push button controls and the system state is indicated by one of three indicators. Before using the system in a live context, the presenter has at his disposal a system test facility, which if used, generates 100 test calls. These are registered on



Testing Voteline equipment



Radio Station



Far left:
Coventry housewife Sue Whittle listens to the Mercia Sound announcement telling her that her telephone vote has been recorded.

Centre:
Technical officers Makhan Singh and Glen Chambers, who between them developed Voteline test equipment at Wolverhampton exchange for Beacon Radio.

Above left:
Mercia Sound disc jockey Jim Lee invites responses from listeners as Voteline equipment – on his left – totals up telephone calls.

each of the four totalisers and once the test sequence is complete the totalisers are automatically reset. At the telephone exchange the Voteline equipment registers and counts the votes as they come in.

At Coventry, each of the four Voteline numbers has 15 lines associated with it. Each line is connected to a line terminating circuit which acts as interface between the Strowger equipment in the exchange and the Voteline equipment. The two ends of the Voteline system are connected by a four-wire, speech-band circuit. Data and control signals use separate channels and consist of two out of five multi-frequency tones.

When a count is in progress all 60 lines are continuously scanned for calls. When one is detected it is stored, encoded and then transmitted in packets to the Mercia Sound studio where it operates the appropriate totaliser. A duplicate set of totalisers exists at the exchange which mirrors the state of the studio totaliser.

Flexibility

At the heart of the Voteline system is a microprocessor which controls all functions of equipment from opening the lines to ensuring that each vote operates the correct totaliser. The microprocessor is controlled by a computer program stored on an erasable, programmable-memory chip. This introduces a degree of flexibility in that the computer program can be re-written to introduce new facilities.

A major improvement to come from further talks with Mercia Sound was for a call trap to be incorporated under their control. This additional facility enables the station to select voters at random to take part in programmes thereby creating an air of excitement. It has been designed and incorporated in the system and went on trial in December. It is hoped to further the joint enterprise with Mercia Sound and by continued discussions, expand and improve the service.

The radio station has agreed to avoid using the service between 9 am and 5.30 pm weekdays which greatly limits provision of extra equipment in the public exchange.

If necessary, up to 30 lines per option could be made available on existing numbers. Over this, the system would have to transfer to special information services equipment. Work is in hand to develop Voteline systems for other areas and one for Beacon Radio in West Midlands Area is under construction. It will also be necessary to design the service for interworking with System X.

In working with Coventry's local radio station, a close relationship has been built up but there are other avenues to explore. Apart from radio, newspapers and local authorities are possible candidates for using the service to canvas public opinion. Coventry Area sees 'televoting' expanding for a number of years yet but when Prestel and interactive cable tv become more widely available, these services could well take over Televote's role. Ⓣ

Mr A Birch and **Mr R Green** are managers in the local exchange division of Coventry Area.

Entering new territories . . .

Far-reaching changes in the structure of British Telecom in which regions and areas will be replaced by 'districts' and 'territories' are now being planned by Local Communications Services (LCS). The re-organisation is aimed at making British Telecom more responsive to opportunities and customer needs.

The detailed arrangements to phase out the regional and area structure after nearly 50 years are being produced by teams up and down the country who are looking closely at the present set-up to see how it can be best adapted to flourish in the new competitive environment.

It is likely that there will be 24 'districts' made up from 50 telephone areas outside London. These in turn will be grouped into four territories. Because of its unique close-knit structure London will be regarded as a fifth territory although it is unlikely to have districts of the same type as envisaged for the provinces.

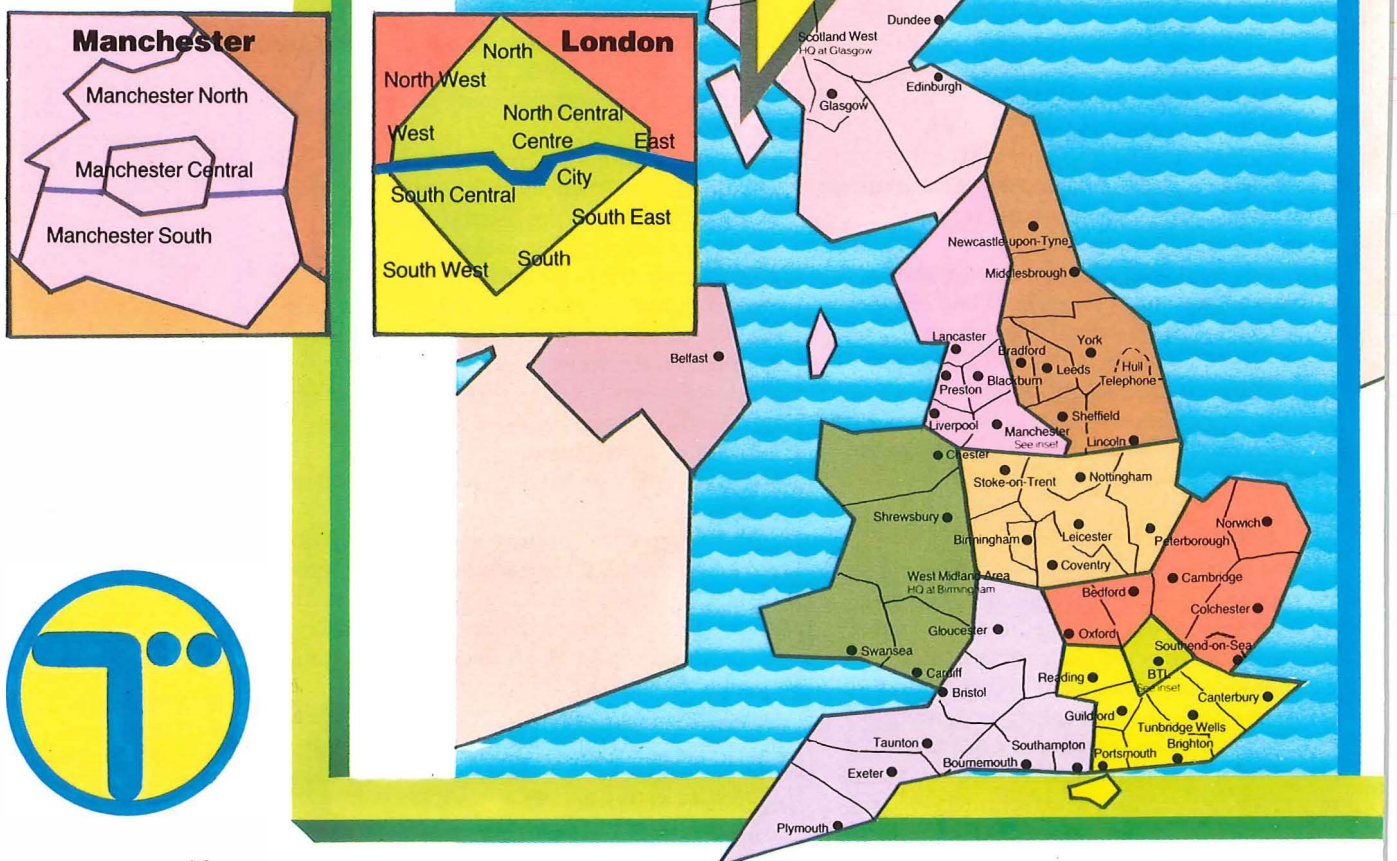
This reorganisation in LCS follows the changes introduced in areas last year (see *British Telecom Journal*, Spring 1983). That restructuring was designed to streamline areas by making them profit centres and introduce mixed-hierarchy working.

Iain Vallance, Managing Director, LCS, describes the creation of the districts as ". . . establishing self-sufficient field units, with responsibility for detailed planning, execution and maintenance of all LCS operations within each district office."

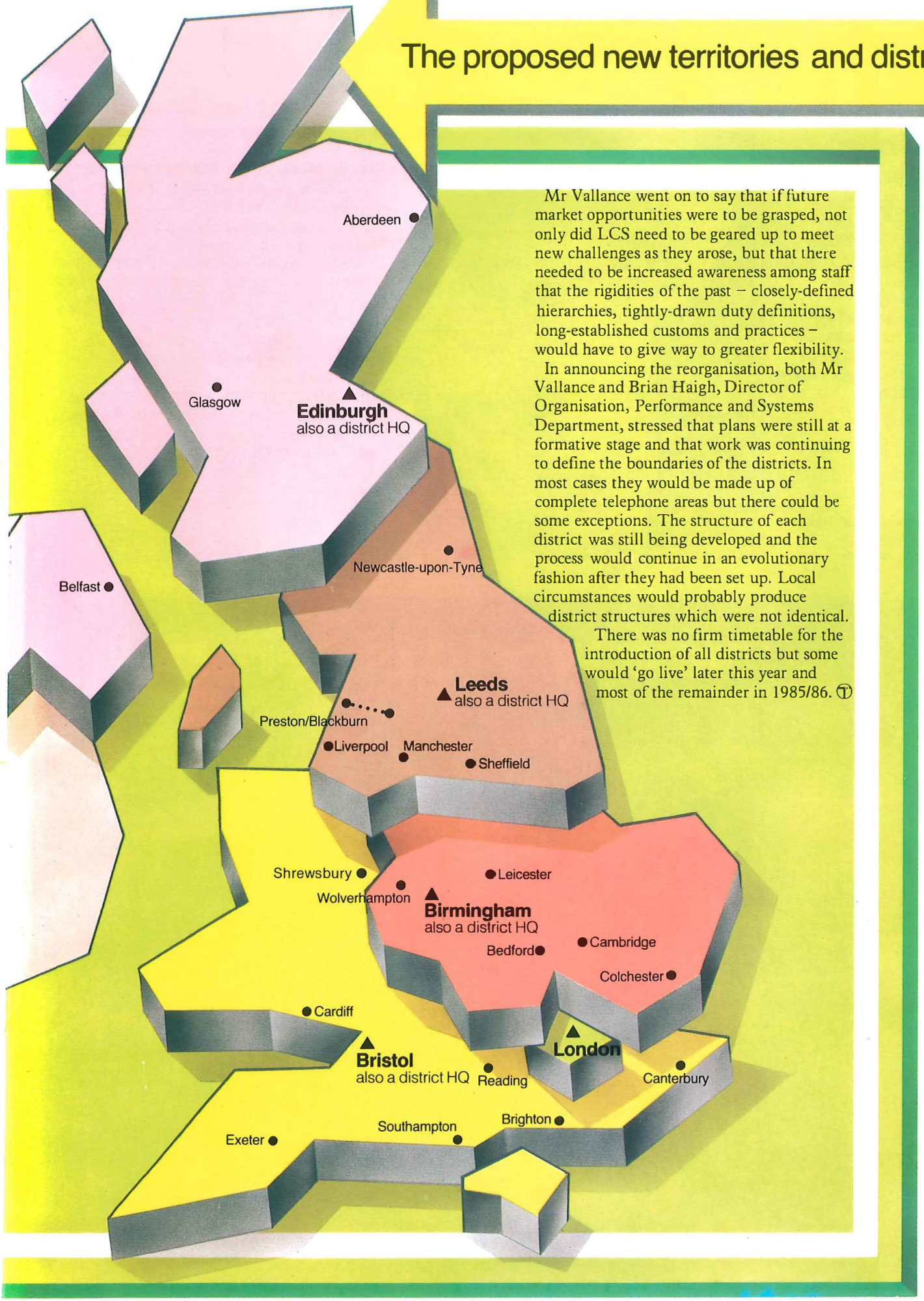
He said that British Telecom had to recognise from the outset that the 1980s and beyond would be a period of rapid and fundamental change affecting everyone. The recent decades of relative stability in the work environment had disappeared and were unlikely to return.

"Competition, unleashed by the 1981 Act, is already with us," he said, "and will become increasingly effective. New technology, and with it new services and facilities, are emerging at an ever-increasing pace, often in ways that cannot be foreseen. These are the inescapable facts of life and to underestimate their impact would have damaging consequences for LCS and all its staff."

The current regional and telephone area map



The proposed new territories and districts



Mr Vallance went on to say that if future market opportunities were to be grasped, not only did LCS need to be geared up to meet new challenges as they arose, but that there needed to be increased awareness among staff that the rigidities of the past – closely-defined hierarchies, tightly-drawn duty definitions, long-established customs and practices – would have to give way to greater flexibility.

In announcing the reorganisation, both Mr Vallance and Brian Haigh, Director of Organisation, Performance and Systems Department, stressed that plans were still at a formative stage and that work was continuing to define the boundaries of the districts. In most cases they would be made up of complete telephone areas but there could be some exceptions. The structure of each district was still being developed and the process would continue in an evolutionary fashion after they had been set up. Local circumstances would probably produce district structures which were not identical.

There was no firm timetable for the introduction of all districts but some would 'go live' later this year and most of the remainder in 1985/86. Ⓣ

This, the seventeenth in our series on overseas administrations, ventures for the first time to the South American continent to look at Brazil, a vast country of contrasts which contains some of the most modern telecommunications facilities.

Brazil, rich in many raw materials and famous for its coffee exports, is a vast country – the fifth largest in the world. It ranges from tropical rain forest in the Amazon basin to large areas of undulating forest-covered plateau and coastal lowlands. Its population is 125 million, yet density is under 15 people per square kilometre with most people living in urban areas in the south east and north east.
Forty per cent of the work force are in agriculture based in scattered farming communities but during the past 20 years manufacturing has grown significantly and exports have become highly important.

Microwave radio towers high above Rio de Janeiro.

New World enterprise

THE WORLD OF TELECOMMUNICATIONS

Despite being the eighth largest economy in the world in terms of gross domestic product, Brazil is still developing as a New World country but lack of its own oil supply has caused severe economic problems since the 1973 oil crisis.

Obviously for a developing country, telecommunications represent an economic paradox. They require large capital outlay and continuous expensive research and development (either imported from developed countries or domestic) but they are also vital to economic growth. Brazil at present has the tenth largest telecommunications system in the world (about ten million telephones). This is sufficient to cope with the vital needs of business but plans are in hand for future development to improve the situation overall.

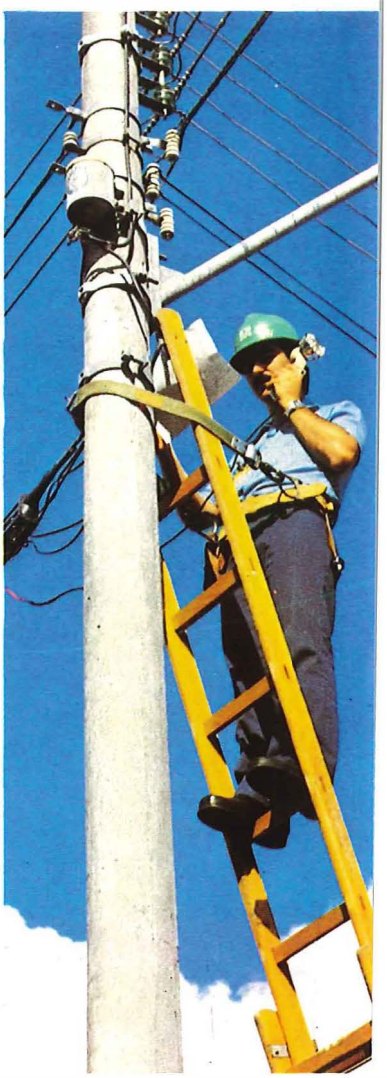
If in the early 1960s, one had forecast the likely situation in Brazil in 1983, it is doubtful whether the current situation would have been anticipated, as at that time there were over 800 very small private telephone companies which had sprung up in a very localised form with little or no interconnection. The government had made no plans for telecommunications at this point, and it was becoming apparent that a comprehensive system would not emerge naturally.

In 1965 the government stepped in with the formation of a public company called Empresa Brasileira de Telecomunicacoes – Embratel – as the trunk and international carrier, and in 1967 created a separate Ministry to regulate communications, with the task of unifying telecommunications. It was from this date that effective planning really began in Brazil and the foundations of the present system were laid.

A second important development was the rationalisation of operational organisation with the formation in 1972 of Telecomunicacoes Brasileiras S/A – known as Telebras. The Ministry was then in the position of being the policy maker, and Telebras became the overall administrator, setting up 28 state-wide operators with the status of limited companies for which Telebras was the holding company. Embratel also became a Telebras subsidiary. ▷

Left: Brazil has about 75,000 public call boxes.

Below: A linesman's work is similar the world over.



The authors – **Messrs P H Dabbs, F Cassidy, D Long, A Watson** and **M Reid** are all members of the international comparisons group in the organisation, performance and systems department of Local Communications Services. They acknowledge the help of **Senhor Rodrigo Octavio Cesar Jordao Ramos,** assessor de comunicacao social.

Manufacture of printed circuit boards is undertaken by the Brazilian administration.

The process of absorbing the private companies then began and this is only now nearing completion. Telebras provides finance for the system by share issue and by borrowing from capital markets and allocates resources to the companies for the implementation of policies set by the Ministry of Communications. Telebras is particularly concerned with helping development in the more remote areas, as well as providing services to the low income sector of the population.

As a result of the improved organisation, the telephone system grew from 2.4 million telephones in 1973 to about ten million by last year. Telephone penetration is still low at 7.3 connections per 100 population, but as 70 per cent of connections are in the major cities and 42 per cent are concentrated in the four main commercial centres of Brasilia, Rio de Janeiro, Sao Paulo and Belo Horizonte, the vital business links are covered. The most frequently called countries are the United States, Argentina, Peru, Chile, Venezuela and the United Kingdom. There is also a sizeable public coinbox system with 75,000 installations.

Today most switching is electro-mechanical but the Ministry's plan has always been to introduce electronic switching at the earliest possible date. As a result, the domestic research and development centre in Sao Paulo began work on developing a home-grown electronic switching family known as Tropico in the mid-1970s.

A new development in Brazil, as in the rest of the world, is fibre optic transmission and in late 1982, a prototype fibre optic link began trials between two exchanges in Rio de Janeiro. This was the culmination of ten years of development to find an economical manufacturing process which would compare favourably with imported products.

With the efforts made in training staff and the installation of modern equipment, the quality of telephone service has been steadily improving although, as yet, at 87 per 100 telephones a year, fault reports are high. On the other hand, 99 per cent of faults are cleared within 24 hours. There is also a large and fast growing telex service, the 12,000 telex stations system of 1975 having grown to a phenomenal 66,000 in 1982 which contributes significantly to overall income.

Investment

Of a total operating income of 517 billion cruzeiros in 1982 (400 cruzeiros = £1) telephone service accounted for 462 billion and telex service 30 billion. It is unlikely that the target for self-financing will be achieved in the near future. Annual investment in 1983 was about 535 billion cruzeiros and this level is expected to increase in future years to meet demand for new services.

Training the right number of staff in the latest technology is an important factor in effective telecommunications. Telebras employs 98,000 people, of whom 12,000 are technical staff. It runs a training programme for managers and has a series of national and regional training centres which offer around 100 modular courses.

Brazil, however, is by no means concerned only with extending existing services. It also wishes to introduce new ones and is currently working on an impressive satellite communications programme. This includes the development of large and medium sized earth stations for public telephony and television transmissions as part of a domestic satellite system to be put in operation next year and in anticipation of the launch of a domestic satellite in the near future.

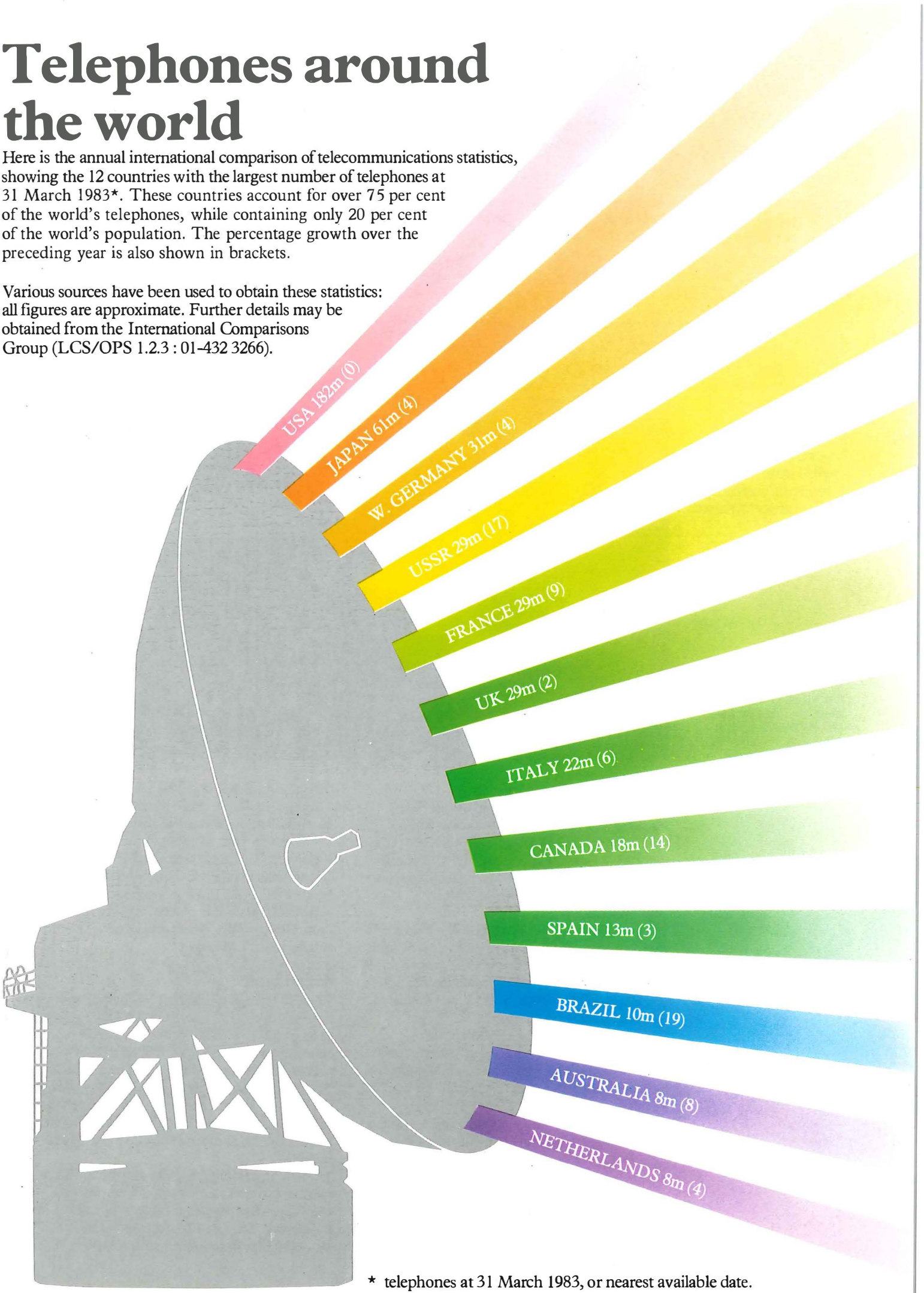
Work is also in hand on the development of a packet switching network called Rexpac, and the development of a switching system for rural areas. A Tropico 1000-line exchange is currently being tested by the Sao Paulo and Rio de Janeiro telephone companies.

With close co-operation between government, finance houses, telecommunications manufacturers and operating companies, Brazil has developed the nucleus of a modern system with very limited resources. Future development has been carefully planned and the Brazilian system is now set to grow from what is a very firm base.

Telephones around the world

Here is the annual international comparison of telecommunications statistics, showing the 12 countries with the largest number of telephones at 31 March 1983*. These countries account for over 75 per cent of the world's telephones, while containing only 20 per cent of the world's population. The percentage growth over the preceding year is also shown in brackets.

Various sources have been used to obtain these statistics: all figures are approximate. Further details may be obtained from the International Comparisons Group (LCS/OPS 1.2.3 : 01-432 3266).



* telephones at 31 March 1983, or nearest available date.

British Telecom Journal
Spring 1984

Gateway to a digital world

Martin McGrath and Dave Ballinger

Twenty one years after the first direct dialled call was made from London to Paris, British Telecom International (BTI) has opened its first digital international telephone exchange at Keybridge House in London.

Co-author Dave Ballinger (left) checks the central processor test unit with David Williams, a trainee technical officer at Keybridge House.

Opening of the new digital international exchange brings the dawn of a new era in international telecommunications which will link the UK's expanding inland digital network with similar facilities overseas thus giving British Telecom customers access to the world's finest communications.

The decision to specify Keybridge House as a digital international switching centre (ISC) was made at an early stage to meet the growth in digital international transmission facilities as these become available. It was planned that the new ISC would take advantage of the space-saving, lower maintenance cost, operational flexibility and many other benefits of digital switching and stored program control.

BTI currently operates five electro-mechanical analogue ISCs – Wood Street, Mollison, De Havilland, Mondial and Thames 1 – and a stored program control analogue unit called Thames 2. Keybridge ISC will act as a bridge between the existing analogue era and the future fully digital era by providing circuits to and from both analogue and digital networks. It will be extended progressively in stages until it is complete by 1986.

Primarily, Keybridge ISC will switch international direct dialled (IDD) traffic between British Telecom's national network and larger traffic routes such as those to the USA, France, Germany, Australia, Japan and Hong Kong. Using links to other ISCs, Keybridge will also be able to handle international traffic for other countries, international transit traffic and calls controlled by operators working at UK international exchanges.

Fresh look

The L M Ericsson AXE 10 switching system – known in British Telecom as TXD20 – is used at Keybridge. TXD20 provides stored program control by combining centralised and distributed processing techniques as well as time-space-time digital switching. This new technology calls for a fresh look at both operating and maintenance activities, and in the case of the TXD20 system, incorporates a number of new features. These include:

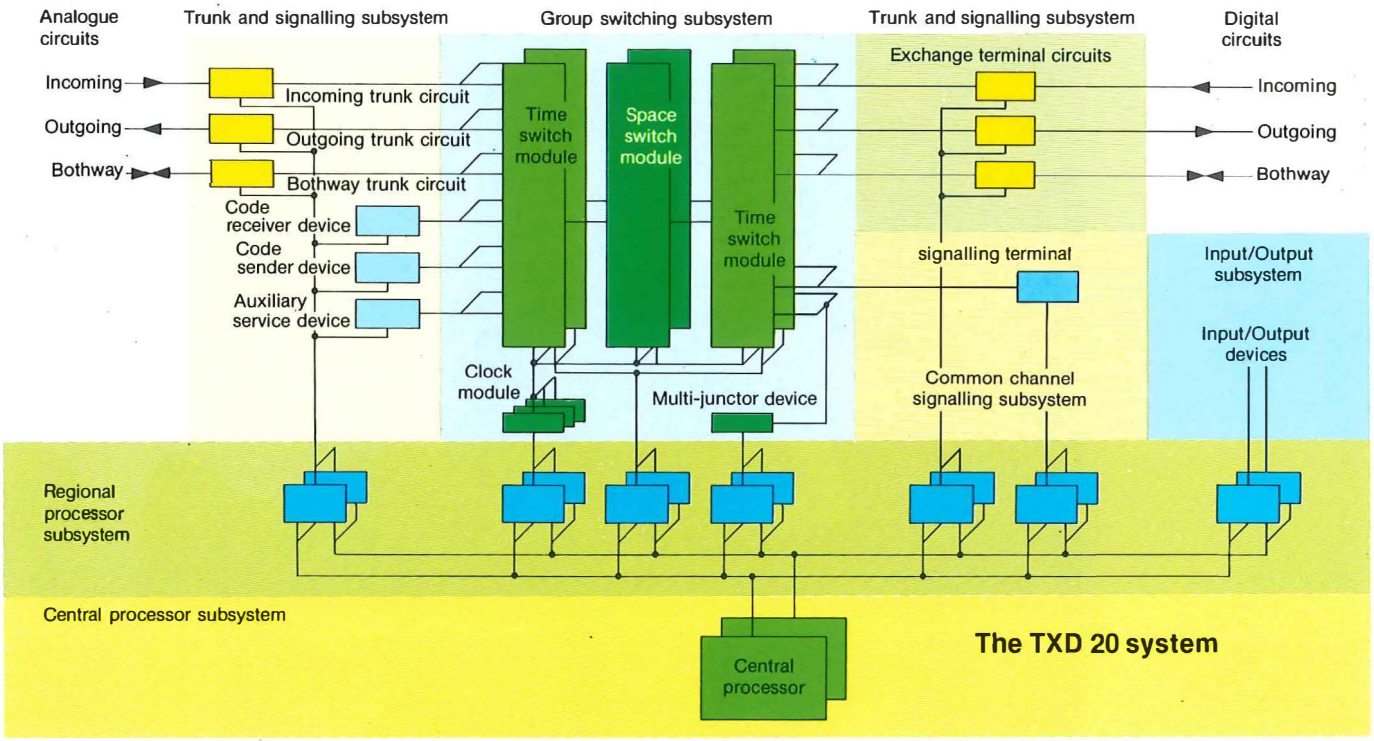
*A data processing and control system, with a two-level, duplicated structure comprising a central processor and a number of small regional processors. The central processor handles call set up including route and path selection,

operation, maintenance and fault diagnosis, while the regional processors are small mini-computer type units performing frequent routine tasks such as scanning, hardware operation and signal decoding. After the second stage is introduced, a more powerful central processor will provide capacity to meet all planned extensions without the need to install more processors.

*A group switching subsystem, controlled by regional processors and with a triplicated clock module for providing timing. The switch provides time switching between time slots and space switching between pulse code modulation systems.

*A trunk and signalling subsystem comprising units for terminating both analogue and digital circuits together with devices for providing signalling and service facilities.

*A common channel signalling subsystem, which provides the terminal and associated functions for common channel signalling links. Signalling systems CCITT 6 for use on intercontinental routes and CCITT 7 for use in the international and inland networks are to be provided.



*An input-output subsystem, which provides all the various man-machine interface and data handling facilities such as visual display terminals, printers and cartridge tape readers.

Other subsystems include software-only functions of traffic control, charging and operation and maintenance facilities. Both analogue and digital circuit terminations have been provided initially to interconnect with existing analogue systems in the national and international networks as well as with new digital systems.

Flexibility

A range of signalling systems are catered for to meet various network requirements and provide flexibility for interworking with the old and new networks according to the availability and location of digital plant. The four main network interfaces are:

*Signalling system loop disconnect which will be used mainly for traffic to and from the London Area (including IDD traffic directly routed from some London local exchanges for which metering-over-junction facilities are provided). This system will also be used for traffic to and from the rest of the country.

*Signalling system AC11 in analogue format for connection to existing analogue network centres and some digital main network switching units as these are brought into service. When Stage 2 is introduced, more AC11 terminations will be provided in digital format.

*CCITT R2 in analogue format for traffic to European centres. Some digital CCITT R2 interfaces will be provided for circuits routed via Madley satellite earth station and the European Communications Satellite system (ECS).

*CCITT 5 (multi-frequency signalling) and CCITT 6 (common channel signalling) terminations for traffic to intercontinental destinations. Initially in analogue form, those added at stage 2 will be in digital format.

By 1986 Keybridge ISC will have more digital circuits added including on the international side both CCITT 5 and 6 terminations together with a small quantity of CCITT 7 circuits. Nationally, the CCITT 7 signalling system will be used for international calls improving the quality of service to customers.

An international maintenance centre (IMC) will take care of the operation and maintenance activities for Keybridge ISC. The centre combines the tasks traditionally undertaken ▷

separately by international transmission and international switching maintenance centres. Transmission test facilities at IMC consoles are provided for analogue circuits using an automatic test access facility while access to digital circuits is gained via the exchange digital switching network.

Documentation

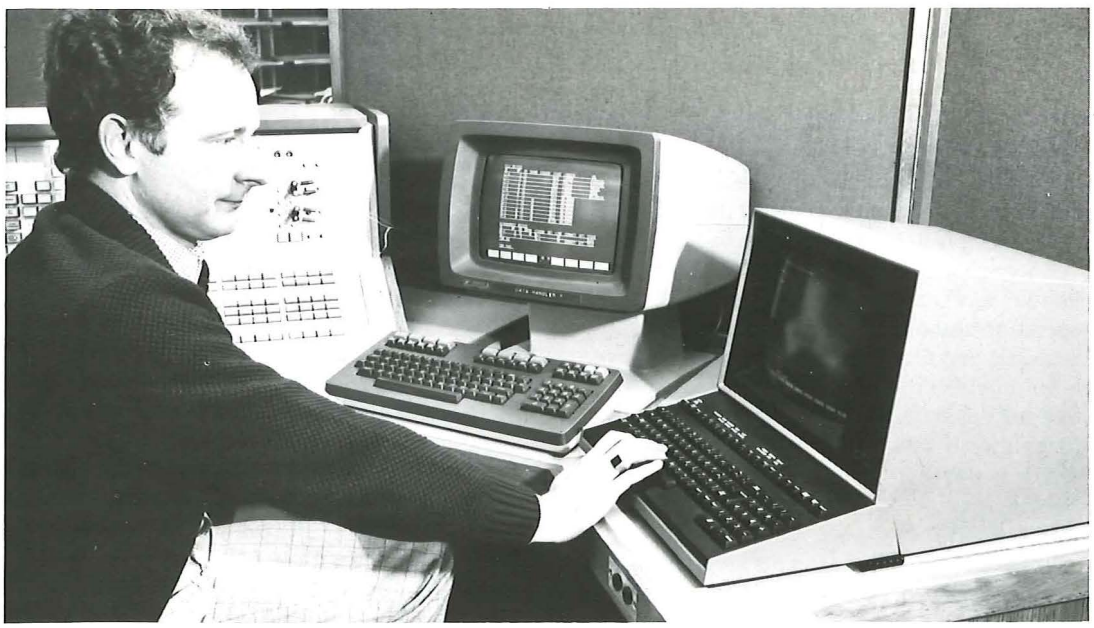
Circuit provision work will not be carried out in the IMC but will be undertaken in the repeater station using IMC-style consoles. Additional features of the IMC include a separate room for documentation and analysis, a magnetic tape deck room and facilities for preparing and handling changes to exchange routing information following network additions and modifications.

IDD traffic continues to grow and the provision of Keybridge ISC significantly augments BTI's existing switching capacity and at the same time lays the foundation for digital working in the international network. A further wholly digital ISC is planned for 1988 and this unit, to be called Kelvin ISC, will be located in Bloomsbury, London.

In the same period, international digital transmission facilities are being introduced to Europe and North America using optical fibre submarine cable and digital satellite systems. The integration of these systems into BTI's network will increasingly offer customers the benefits of digital technology and will allow the later introduction of an international integrated services digital network (ISDN).

Digital technology offers greatly improved quality of service and reductions in running costs over earlier techniques and provides the basis for introducing new digital international services at marketable prices. BTI intends to keep the UK in the front rank of world telecommunications and Keybridge international switching centre is a major step in fulfilling this policy. ⓣ

Work continues at Keybridge. Thorn-Ericsson installer Mohn Tida wires up a distribution module rack in the switching centre.



Maintenance technical officer Hugh Halligan checks status of peripheral equipment on the data handler terminal in Keybridge's international maintenance centre.

Mr M E McGrath is head of the telephone network switching and facilities planning group in British Telecom International's technical strategy unit.

Mr D A Ballinger is responsible for switching systems technology and strategic network studies in the same unit.

DRAFT

25 OCTOBER 1983

LICENCE

GRANTED BY

THE SECRETARY OF STATE FOR TRADE AND INDUSTRY
TO

BRITISH TELECOMMUNICATIONS

Department of Trade and Industry
1 Victoria Street
LONDON SW1

Price £1.00 net

Operating by licence

Claire Milne

Three years after the 1981 British Telecom Act gave the Government wide powers to relax the telecommunications monopoly, a further Act to turn British Telecom into a public limited company (plc) will come into force this summer. This feature looks at some of the issues involved in what is the biggest and most complex exercise of its kind ever undertaken in the UK.

The 1981 British Telecommunications Act heralded the beginning of a new era in UK telecommunications and many changes have taken place since it was passed. (See 'Liberalisation – the UK experience', *British Telecom Journal,* Summer 1983.) For the first time, the Act gave Government powers to license other operators to run telecommunication systems in competition with British Telecom. It also set up the machinery for independent approvals of network attachments such as telephones, answering machines and private branch exchanges (PBXs).

Soon, the Mercury consortium was licensed to run a new network and provide competing telecommunication services. A General Licence has also been issued under which anyone may offer Value Added Network Services, such as information or banking provided over telephone lines. Many types of terminal apparatus have been approved and apparatus supply is rapidly becoming a fully competitive activity. In short, competition is already reaching all sectors of British Telecom.

But the Government is anxious to do even more to create the extensively liberalised telecommunications market that it considers necessary for this country to exploit technological advances to the full. British Telecom plays a central role in the UK telecommunications scene and if there is to be meaningful competition, British Telecom must be part of it. As a nationalised industry, it has been subject to many Government controls which may have little to do with the marketplace, and the limitation placed on its borrowing has been a significant factor in slowing down network modernisation. At the same time, it is difficult for the Government to develop its policy of wide-ranging competition while British Telecom occupies the special position which it has as a nationalised industry.

Now the provisions of a new Act of Parliament – the Telecommunications Act 1984 – will soon come into force and turn British Telecom into a public limited company (plc). When British Telecom plc is first formed, the Government ▷

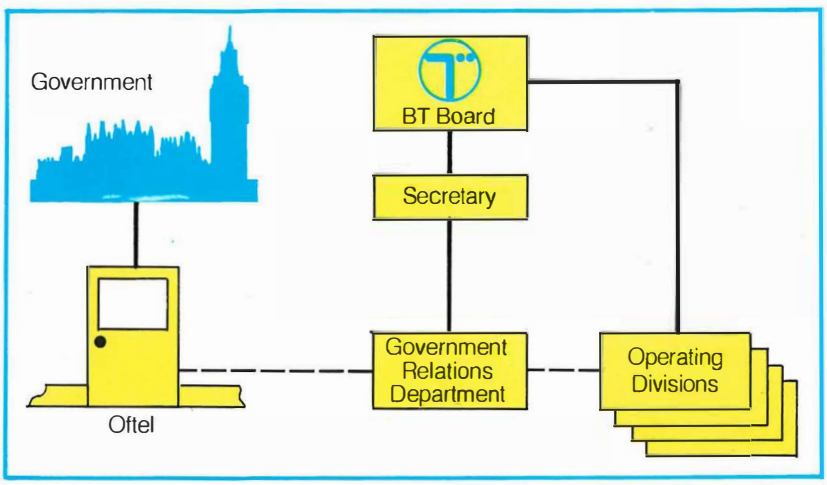


Diagram showing main link between British Telecom and Government.

Panel 1

The Licensed Telecom Systems

Applicable Systems (that is, those systems to which the licence applies) are all the telecom systems which British Telecom runs in the UK up to and including a network terminating point (NTP) wherever Applicable Systems meet other systems or approved apparatus.

Except . . . Local systems in the Hull area (which will continue to be run by Hull Telephone).

Except . . . Mobile radio systems (radiophone and radiopaging, which British Telecom will continue to run but under a separate licence).

Except . . . Any other systems which British Telecom runs under another licence (for example, PBXs run under the Branch Systems General Licence).

On customers' premises, the NTP might typically be within a socket into which approved apparatus can be plugged, or a test jack frame for the connection of PBXs.

A telecom system is defined in the Act to be a system for the *conveyance* of electromagnetically-coded signals.

will initially still own it all, but a few months later, 51 per cent of the shares are expected to be sold in stages, and British Telecom will then be able to enter the commercial world in a similar way to any other plc.

British Telecom's traditional statutory monopoly has meant that anyone else wanting to run a telecommunication system (other than certain types, such as completely private systems) has had to ask for a licence, at first from the Post Office, and since the 1981 Act from British Telecom or the Secretary of State for Industry. In the new climate, it would make no sense for British Telecom to retain this position. Apart from the obvious unfair competitive advantage, British Telecom itself would be faced with increasing conflicts as both regulator and competitor. These have already caused many problems over the past two or three years.

The new Telecommunications Act will abolish British Telecom's statutory monopoly so that in future it will need a licence to run its systems like anyone else. It will lose its power to grant licences, and control of licensing will pass to the Secretary of State.

The Secretary of State will continue to be responsible for issuing main policy-setting licences and a new agency will oversee all telecommunications activities and ensure that licensees abide by the terms of their licences. The new Act will set up an Office of Telecommunications (Oftel), headed by a Director General of Telecommunications (DGT).

So that the political control formerly exercised over British Telecom as a nationalised industry is not replaced by another form of political control, the Government has stated that Oftel will have considerable independence. Once appointed, the DGT cannot be removed from office for five years and will be in a similar position to that of the Director General of Fair Trading, who heads the Office of Fair Trading.

As well as having oversight of licensed activities and the responsibility for amending licences if that proves necessary, the DGT is

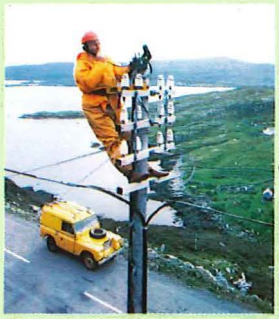
Panel 2 **Preserving services and protecting consumers**

General service obligations

- Universal service
- Directory enquiries
- Installation and maintenance
- International services
- Special operator services for emergencies
- Maritime emergency service
- Contingency planning
- 24-hour fault repair for essential services
- Maritime services

Community obligations

- Rural areas
- 999 emergency service
- Public call boxes
- Facilities for disabled
- Telephones for the hard of hearing
- Inductive couplers in public call boxes
- Free directory enquiries for blind and disabled
- Access charges



Prices and terms

- Standard published charges
- RPI-x
- Uniform charges for installation
- Uniform charges for maintenance
- No undue preference or discrimination

Consumer affairs

- Consumer Code of Practice
- Arbitration of disputes
- Consultation with consumer bodies
- Independent approval of meters

given a number of other important functions by the Act, such as investigating cases of alleged anti-competitive practices and abuses of monopoly powers.

Where necessary, the DGT can refer cases under general Fair Trading legislation to the Monopolies and Mergers Commission (MMC), who in turn may recommend the Secretary of State to take measures designed to remedy any abuses. He must also protect the interests of users and consumers of telecommunications, by following up complaints and taking over as consumer watchdog (but with sharper teeth) from the Post Office Users' National Council, (POUNC). In these tasks he must take note of the views of various advisory bodies. He must collect information on telecommunications, publish it if considered necessary, and be ready to give advice on telecommunications matters.

Guidelines

The all-important Clause 3 of the Act sets out statutory guidelines for the DGT and the Secretary of State when they are carrying out their functions under the legislation. They have a primary duty to ensure that telecommunication services including emergency services, public call boxes, maritime services and services in rural areas are provided throughout the UK to meet all reasonable demands, and they must bear in mind that the operators obliged to provide this 'universal service' must be adequately financed. Subsidiary duties include promoting the interests of consumers (including the disabled), effective competition, relevant research and development and UK interests abroad.

Many of the aims set out in Clause 3 are reflected in particular conditions of the British Telecom licence. At the time of writing, the licence was still being discussed by British Telecom and the Government, but the general picture was already fairly clear.

The licence is a weighty legal document in five parts. The first simply licenses British Telecom to run telecommunication systems (see panel 1). The licence lasts for 25 years, but will not end either then or later unless ten years' notice of withdrawal has been given. (If the licence were subject to being ended at short notice at the Government's discretion, British Telecom might find it impossible to attract the funds it needs for long-term investment.) Part one gives British Telecom the benefit of the new 'Telecom Code', which is to replace the old Telegraph Act provisions for placing external plant such as poles and ducts.

Part two, the heart of the licence, contains the conditions subject to which the licence is issued. These are covered more fully shortly. Part three lists the circumstances in which the licence could be revoked and include British Telecom defaulting on its licence fee, ignoring a licence enforcement order, or going bankrupt.

Part four formally authorises the connection of the licensed systems to other systems and apparatus, as well as the provision of telecommunication services by means of the licensed systems. Lastly, Part five imposes various restrictions on British Telecom's use of the Telecom Code. These are mainly intended to protect the environment by, for example, preventing the use of unsightly overhead cables in areas of outstanding natural beauty.

Panel 3

Fair trading conditions

Apparatus supply
- Separation of network and apparatus activities
- No unfair cross-subsidies
- Equal treatment of competitors
- No unfair use of network information
- No linked sales
- Separate charging for network services and apparatus

Connection
- Interconnect with competitors
- Connection of approved apparatus
- Provision of services by others
- Notice of systems changes

General fair trading
- Standard published charges
- No undue preference or discrimination
- Notification of joint ventures

Fair acquisition
- Apparatus production
- No unfair exclusive dealing

Part two contains more than 40 conditions, the drafting of which has involved a delicate balancing act. To start with, the Government is anxious to ensure that its liberalisation policy does not have unwanted side-effects. Public concern has been expressed that, without special controls, the profit motive might lead British Telecom plc to exploit its surviving areas of monopoly, and to neglect unprofitable market sectors. Several conditions are, therefore, devoted to the preservation of various services and protection of the interests of consumers.

Again, fears have been voiced that unleashing a company of the size and strength of British Telecom on to the market could from the outset stifle the very competition which the Government is trying to foster. For this reason several conditions make sure that British Telecom can only compete in ways that will ensure other firms are not at a disadvantage.

Prospects

But over-regulation, resulting from too many or too rigid conditions, could easily frustrate the aim of producing a vigorous, adventurous British Telecom capable of leading the UK into a new telecommunications era, of providing attractive prospects for its staff and of raising the finance it needs on the open market.

Panel 2 on page 26 lists in more detail conditions about service preservation and consumer interests. Of particular interest are the access charges condition and what is termed the RPI-x condition. ▷

As panel 2 shows, the licence calls for British Telecom to continue providing a whole range of services, most of which are in any case commercially viable, but others of which may not be profitable. In the latter category are some services to rural areas, public call box services, services for the disabled and the 999 emergency facility.

These are all community services which often do not cover their own cost. It would not be fair to ask British Telecom to foot the bills when its competitors are free from such burdens.

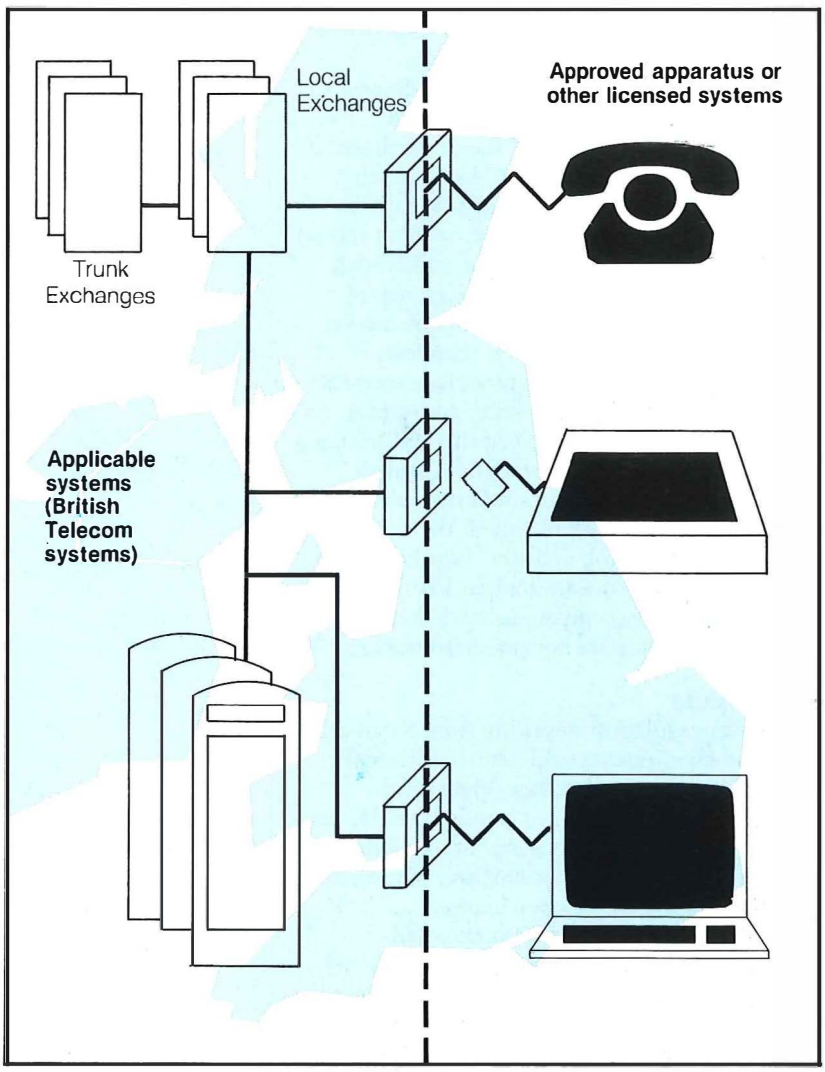
To get round this problem, the access charge system has been devised, whereby British Telecom can get a fair contribution to these costs from the operators of interconnected networks.

The RPI-x condition embodies a recommendation made by Professor Stephen Littlechild in his report, commissioned by the Government, on the limitation of British Telecom's monopoly profits. His main point was that the best form of price control is a competitive marketplace, and RPI-x is only a stop-gap measure to guarantee that British Telecom's customers cannot be exploited in areas where competition has not yet bitten. So at first, it will only apply for five years.

The symbol 'x', whose value had not at the time of writing been fixed, is the yearly amount, in percentage points, by which British Telecom will have to *reduce* the real prices of a range of basic services, taken together. These include installation and maintenance of exchange lines, and local calls.

More detail of the fair trading conditions is shown in panel 3 on page 27. Key to several of these conditions is that British Telecom must show that it is not using its privileged position as the established network provider to gain advantages that are not available to its competitors in terminal apparatus supply.

Ms C B Milne is a head of group in the newly-formed Government Relations Department.



Network business

It is, therefore, required to report on and account for these two areas of its activity quite separately, and the network business may not cross-subsidise the apparatus business. British Telecom must connect competitively-supplied terminal apparatus to its network on exactly the same terms as apparatus it supplies itself. Even the flow of information from the network side to the apparatus side will be carefully controlled, by the provisions of a code of practice.

British Telecom will also have to show that it is not abusing its purchasing power. Conditions are included that will put any substantial manufacturing in a separate subsidiary at arm's length from the rest of British Telecom, and prevent British Telecom from requiring its suppliers to enter into exclusive dealing arrangements.

This array of licence conditions can only be effective if there are adequate means to enforce them. The DGT will have wide-ranging powers to call for any information from British Telecom (or other licensees) necessary for him to carry out his duties, including investigation of alleged breaches of licence conditions. If he is satisfied that there is a breach, he can, following due process, issue an order to enforce compliance. Provisional orders can be issued with immediate effect.

Injunction

If the operator fails to comply with the order, he can be sued for damages by any injured party, and the DGT can enforce the order through a court injunction. In addition, if the DGT thinks that an operator is misbehaving in a way that does not amount to a breach of a licence condition, he can change or add to the licence conditions without the licensee's consent, subject to obtaining a favourable recommendation from the MMC.

British Telecom, like all other operators, will therefore have no option but to adhere scrupulously to its licence conditions. This means that the interests of all users of telecommunications services and of competitors in the UK will be safeguarded; but, provided the balance remains right in the final form of the licence, British Telecom will be able to take proper advantage of the rapid growth of the telecommunications market and its convergence with computing into the information technology of the future, with the wide prospects that this will offer.

For model demonstrations

British Telecom Journal
Spring 1984

The world's first integrated services digital network (ISDN) demonstration model – made up from equipment used at Telecom 83 in Geneva – is now being used by British Telecom in London for marketing demonstrations to a wide range of business customers.

The decision to build the model was made jointly by Local Communication Services and National Networks. As well as its demonstration capabilities, the model will also be used as a test facility to prove the latest technological advances before they are incorporated in the pilot ISDN service due to open later this year.

Construction

The main switching unit was installed and fully operational within two weeks of the equipment arriving back in the UK from Geneva. Once the construction of the professionally designed demonstration area was completed, the terminal equipment was installed and commissioned as standard single line integrated digital access (IDA) circuits using two types of network terminating equipment developed for the pilot ISDN service.

The core of the model is a System X concentrator module (digital subscribers switching subsystem) with processing capability supplied by a processor utility subsystem (PUS) simulator. This mode of operation is similar to a remote concentrator unit (RCU) operating in isolation from its parent local exchange. The −50V power to the concentrator is supplied by the type of equipment rack being used in System X installations.

Equipment

The model also houses a range of high-speed terminal equipment such as fast facsimile, photovideotex and slow-scan tv. In addition there are some commercially-available low-speed terminals which reflect the immediate and practical communications requirements of many potential customers. All the equipment is demonstrated live with the calls being set up from one terminal through the System X concentrator switch to the terminal at the distant end.

The slow-scan tv facility has the potential of scanning up to four independent camera locations but only two are used on this model, one showing a panoramic view of the City of London, the other a view of the British Telecom Research Laboratory site at Martlesham. The photovideotex facility includes access to an experimental photovideotex database to help customers appreciate the potential of such an installation.

Demonstrating the model to customers is a vital element.

Indications

With major customers now viewing the model there are early indications that they are highly impressed with the concept of a fully integrated digital network capable of supporting not only terminals which are immediately available, but also flexible enough to allow evolution to meet the likely needs of future generations of speech and data terminal equipment.

First across the Channel

The proliferation of submarine cables both across the Atlantic and to mainland Europe during the last 30 or so years has played a major part in the spectacular development of international communications. In this, the first of two specially written articles for *British Telecom Journal*, departmental record officer *Pat Panton* looks at early attempts to lay undersea cables across the Channel and the Irish Sea.

After the successful introduction of the early inland telegraphs, and in particular, the establishment of the line from London to Dover in 1846, it was logical that the thoughts of engineers should turn to more ambitious schemes for communication overseas. The main difficulty was to solve the problem of providing adequate insulation for cable conducting wire which had to be proof against the penetration of water at great pressure, chafing, and able to withstand the attack of biological enemies.

At one time, rubber was thought to be suitable but it broke down when submerged for any length of time in sea water. The introduction of gutta percha, the coagulated latex from trees in the Malay peninsula, enabled work to proceed with greater promise. Gutta percha differed from rubber in being inelastic at ordinary temperatures and in becoming soft and plastic on immersion in hot water.

Although first known in Europe in the middle of the 17th century, gutta percha had found no special use and it was not until after it was brought to the notice of the Royal Society of Arts by Dr Montgomerie and examined by Faraday in 1843, and again in 1848, that its excellent insulating qualities were recognised, as the best material then available for insulating an underwater conductor.

The achievement of laying the first submarine cable of practical significance was due to the enterprise of brothers Jacob and John Watkins Brett. They registered the 'General Oceanic Telegraphic Company' and their objectives were to establish a telegraphic communication from the British Isles across the Atlantic Ocean to Nova Scotia and Canada.

The Bretts were also busy in France and negotiated a concession from the French Government for the laying of a cable from Dover to Calais. In August 1850, a steam tug, the *Goliah*, was chartered and a large drum, seven feet in diameter and 15 feet long, weighing two tons, was built on the deck and the insulating cable, weighing five tons was then wound on. The shore ends were laid first; that on the English side began from a horse box which was used to house the instruments at the Dover terminal of the South Eastern Railway, while on the French side, the shore end was laid from Cap Gris Nez.

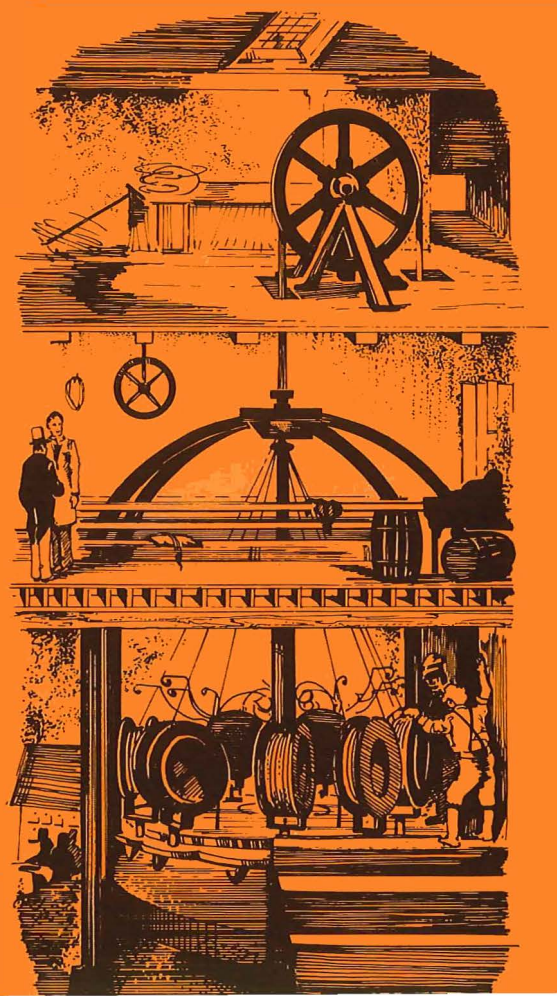
Weights

As the cable was paid out, weights were attached to it at frequent intervals to aid its sinking to the sea bed. These weights, which varied from eight to 16 lb, were made in two halves and were clamped to the cable by studs.

Before the joint was made with the shore end, communication with the engineers waiting at Dover was attempted unsuccessfully using Jacob Brett's modified house printing telegraph.

After the joint with the French shore end was made to give an uninterrupted conductor from shore to shore, a Cooke and Wheatstone needle telegraph was connected and messages were exchanged, one of which was sent by John Brett to Prince Louis Napoleon Bonaparte who had taken much interest in the enterprise.

On attempting to resume communications the following morning, no signals could be received and it became apparent that the line had broken near the French coast. The *Goliah* was



immediately sent back to recover the faulty portion of the cable.

The failure of the cable was reported as being caused by a French fisherman who fouled the cable with his anchor and, thinking it to be a new form of seaweed, had chopped it asunder.

Such was the lack of confidence in the undertaking that Brett encountered great difficulty in his appeal for capital with which to manufacture and lay a second and stronger cable. Indeed, the whole project might have collapsed altogether if it had not been for the efforts and enthusiasm of Thomas Russell Crampton, a railway engineer and inventor. Not only did he provide half the capital required – £15,000 – but he was responsible for raising the remaining sum. Crampton was himself responsible for the design of the new cable and the main features of it were embodied in subsequent cables for a number of years.

The Gutta Percha Company manufactured the core and their main endeavour was to produce a cable having a continuous conductor, with quality being of secondary importance. Hemp yarn was laid on the insulated core to act as a bedding for the armouring wires and to protect the insulation, but tension at the serving machine was not uniform so that at times the yarn cut deeply into the gutta percha it was supposed to protect. Further, the surface of the galvanised armouring wires was irregular and in places there were blobs of zinc galvanising which tended to penetrate the insulation and make contact with the central conductor.

Guidance

Cable laying began in September 1851, using the Government hulk *Blazer*, towed by two tugs under the guidance of a small steamer also lent by the Government. Twenty-five miles of cable had been provided but, partly because of the poor weather and inaccurate steering and partly due to the inefficient brake which had allowed the heavy cable to pay out too quickly, the ships were still a mile from the French coast when the end of the cable was reached. To complete the remaining distance, Crampton had to splice on an odd length of cable.

After testing which lasted throughout October, the cable was eventually opened for the transmission of messages in November 1851. It can rightly claim to have been the first efficient submarine cable for it was reported as being still in good working condition ten years later. Apart from occasional repairs made necessary by damage from ships' anchors, it was in constant use until 1859 when major repairs were undertaken. Even then it was found that the gutta percha was still in perfect condition, so complete had been the protection afforded by the tarred hemp and the immersion in water.

Impetus

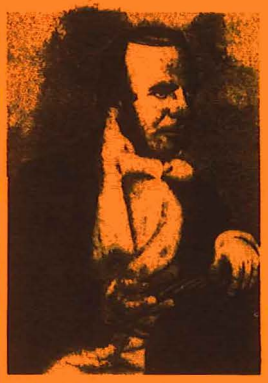
The successful laying of the 1851 cable across the Channel gave great impetus to submarine cable enterprises and among the first of the new projects was the linking of England with Ireland. Two attempts were made in 1852, one of which connected Holyhead and Howth with a light cable which failed after only three days.

It was not until May 1853 that a permanent cable was laid between Port Patrick and Donaghadee in County Down. This cable, which was laid for the British and Irish Magnetic Telegraph Company by Charles Bright, lasted for many years.

Two further cables were laid between England and the Continent in 1853, one connecting Dover with Ostend and another Orfordness with Scheveningen in Holland before Brett undertook the laying of several cables in the Mediterranean for the French and Italian Governments. One cable was laid between Spezzia on the Italian coast and Corsica, a distance of 110 miles, while another connected Corsica with Sardinia.

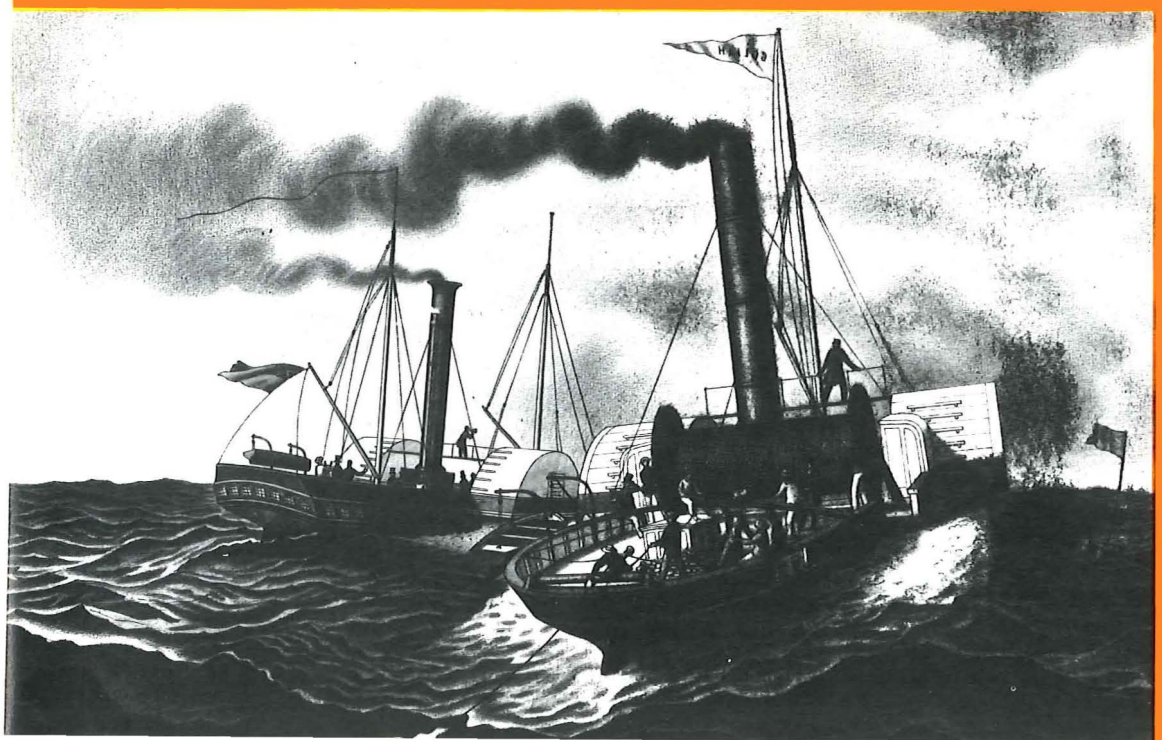
A number of other cables were laid in the Mediterranean and elsewhere during the succeeding years but many were lost to inexperience in design and manufacture or to faulty technique in handling and laying. Similar failures were to attend the early attempts to lay an Atlantic cable. Ⓣ

Jacob Brett.



John Watkins Brett.

In his second article in the Summer issue of *British Telecom Journal*, Pat Panton traces the history of undersea cables between the UK and North America between 1856 and 1956.



Far left: The completed coil of 'submarine telegraph rope' used for the first successful cross-Channel cable.

Centre: The armouring wires being applied to the first successful cable laid across the Channel in 1851 by the Brett brothers.

Left: Laying of the first submarine cable from Dover. The *Goliah* is accompanied by survey ship *Widgeon*.

British Telecom Journal
Spring 1984
Merlin spells success

Merlin spells success

John Smart

After widespread advertising both in the national press and on television, the type of products offered by BT Merlin are now much more familiar. But why does Merlin exist, what does it do, and what are its objectives? After all, British Telecom has always been involved in the supply of private exchanges and call-connect systems . . .

With the coming of liberalisation in the UK telecommunications market, the scene was changing to allow, with suitable approval, supply from any sources. Clearly, the market would be more competitive and the approach a little more enterprising. Within the same time frame, emphasis has grown on office automation, fuelled by the ever-increasing costs of microcomputer systems. It was to tackle this large and potentially lucrative market that BT Merlin was set up.

With a sales target of more than £400 million (at retail prices) in 1984/85, and an objective to capture a major share of the rapidly expanding business systems market, Merlin faces an interesting and exciting challenge. Led by chief executive Gordon Pocock, it has three main areas of business activity. These are:

*Engineering and Procurement based at Felixstowe.
*Sales and Operations based in London.
*Marketing – also based in London.

Merlin distributes business products traditionally provided by British Telecom – private exchanges, keysystems, teleprinters and data communications – through its local outlets which sell, install and maintain them. For office automation products and systems, where new market development activities are needed, Merlin has established two operations centres –

Merlin Modulas is a special system designed to help travel agents offer their customers a faster and better service.

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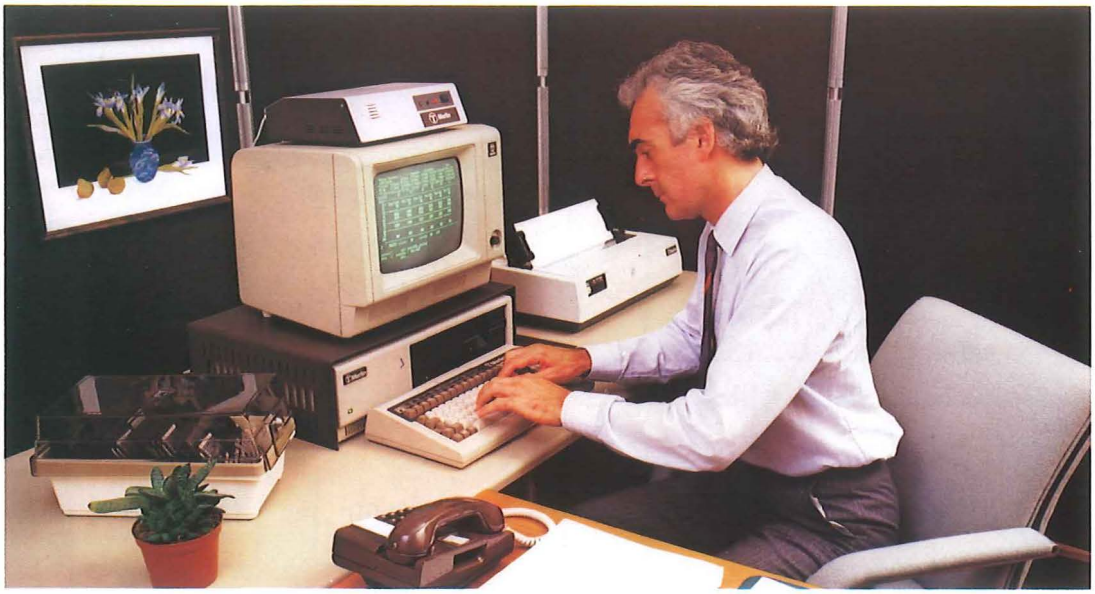

Offices and business throughout the country have taken to Merlin's 2200 range of small business computers. This one is the 2215 with a 64kilobytes memory plus twin floppy disk drives.

one at Ealing in London covering the south and west – and the other in Leeds covering the rest of the UK. Each centre has its own showroom and demonstration facilities and an increasing number of local offices.

For some years, the 'electronic office' has been regarded as the way ahead for business operations. The two main constituents of the electronic office are computing and communications. Both have been available for many years, but only recently has computing become cost-effective for most business users and only now is computing and communications coming together in a way which allows their full potential to be realised. With the launch last year of its office automation products, Merlin is in a unique position to bring about this convergence.

But benefits to the business user are not obtained solely by providing new technology. Unless that user can quickly and effectively apply the technology to his or her own problems then much is lost. The fashionable term 'user friendly' has been widely applied to a number of computer-based systems, and is mainly intended to mean that the machine part of the man/machine interface is of particular help to the user. Merlin aims to develop this idea further than ever before.

What, then, does Merlin actually offer the business world? For a start, its products include the M1100 communicating VDU terminal which offers a simple and effective interface to time-sharing computer bureaux. Also used as a terminal for in-house computers, the addition of an auto-dialling modem connects the terminal to the public telephone network and allows the user to store up to ten telephone numbers plus access passwords and other log-on information.

So by operating a single key, a user can make a connection quickly and simply to the selected bureau or service such as Telecom Gold or Prestel. And although designed to meet a basic terminal need, the M1100 can be upgraded to become a powerful microcomputer system adding a processor unit and disk drive.

Next in the range is the M2200 series of small business computers. This series provides computers of varying capacity starting with the M2215 with a 64 kilobytes memory plus twin ▷

Debbie Lovejoy, secretary at the Ealing showroom tries out the top of the range M3300 communicating word processor.

British Telecom Journal
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Merlin Board and Main Divisions

Gordon Pocock
CE Merlin

- Camilla Crump — Finance
- Peter Chamberlain — Sales & Operations
- Chris Rowlands — Engineering
- David Cartwright — Marketing

floppy disk drives. A comprehensive range of software packages deals with payroll processing, invoicing, stock control, sales and purchasing ledgers, financial modelling, sorting and update of mailing lists and word processing, making this system eminently suited to any small business needs.

The auto-dialling modem helps the M2200 series connect to the public telephone network giving access to Prestel and other private viewdata services or to other computers for electronic mail transfer. Connection is also possible to the Puma teleprinter and thus to the national and international telex network.

At the heart of the simplified operation of the M2200 series is a program called MerlinMaster. Developed by Merlin to make operation easier for the user, it shows system options in a simple menu form on the VDU and then explains, in plain English, exactly how to operate the machine to achieve the desired result. This feature sets the M2200 small business computers apart from its competitors.

Applications

Although the M2200 machines can carry out word processing functions, there are applications for dedicated word processor systems. To meet this need, the M3300 communicating word processor offers a full range of capabilities as well as a communications interface. When connected to a Puma teleprinter, it is linked to the telex network, and by adding a modem, gives access to the public telephone network and thus to computer bureaux, timesharing computers, Prestel, electronic mail services and other databases.

A new international standard has now been established for communication between word-processors providing professional automatic electronic mail. Called teletex, the new standard enables machines operating to this standard to communicate with each other via national and international telephone networks. Merlin plans to provide a teletex option, called Merlintex, for its word processor and small business computers, thus adding to the benefits.

As well as entering the office automation market with a range of general purpose business machines, Merlin also recognised the special needs of some users. The first example of such a system developed to meet specific needs is Merlin Modulas, designed to help travel agents offer their customers a faster and better service.

Major products

This is a microcomputer system with software packages handling client management, accounting, reservation data transfer, ticket issue, word processing and viewdata access. Merlin intends to continue to develop systems for other common-user groups. As well as these major products, the Merlin range includes well-proven software packages for the M2200 computers.

Merlin office communication systems range from small key systems serving up to ten extensions to the new Merlin DX information communication system. Included in this range are the popular Herald and Monarch, now widely installed in businesses throughout the UK offering a host of facilities to customers.

For telex users, Merlin offers three machines which are as far removed from the old-fashioned noisy teleprinters as the Ford Sierra is from the Model T. The Puma 73 has its own memory for preparing and storing messages while the Cheetah 85 and 87 models incorporate microprocessor control for memory store, automatic data and time insertion, video display for message preparation and automatic message transmission.

It has taken just a few months for BT Merlin to become an established name in office automation. With a widespread network of sales outlets, service centres and comprehensive training schemes, customers can trust Merlin, together with its British Telecom partners, to provide sound solutions to their office automation and communication problems.

Mr J Smart is public relations officer for Merlin.

For switching that won't cost you a packet, the new GEC 4150 comes top of the list.

STANDARDS. With communication software conforming to the CCITT X25 standard as used by British Telecom in the National Packet Switching Services, the GEC 4150 is compatible with IBM and ICL communication protocols both interactive and batch.

FLEXIBILITY. GEC 4150 can be used as a Network Node, Network Management Centre, Gateway, Protocol Converter, or Front End Processor.

LOW COST. For a 200 packet per second exchange GEC 4150 communication configurations start at £9250, and the new package systems concept makes configuring and enhancement easy.

Thanks to the GEC 4150's high electronic content, the resulting environmental tolerance and reliability means you can locate it almost anywhere.

As part of one of the largest high technology engineering companies in the world GEC Computers offers unrivalled expertise in networking systems. Every machine in the field is backed by GEC field support facilities and specialist technical teams are on hand to offer advice and guidance.

Call us in Manchester (061-872 3433), Birmingham (021-327 1829), London (01-953 2030 ext. 3187), The Hague (070 633944) or Frankfurt (0611 632028/9) to make the switch to reliable communications.

GEC Computers Limited, Elstree Way, Borehamwood, Hertfordshire WD6 1RX. Telephone: 01-953 2030. Telex: 22777.

GEC Computers
Right from the start

Isn't it time you switched to the new GEC 4150?

GEC

Part of GEC Information Systems Ltd.
Holding Company: The General Electric Company plc of England.

When you've been finding faults as long as we have, it's easy to knock the competition.

STC first set out to design a new system of remote line testing equipment back in 1977.

The results attracted worldwide interest and praise.

Not least from British Telecom who worked closely with us to develop the STC RLT II.

Its ability to pin point faults at any distance from the Repair Service Centre led to its introduction on a trial basis both here and abroad.

Today, the RLT II is tried, tested and already operating in several centres throughout the U.K.

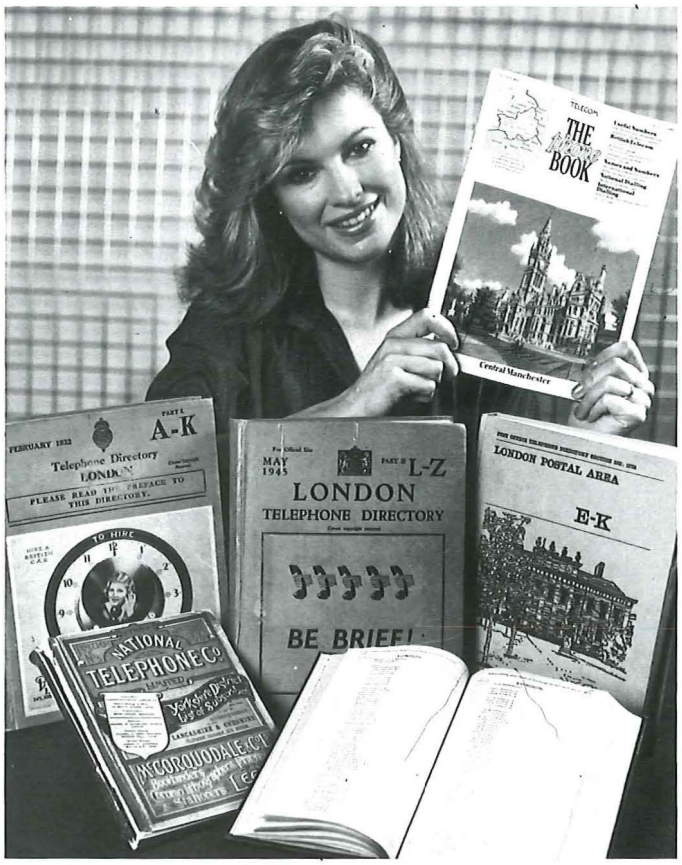
We're sorry to say our competitors are a little behind.

But who's fault is that?

STC

RLT II Remote Line Tester

FOR FURTHER INFORMATION PLEASE CONTACT A E REDHEAD, STC TELECOMMUNICATIONS LTD., INFORMATION TERMINALS DIVISION, OAKLEIGH ROAD SOUTH, NEW SOUTHGATE, LONDON N11 1HB. TEL: 01-368 1234



Enter the Phone Book

Manchester Central is the first of British Telecom's telephone areas to use the brighter, more informative, Phone Book launched in March. The new Phone Book – renamed and revamped – will eventually replace the current alphabetical telephone directory whose basic design goes back over ten years.

Customer response will influence the format of future books and by the end of 1986, nationwide coverage is expected to have been completed.

The Phone Book is the same size as the directory it replaces and includes new information – in plain English – such as national and international codes, a wealth of local information including useful numbers and places of interest. There is also more on British Telecom services, who to contact and what to do in event of complaint or query.

Major changes to language, design and layout have been introduced in the new publication. Contents are indexed more clearly and information is arranged in easy-to-find sections.

Exchange for MPs

A £1 million order to install a high technology telephone exchange at the Palace of Westminster has been won by British Telecom London's South Central area.

The new system for MPs and Peers will also serve the permanent officials and their departments at Westminster. The system will use the latest microchip circuitry and push-button telephones to give users a wide range of advanced telephone facilities. It replaces existing equipment which is becoming outdated.

British Telecom will supply a 5,000 line Merlin DX digital call-connect system made by Plessey Office Systems Limited. It will be capable of switching computer data as well as telephone calls and is designed for further expansion.

The new exchange is more flexible and economical than its predecessor, and offers a wide range of advanced facilities which include:

★ Extensions arranged in groups, with calls being connected to any free phone in the group

★ Operator-controlled 'do not disturb'

★ Call logging

★ Automatic indication on an existing call that another is waiting

★ Automatic re-dialling of a number engaged or not replying on the first attempt.

Government sales

British Telecom has created a new division to handle the telecommunications needs of Government departments. The move will give them greater access to all the wide range of products and services now on offer.

The new Government sales division reflects the importance that British Telecom gives to maintaining a highly professional service. Seven major account managers have been appointed and each will be responsible for specific Government departments.

With the telecommunications market changing so rapidly, British Telecom will now be on hand with expert advice on all aspects of equipment and applications, ranging from the traditional use of telephones to the provision of sophisticated digital networks and office automation systems.

BTI's cable share

British Telecom International (BTI) has a major share in one of the world's longest cable systems, running 7,000 nautical miles from Marseilles to Singapore at a cost of more than $400 million. It is due to come into service within two years.

The new cable is needed to meet the expanding demand for telephone service between the three continents it connects. BTI will use the cable as an additional route for phone calls to Egypt, Saudi Arabia and Singapore.

Representatives of BTI, which has the fifth largest share in the system, and the cable's 19 other co-owners met recently in Singapore to agree arrangements for the project.

The link will consist of seven undersea sections and a land cable across Egypt. It will run via Medan (Indonesia), Colombo (Sri Lanka), Djibouti, Jeddah (Saudi Arabia), Suez, Alexandria and Palermo.

Bills cut by phone

Britain's householders may soon have British Telecom to help them fight rising energy bills, if trials prove successful.

By means of information sent cheaply over their telephone line when it is not being used for calls, 300 householders near Guildford, Derby and Dudley can save money by allowing certain electrical appliances to be switched off automatically for short periods to reduce peak loads on the network. They will also be able to pay their gas, electricity and water bills automatically by phone, simply by pressing a button which sends an instruction over the line to a computer, telling the gas, electricity or water board to transfer money from their bank accounts.

The development, known as Calms (Credit and Load Management System), has been developed by Seeboard engineers. The Calm unit – known as 'Energy Minder' – is a push-button microchip metering and control unit.

Each householder's 'Energy Minder' is connected over British Telecom's phone network to special equipment provided by British Telecom at a local exchange. This communicates with electricity board computers by private circuit.

Once a quarter the 'Minder' is called up automatically over the phone line by the electricity authority computer to collect the recorded electricity consumption and calculate the customer's bill.

If the customer agrees, the computer will also be able to send a signal telling the 'Minder' to switch off, for short periods, domestic appliances (such as immersion heaters and freezers) thus reducing peak demand which the electricity boards have to meet using short term expensive methods of generation.

This 'quiet line' use is seen by British Telecom as a significant new way of exploiting more fully its nationwide network of local lines connecting customers to telephone exchanges and a wide range of new facilities for the domestic and small business user are planned.

The new Elite

British Telecom launched its latest electronic telephone system – Rhapsody Elite – especially designed for growing businesses. It is capable of linking three external exchange lines with up to six internal extensions, and offers a wide range of advanced facilities normally associated with much more expensive switchboards.

Among these advantages are last number re-dial, up to six-way internal conference calls, call transfer and call interception.

Ray Rankmore, Chief Executive of British Telecom Enterprises Consumer Products, said: "Rhapsody Elite brings the modern time-saving advantages of big-business communications within the reach of smaller firms". ▷ 41

NEW SCENE NEW SCENE NEW SCENE

SEE US AT COMMUNICATIONS '84 N.E.C., BIRMINGHAM STAND NO. 5D20 MAY 15-18, 1984.

Retrieve the Past, Prepare for

The LRS-100: Maximum repair service automation. Our Loop Reporting System saves time and money.

There is one sure way to help your repair service control (RSC) operate more efficiently and economically. Use your people more effectively.

The Northern Telecom LRS-100 Loop Reporting System is the most powerful tool available to achieve this aim. It automates and completely integrates the RSC administration and testing functions—customer line records, fault reports, testing, priority assignments, distribution management, statistics—literally every important function of the RSC.

The past: the answer to your problems.

When a customer reports a problem, the person receiving the call gets complete customer line record data instantly, including station equipment facts and a history of prior repairs and installation orders. The system verifies the fault and a firm commitment for service can be given to the customer immediately. Skilled testers are able to concentrate on the more difficult problems, thus enabling their time to be used more effectively.

The present: accurate distribution reduces wasted time.

Automatic and accurate distribution priority management and geographic block control substantially reduce time wasted in fruitless journeys by outside work forces. Also, by recognizing "common cause" fault patterns the system eliminates duplication of handling and distribution. Most importantly, LRS-100 automation helps balance the RSC's workload and utilize its resources for better management of the repair work force and no confusion—just smooth, efficient service from initial fault report to close-out.

The future: face it with confidence.

By maximizing control and making effective use of RSC resources and outside work forces, LRS-100 offers management some very important advantages in an increasingly competitive environment. Instant access to the LRS-100 customer service facts, line diagnosis (with interpreted results) and accuracy of distribution allows everyone in the RSC to work more effectively because everyone has all the information needed about the work in progress. By compiling statistics automatically, LRS-100 gives managers the information they need to control the present and plan the future.

Through the system's automated routining capability and our exclusive cable topology reports, you will be able to spot problems as they develop, improving service through preventive maintenance.

LRS-100: the head of the family.

The LRS-100 is part of a modular family of automated systems for the RSC. You can begin with our LRS-1 for automated testing, add the routining capabilities of LRS-10 and expand to a fully integrated, paperless test and administration system with LRS-100.

Control the Present, the Future.

For more information, call or write:
Northern Telecom (U.K.) Limited
Langton House
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Tel. (628) 72921

northern telecom

"Now" The Second Generation Puma Telex with Display...

Trend were first to revolutionise the use of the telex network with their electronic telex terminal. Now, Trend's second generation Puma Display Telex Terminal gives you even more advantages over existing terminals.

- Larger 40K user memory
- Automatic insertion of time and date
- Flicker free 40 character LCD strip display
- Automatic transmission of messages with timed release
  - Queue jumping for priority transmissions
  - Uninterrupted local operation
- Communications port up to 9.6K bits with X-on/X-off protocol
- "Mailbox" option

It receives, auto-dials, stores, waits, re-dials and auto-clears – all without operator intervention!

Electronic typewriters, word processors, computers etc. can now be simply used to prepare off-line telexes. Incoming messages are printed out by the Puma or may be held in store to be redirected to another local or distant station.

And with the exciting "Mailbox" option – allows otherwise dedicated office systems to access the international telex network. At the touch of a key, you transmit messages into the **extra** 40K memory for full automatic transmission to anywhere in the world without disturbing your telex operator.

So at last you can combine all the advantages of your existing office systems with the most flexible Telex Terminal available . . . same compact size, more memory (up to 80K), more operating features, even easier operation and all for virtually the same price.

"Mailbox" is a plug-in option which will be available shortly.

Isn't it time to think again? Contact us today for full details.

'thinks'

* PUMA – trademark of British Telecom.

TREND®

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Västra, Hindbyvägen 10, S 214 58 Malmö
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. . . and distributors throughout the world.

Acre savings

Microchips will soon help all British Telecom operators to connect calls – and clock up savings of nearly £2.5 million a year. New automatic call-recording equipment (Acre) – a British Telecom invention – will save about a fifth of the time operators take in connecting most calls, allowing them more time to help customers.

Instead of using the time-consuming method of writing details of calls on a 'ticket', Acre records details automatically on magnetic tape for subsequent processing in British Telecom's computer-based telephone billing system. Acre stores only the details for billing purposes; it cannot record the call itself.

Acre is already being installed on modern cordless switchboards following a trial at Tunbridge Wells, and contracts worth a total of £4 million have been placed for the supply of equipment. Deliveries are due to start this summer and will be completed by late next year.

Telemessage gains

Telemessage, the successor to the telegram, has been making large gains in the business-user field with its Multiple Address Processing System (Maps).

Customers' regular mailing lists are stored free of charge on a computer. When the customer wants the same text sent to the addresses on the list he calls the Maps number and dictates the message.

Provided the text is sent before 10 pm on weekdays and 7 pm on Sundays the message will arrive the next working day.

The system offers considerable discounts over the rate for an individual Telemessage. There is no paperwork and the customer can have an itemised bill with his telephone or telex bill.

Contracts

CAP has been awarded a £2 million contract by British Telecom International for a computer system to handle accounting and traffic analysis at Mondial House, London.

Coachwork Conversions has won a £1.7 million order for more than 1,400 special purpose lift-on, lift-off vehicle bodies for British Telecom. The bodies are tailored to the Leyland Sherpa 255 chassis-cab and will be used as mobile work units.

Jarvis, building and civil engineering contractors, has won two orders worth nearly £750,000. The largest is for an extension to Burgh Heath telephone exchange at Banstead in Surrey. The second involves work on a warehouse and offices in London.

Marconi Communications Systems has won a £600,000 contract from BTI for transmitting and remote control equipment for its long-range maritime communication services.

Mitel Telecom has received a £25 million order to supply a range of call-connect systems including Regent and the new TX-14 (Superset 4) feature telephone.

Optronics of Cambridge has picked up a £70,000 order for optical couplers to be used in BT Cable's television network. The couplers, manufactured by the Canadian company Canstar provide branching points in the 'switched-star' network.

STC Telecommunications has announced four new contracts. The first, worth more than £30 million, was awarded to provide improved customer facilities for TXE4 telephone exchanges. The second was won by STC's Electronics Division, and is for frequency division multiplex equipment transmission equipment worth £400,000 for BTI's Goonhilly earth station. The Electronics Division also won a further £750,000 order for telegraph converter equipment. And STC have won a major order for 40,000 Call Four radiopagers which feature four addresses differentiated by tone patterns. The radiopagers are manufactured at the company's Monkstown site in Northern Ireland.

TMC Limited has been awarded contracts worth more than £17 million for a range of telephone instruments including the successful Statesman electronic push-button telephone. All the instruments will be manufactured in the company's Airdrie factory.

Xtec, data communications specialists, has won a £300,000 contract to supply networking equipment to be used with System X exchanges.

Gamestar scores

British Telecom Cable Interactive Services (BTCIS) has won the first contract to supply tv video games to a UK cable operator.

The contract is with Rediffusion and is for the BTCIS Gamestar service. Up to one million homes on Rediffusion networks throughout the country will be able to access Gamestar starting this summer.

US video link

The first stage in a videoconference link-up between Washington and London, using the latest digital techniques, was set up by British Telecom International (BTI) for a five-day session of debates held simultaneously in the two cities.

BTI provided a link from the Euston Confravision studio to the United States Information Agency's studio in Washington. Transmissions went by cable from the studio to the London Telecom Tower and from there by microwave radio to a small-dish terminal at Martlesham in Suffolk. They were then beamed up to an Atlantic Ocean Intelsat communications satellite and relayed to a transportable earth station in Washington.

BTI launched a digital public videoconferencing service to Canada in February and will introduce a service to the US later this year.

High flying data

British Telecom International's Business Communications Service (BCS) has secured a data transmission contract from Trans-World Airlines Incorporated (TWA), of Kansas City, Missouri worth £1 million over five years.

This means that TWA will use London as the hub of all its computer data transmissions between Europe and the US.

BCS has worked with TWA to design and install dedicated equipment to give a 24-hour, year-round communications facility for the airline. The equipment, to be installed at one of British Telecom's international switching centres in London, was due to be fully operational by Easter.

Getting the fax

A comprehensive guide to UK and international facsimile transmission has been published by British Telecom and contains more than 7,000 entries covering most sectors of British industry.

Included in each directory entry is the customer's name, address, fax machine number and compatibility. There is also a guide on how to make international fax calls and information on bureau services such as (BTI) Bureaufax.

Bank's new link

British Telecom has provided a new private video conferencing service for the National Westminster Bank enabling senior managers to use a new link between the Bank's two computer centres, in Aldgate, London, and at Kegworth, Leicestershire.

British Telecom provided the high-speed digital link and the terminal equipment at each end including camera, monitor screen, microphone and loudspeaker built into a single unit, plus the digital converter which is the key element of the system.

The NatWest installation paves the way for a new service from British Telecom, to be called VideoStream.

Network for defence

A contract worth nearly £500,000 for defining a new defence communications network has been won by British Telecom. The proposed network will provide defence-owned, rapid and secure communications between many establishments throughout the UK.

The Ministry of Defence contract is for the Project Definition Study and will take a year to complete. It will be undertaken by the Government Services Division of British Telecom's National Networks working closely with MoD's communications experts.

Installation will need another contract. It is estimated the work will take about four years to complete.

VIP visitor to British Telecom International's new satellite earth station in London's dockland was the Duke of Edinburgh who was presented with an engraved glass obelisk.

Prince Philip inaugurated the transmission of test pictures from the second of two dish aerials and watched on a television monitor as they were received back a quarter of a second later.

The first aerial is already in full operation beaming programmes to cable television operators in Britain and Europe. The second aerial will transmit to British cable television networks and a third will be ready later this year.

Our picture shows the Duke with BTI managing director, Tony Booth.

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The ideal length of such articles is between 1,000 and 1,500 words. Views of contributors are not necessarily those of the Board.

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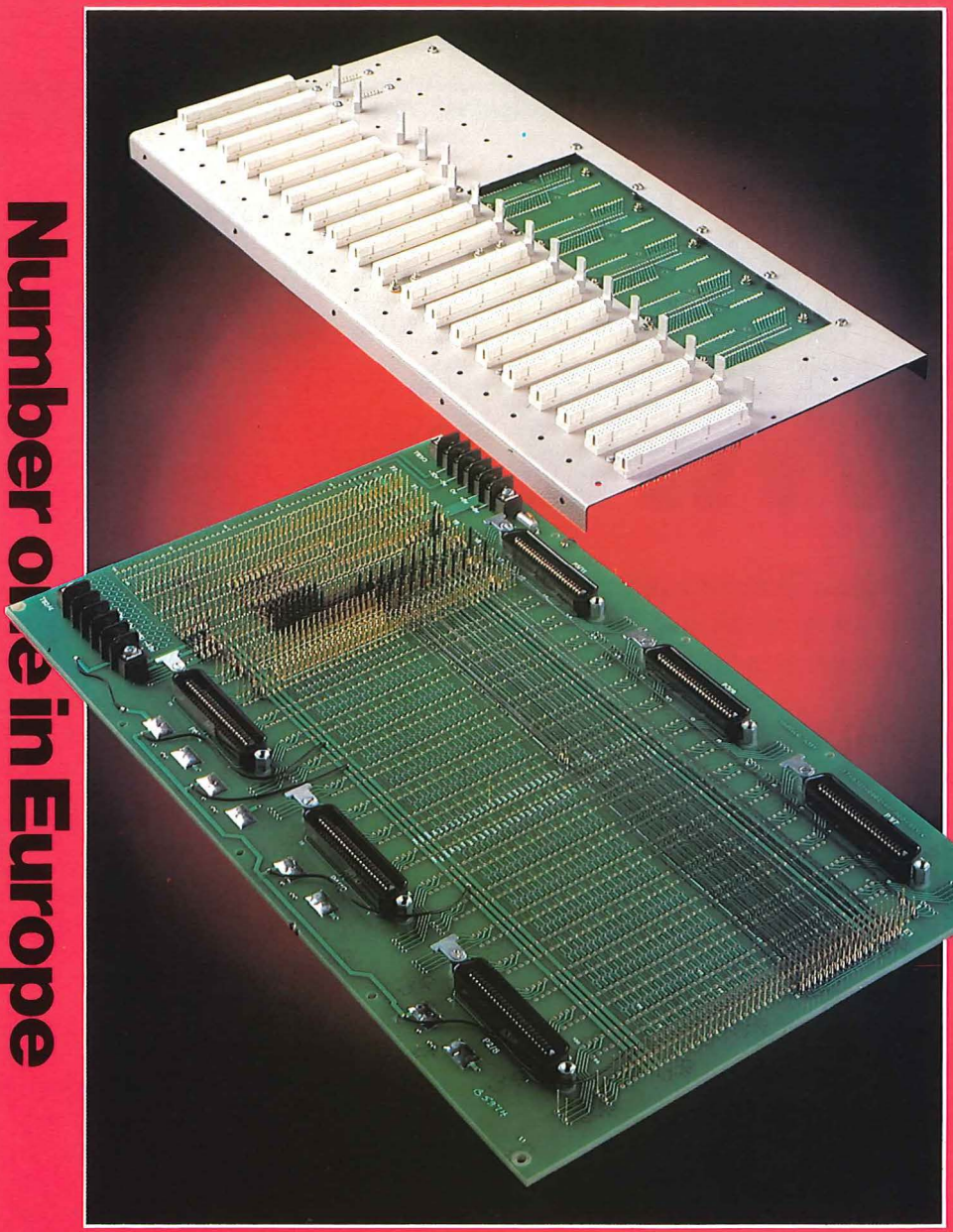

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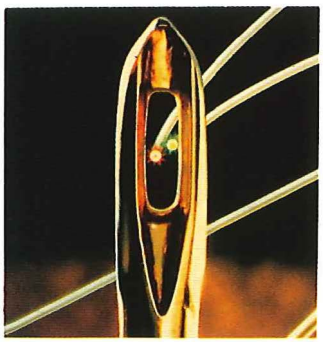
Through these X-Stream services, a family of digital exchanges and complementary services created deliberately to overcome previous limitations, business customers already benefit from higher standards of performance and reliability.

Simultaneously, foundations are being established for many new services to business, especially in the areas of electronic banking and the fully-automated office.

KiloStream: fast low-cost transmission

For private networks KiloStream provides fast, cost-effective links between computers and terminals – voice capability, too.

KiloStream makes simpler the transition beween analogue and digital working and can produce transmission savings of up to 80% on analogue/modem private circuits.



Optical glass fibres. The advanced monomode fibre (left), has a core diameter of 8 microns, can span up to 30 km. without regeneration.

It is available at a few weeks' notice at over 200 locations across the country and has already been specified by ICL, Horizon and many other major companies.

MegaStream: up to 140 Mbit/s

MegaStream is the highest in capacity of National Networks' private services.

High in quality, versatile and flexible, each circuit is engineered to the customer's specific requirements.

MegaStream is already available nationally at 2Mbit/s (capable of carrying up to 30 voice channels) and will shortly be offered at even higher rates, up to 140Mbit/s. More than 400 circuits have already been ordered.

Installing optical fibre cables under the Hull river

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National Networks routes X-Stream services over high-capacity circuits, monitored round the clock, with full back-up and with dedicated fault-finding and clearance.

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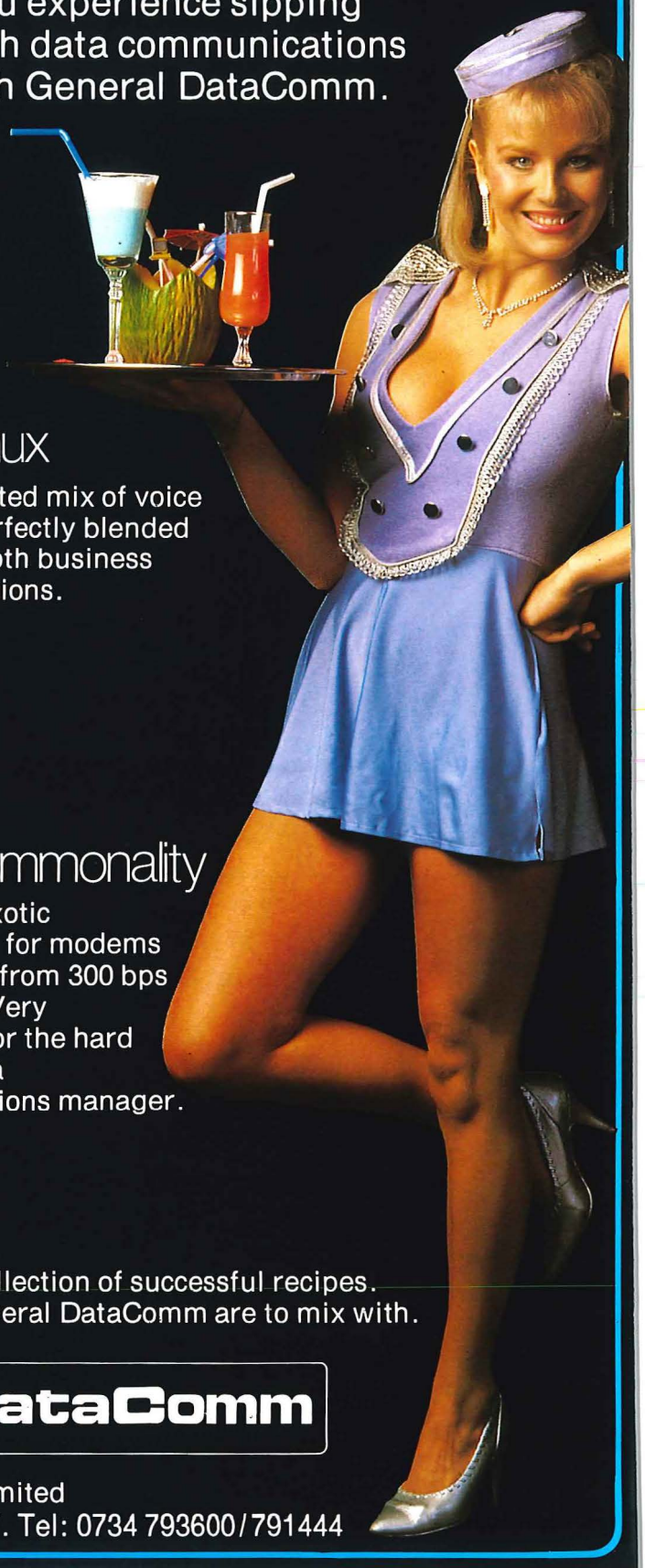

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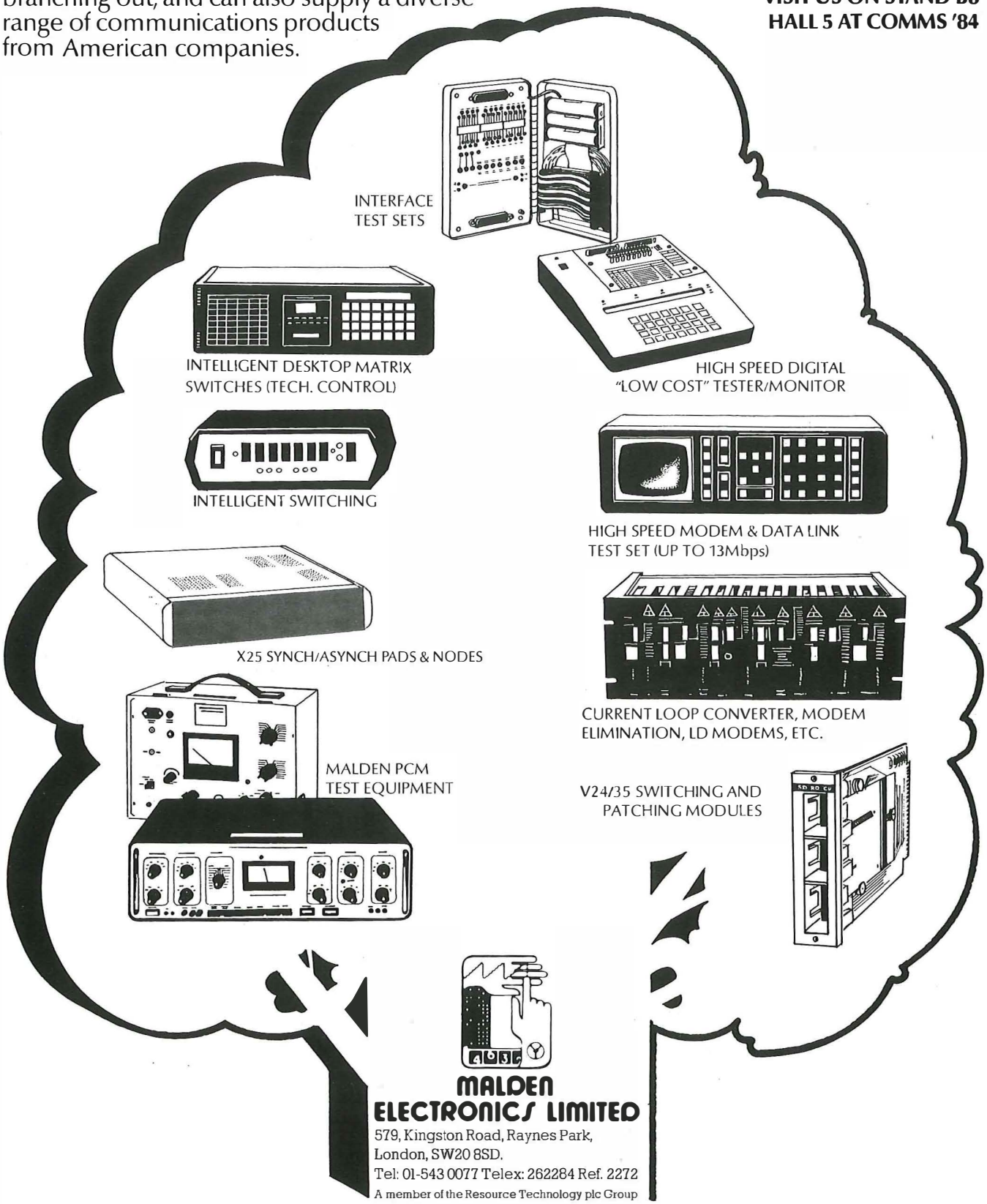

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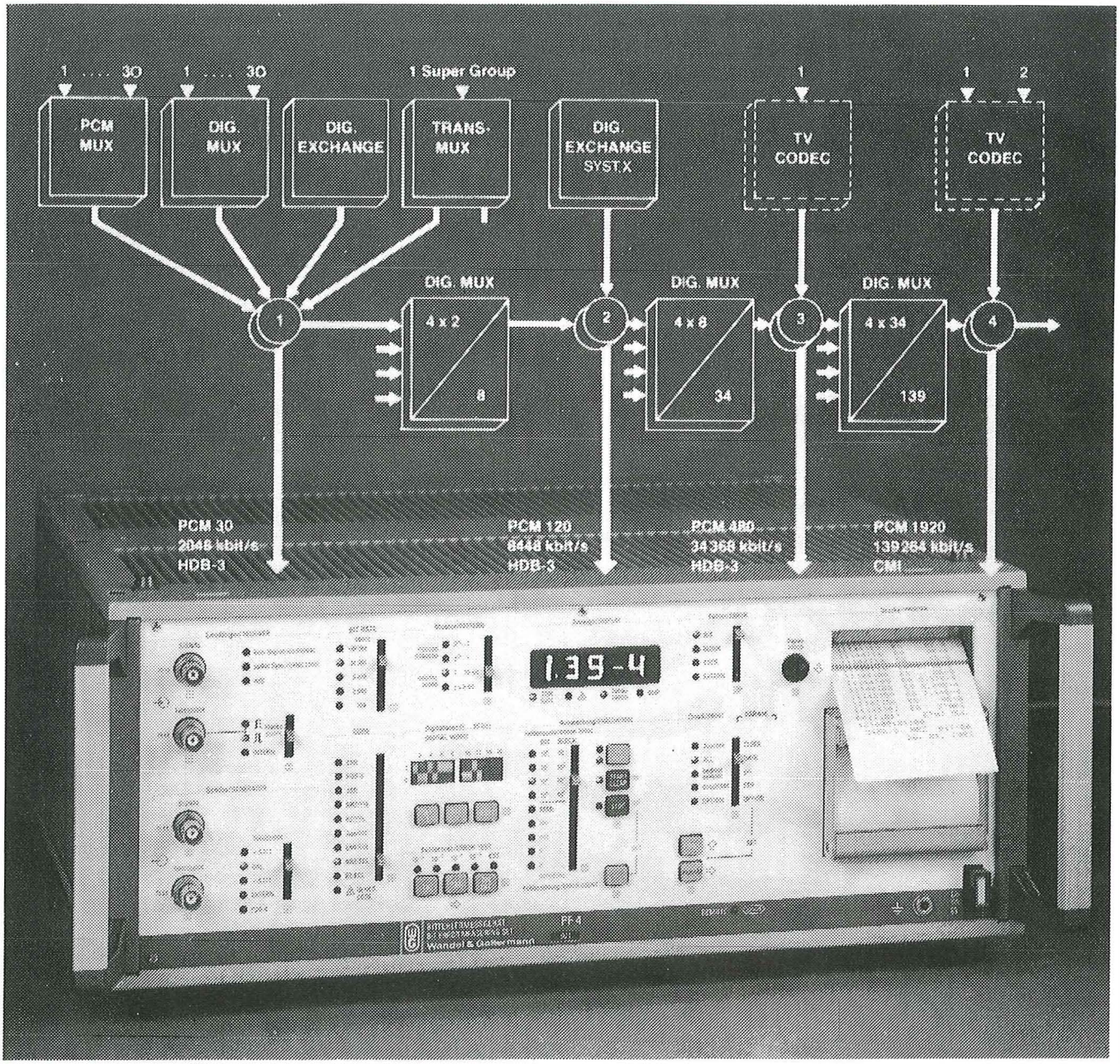

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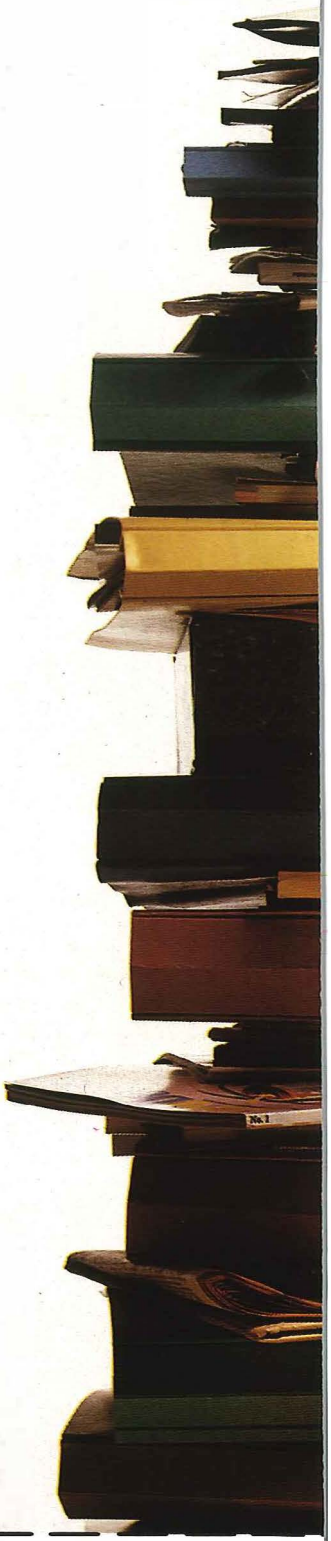

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The winner of the Prize is selected by an independent Prize Committee consisting of members appointed by the Royal Swedish Academy of Engineering Sciences, the Board of Directors of the Swedish Telecommunications Administration and representatives of leading Swedish universities of technology.

Candidates may be nominated by members of the Prize Committee and by organizations or individuals active in the telecommunications field.

Nominations are now being accepted for the 1985 award. All nominations must be in writing and should be accompanied by all relevant supporting material. The closing date for nominations is October 1, 1984.

Only the winner's name will be disclosed. Where the Prize contribution results from the work of two or three people, the Prize may be awarded jointly.

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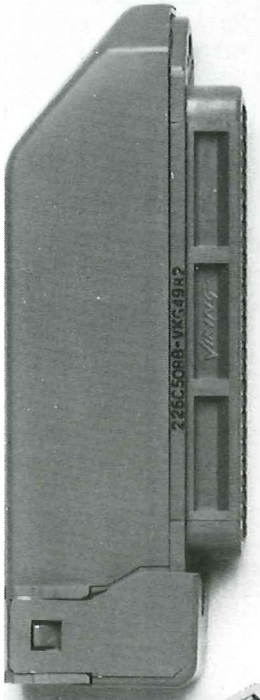

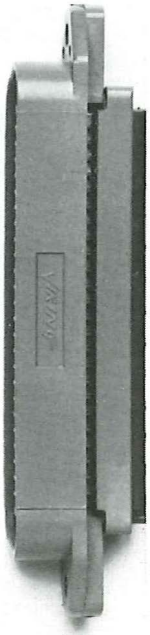

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