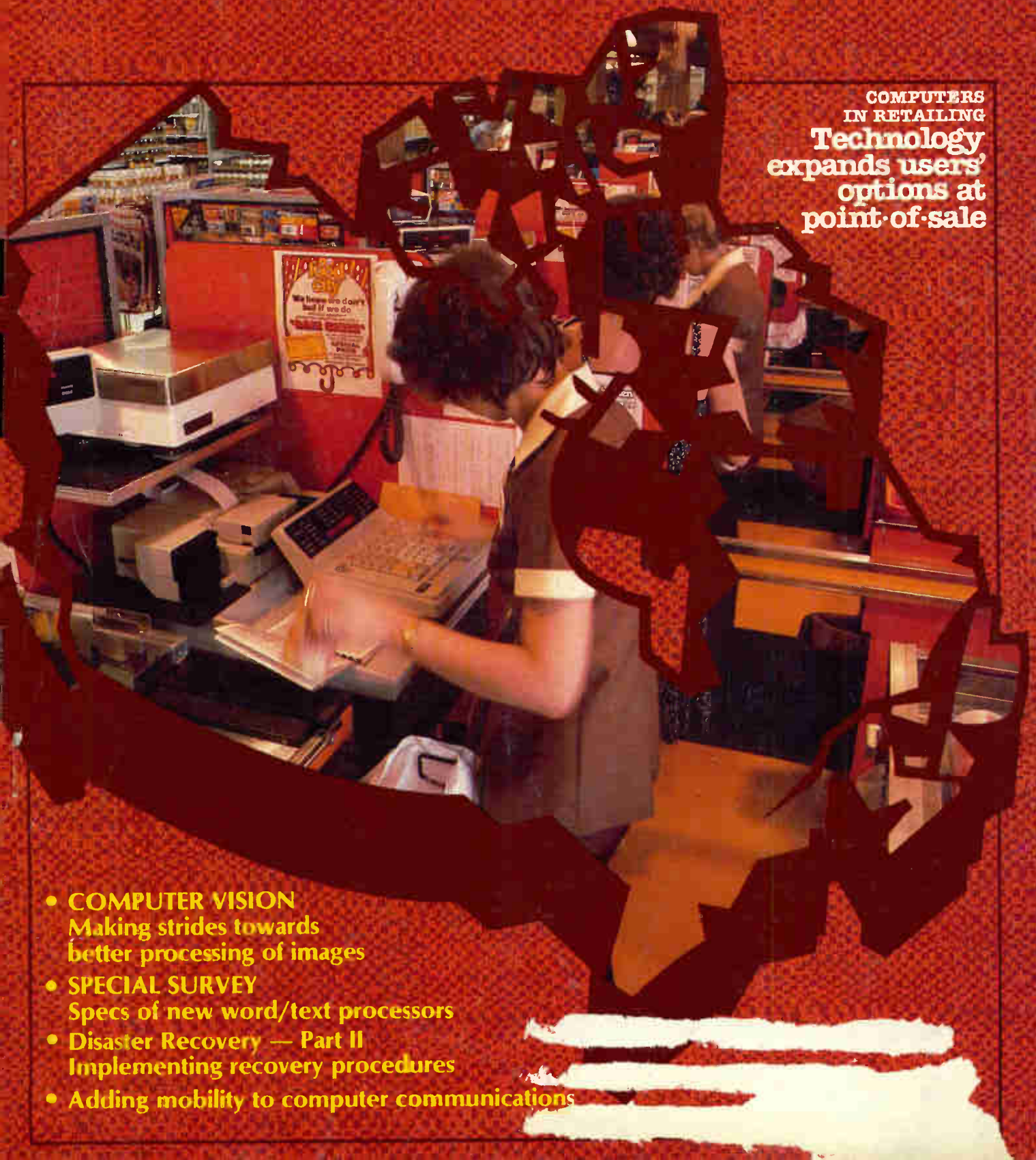
CANADIAN
DATASYSTEMS
September 1981



COMPUTERS IN RETAILING
Technology expands users' options at point-of-sale

- **COMPUTER VISION**
  Making strides towards better processing of images
- **SPECIAL SURVEY**
  Specs of new word/text processors
- **Disaster Recovery — Part II**
  Implementing recovery procedures
- **Adding mobility to computer communications**

"We have used ten XT 100 Terminals, and we are recommending them to all our existing and future Word 11 clients."

Mr. Ron Dutton
General Manager,
North West Computer Services

"We are pleased with the XT 100 Terminals, as they are fully compatible with RSTS on our 11/70."

Mr. Logan Ragan
Manager, Computer Services
Bridge Brand Food Services Ltd.

"We have been extremely happy with the performance of our sixteen XT 100 Terminals. They are fully compatible with RSX 11M and IAS, on our PDP 11/34-40 and PDP 11/70."

Mr. Lorne Sunley
Operations Manager,
Yamaha Canada Music Ltd.

"The XT 100 Terminal is 100% compatible with our Dec systems, and it allows IST to have better client pricing in new offerings."

Mr. Gerard Briere
Director of Marketing,
IST

AND THAT'S JUST THE BEGINNING!

By using Lanpar's financial power, we leave you free to use your capital in other areas. Lanpar can custom-tailor short term rental and lease-purchase plans to suit your needs. With low, long term rates, and one day cancellations, Lanpar makes it easy.

Once you have put your Lanpar XT 100 Terminal into production, we'll make sure it stays in production. Only Lanpar has Service Power.® Service Power® offers you 14 service centres located all across Canada, and field engineers who will be on site within 2 to 4 hours, on average, should your terminal need servicing.

LANPAR

AT LANPAR, TERMINALS ARE JUST THE BEGINNING.

Lanpar Limited:
Montreal (514) 731-7421, Quebec City (418) 653-1345, Ottawa (613) 238-3966, Toronto East (416) 495-9661 Toronto West & Mississauga (416) 494-8031, Burlington (416) 681-2442, Winnipeg (204) 632-4349, Edmonton (403) 453-5946, Calgary (403) 253-8866, Vancouver (604) 689-1516. Service available from Service Centres located in 14 major cities across Canada.

Lanpar has the technological expertise to customize any of its terminals. Our R & D Team has an impressive record of successful adaptations: Over 1000 custom terminals last year alone.

With Lanpar's financial power, lease-purchase plans, Service Power® and technological expertise, it's easy to see why at Lanpar, terminals are just the beginning!

AT LANPAR, RENTALS ARE JUST THE BEGINNING.

At Lanpar we custom-tailor short term rental and lease-purchase plans to suit your needs. Our "No Stranglehold Lease" offers you low, long term rates, yet with one day cancellations. Most plans offer you generous credits towards purchase. Our lease rates can be adapted to include service, installation and delivery. And that's just the beginning!

Once you have put your Lanpar terminal into production, we'll make sure it stays in production. Only Lanpar offers Service Power™. With service centres located nation-wide, we can have an experienced field engineer on site in an average of 2 to 4 hours. Our meantime to repair (MTTR) averages ½ hour. So you can feel at ease even when setting up your own coast-to-coast terminal network.

Lanpar has established an Application Group to help you interface your terminal with different systems. Our R & D team has an impressive record of successful customizations: Over 1,000 custom terminals last year alone.

You can also look to Lanpar for custom-made equipment, options, cables, modems and switches to help you increase the productivity of your particular unit.

And, by using Lanpar's financial power, we leave you free to use your capital in other areas.

So, by having one company offer you flexibility, service expertise, R & D, Application Support and financial strength, it's easy to see why at Lanpar, rentals are just the beginning!

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Service available from Service Centres located in 14 major cities across Canada.

CANADIAN
DATASYSTEMS

SEPTEMBER, 1981 VOLUME 13, NUMBER 9

COVER:
Computerization at the local supermarket is just one facet of the growing world of point-of-sale systems. Photo courtesy of NCR Canada.

NEXT MONTH:
An in-depth preview of the products and services to be displayed at this year's Canadian Computer Show and Conference (Nov. 16-19, in Toronto) will be presented, along with full conference details.

DEPARTMENTS

TALK IS CHEAP.

Especially here.

If you need port contention, port selection or have more terminals than ports, you probably need an intelligent data switching system. We'd like to make a simple point: lots of people will dazzle you with super advantages, gee whiz features and out of this world performance claims. But when it comes time to deliver, and your job is on the line, promises won't help. At Develcon, we've taken a different approach. And it has proved quite successful for us and, more important, our customers.

Above all, Develcon is an *engineering* organization. Our data communications engineers are just that. Without impressive sounding titles. We'd rather they impress you with their knowledge. Their job is to *listen* to you. To learn about your data communications system problems, and then recommend solutions.

Of course, we hope their recommendations include our DATASWITCH intelligent switching system. But if they don't, you'll get straightforward answers. We'll be around for a long time. And if we can be honest with you from the beginning, we'll both be better off in the end. All it takes is a little talk – and we're ready to listen. Let us hear from you today.

Only Develcon Intelligent DATASWITCH Systems offer these advantages:

- Lower costs • Easy expansion
- Increased up time • Management control • Security • Maximum system utilization and flexibility
- Multiple user priority levels
- English language commands
- High speed capability

Develcon ELECTRONICS

Develcon Electronics
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Saskatoon, Saskatchewan
Phone: (306) 374-2202

Develcon has authorized representatives in most metropolitan areas. Call us for the name and number of the nearest one.

Reader Service Card Number 120

SEPTEMBER, 1981
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LETTERS

which praise, castigate, comment and inquire

A 'put down'?

I have been annoyed by articles in various trade magazines which contrast yesterday's computer against the modern computer-on-a-chip. These "Isn't it incredible!" stories invariably tend to put down the old computers, while greatly overstating the capabilities of a piece of silicon.

An example of this appears in your June 1981 issue, p. 102, showing a PDP-1 installation with a girl holding up an integrated circuit. The caption reads in part: "Small chip in inset is capable of performing most of the tasks accomplished by the vintage mini." What utter nonsense.

It's time someone stood up in defence of these 'vintage' machines and set the record straight. You not only ridicule the PDP-1, but also insult the people who originally designed and built the machine. When it comes down to raw computing power, even though it may be 20 years old, the PDP-1, with its 18-bit word length and fast instruction set can run rings around any of the 'one-chip' computers available today. Close examination of the IC the girl is holding reveals it to be an ordinary 16-pin DIP! Such a package might contain a few logic gates or a little memory, but not any microcomputer that I'm aware of.

Bill de Carle
Elrac Computing Ltd.
Toronto

Editor's Note: Digital Equipment Canada Ltd., which supplied the photo of the PDP-1 which went to the National Museum of Science and Technology, acknowledges that the chip in the inset is indeed a 16-PIN chip, and as you point out, does not contain a microprocessor.

"We used the chip simply to illustrate the great changes in technology since the early days of the PDP-1," notes DEC. "A slightly larger chip than the one pictured would have done many of the functions of the PDP-1. You are absolutely right in your comments as well, and the creators of the machine have every right to be proud of it and we agree that every credit is due to them."

No put-down intended!

Micro power

Thank you for a well written article ('How to protect micro power,' June 1981). It adresses an important point to which micro and large-system users pay little attention.

As possible solutions to powerline disturbances, the usual separate powerline, isolation- and regulating-transformers are listed only.

We would like to bring to your attention the ROS powerline filter, a new product developed and manufactured in Canada. It is designed specifically to eliminate high and low-voltage transients, noise bursts, radio frequency interference and line oscillations; problems which account for over 90 per cent of powerline disturbances.

As this filter does not utilize a transformer, it does not generate heat or acoustical noise and is immune to self-oscillations; difficulties which are generally associated with line transformers.

Rolf O. Stiefel
Manager, Marketing
Power Control Inc.
Mississauga, Ont.

Reaching our readers, mail strike or not...

As with many other businesses, this magazine relies on the postal service to deliver its message to readers, customers etc. When it became apparent that there wouldn't be a quick resolution of the strike, this magazine, and its sister publications within Maclean Hunter Business Publishing Co., resorted to an 'alternate delivery plan', that had been developed since the last postal service disruption.

To reach our readers across the country, our alternate distribution called for the services of private carriers to supply our magazines to major centres, where other private distribution services went into action delivering magazines to offices, plants and businesses.

Editors, publishers, advertising reps, and other staffers, all pitched in, working in our printing plant, sorting magazines by destinations, and packaging publications for distribution. The objective was to reach our readers, to deliver the communications message a magazine contains. It wasn't a perfect system, but turned out to be a surprisingly efficient means of reaching most of our readers.

Not knowing what tomorrow will bring, makes the choice easier today:

CENTRONICS® PRINTERS

Centronics Model 6080 and Model 6081 Band printers are outstanding examples of Centronics engineering. Both models feature high throughput, greater efficiency and the superior print quality of fully formed characters, along with the reliability and dependability of Centronics—long a leader in printer technology and printer service.

Model 6080 incorporates the highest levels of band printer technology and for the first time allows a 750 lpm printer to operate at lower noise levels than the average office typewriter.

The 6080 delivers throughput at speeds of up to 750 lpm, making it ideal for distributed processing applications and use in word processing. It also offers a wide selection of character bands and sizes. (48, 64, 96 or 128).

No matter what system you are presently using; IBM, DEC, Burroughs, Univac, Honeywell, NCR, etc. the Centronics 6080 or 6081 will complement them all. For rent, lease or outright purchase - contact CES Ltd. It's an easy choice to make.

Model 6080 featured above, Model 6081 to the right.

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Reader Service Card Number 109

WHAT'S NEW

NEC PC-8000

Prime 850

Ramtek RM-6211

COMPUTERS

Z-80 compatibility

The Product: desk-top computer
Supplier: NEC Information Systems Inc.
Features: The PC-8000 personal computer is designed for the small business and professional market as well as for remote applications in large corporations.

A basic system consists of a Z-80 type processor with 32K RAM and 32K ROM, serial interface, ASCII keyboard with numeric pad and five function keys, an 80x25 CRT, cassette interface, parallel I/O bus extension, and a parallel printer adapter.

On-line data are stored on a mini-floppy diskette drive with a 320K byte capacity. A dual unit can be added. Also optional is an eight-color CRT.

Most application programs developed for Z-80 computers, including those running under CP/M, will execute on the PC-8000.

Reader Service Card Number 1

Increases throughput

The Product: minicomputer
Supplier: Prime Computer of Canada Ltd.
Features: The Prime 850 is a high-end minicomputer which can process two instruction streams simultaneously using a single operating system and sharing the same main memory. This capability is said to enable the system to handle 50 per cent more throughput in a given time than comparable superminis, as well as to operate more efficiently than a two-processor network since the shared programs and software require fewer disc-to-memory transfers.

The 850 uses one-megabyte memory boards with 64K byte MOS RAM chips, and main memory can be expanded from two to eight megabytes. The system supports 128 terminals.

Other features include: burst-mode I/O which increases system speed; and hardware support for floating point arithmetic, decimal arithmetic, and character string operations.

Reader Service Card Number 2

Off-loads host

The Product: batch processors
Supplier: Four-Phase Systems Inc.
Features: The System 311 and 312 batch processors are compatible with the instruction set and I/O channel interface of the IBM 370, and enable Four-Phase front-end system users to off-load their IBM mainframes by transferring batch applications to remote sites.

The 311 is comparable in power to the IBM 3441 Group 1, while the 312, with twice the performance, is comparable to the IBM 4331 Group 2. Disc capacities range from 100M bytes to 1,600M bytes.

These models may be coupled "tightly" or "loosely" with Four-Phase systems by either a high-speed bi-directional channel or a low-speed connection.

Reader Service Card Number 3

TERMINALS

Choose 16 colors

The Product: color graphics terminal
Supplier: Ramtek Corp.
Features: The RM-6211 Colorgraphics terminal offers resolution of 640 x 480 pixels, operating at 30 Hz (interlace), with an option for 640 x 512 pixels operating at 60 Hz (repeat field). Sixteen colors, selected from 64, can be displayed simultaneously, or eight colors plan an alphanumeric overlay or a blink function can be used.

The terminal uses the company's Colorgraphic Programming Language, and is compatible with the Tektronix Plot 10 graphics software as well as several other packages.

Reader Service Card Number 4

PRINTERS/PLOTTERS

Low-end printers

The Product: printers
Supplier: Hewlett-Packard (Canada) Ltd.
Features: The company has entered the low-cost printer market with three thermal printers and one dot-matrix printer.

The 2671A thermal printer offers the 128-character ASCII set plus a line-drawing character set for creating forms and a Roman Extension set. It prints 80 columns per eight-inch line or 132 columns. The 2671G offers the same as well as high-resolution raster graphics, while the 2673A features more enhancements, such as auto-centring, windowing and offsets.

The thermal models print 120 cps, use fan-fold paper, and have been designed to sit on top of the HP 9826 computer system.

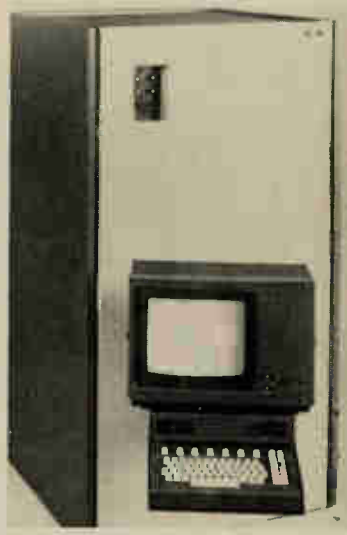
Reader Service Card Number 5

WHAT'S NEW

ISI 387

Micronic 200

Chatsworth OMR 500



CC-80 processor

Options offered

The Product: printer
Supplier: Interface Systems Inc.
Features: The ISI 387 printer is a plug-compatible replacement for the IBM 3287 printer. It offers 180-cps print speed, bold face expanded character printing, SNA-SDLC compatibility and full SCS support. All the options of the 3287 are offered on the 387.

Reader Service Card Number 6

DATA ENTRY

Several scan options

The Product: portable computer
Supplier: Admiral Data Systems
Features: The Micronic 200 portable computer is designed for the retail and wholesale order entry market. It weighs less than half a pound and communicates with the host computer via a 1,200 baud acoustic coupler.

Its features are: LCD display, UPC wand scanning, EAN scanning, modified Plessey scanning, two of five scanning, Code-a-bar scanning, and 8K CMOS memory.

Reader Service Card Number 7

Collects remote data

The Product: data coupler
Supplier: Hewlett-Packard (Canada) Ltd.
Features: The HP 3078A data coupler collects direct electrical data from manufacturing equipment at distances of up to four kilometers from the controlling computer. It can also be used to interface custom-built I/O modules to HP 1000 real-time computer systems.

The 3078A comes as a wall or desk unit. Five electrical interface modules are available for this unit, any three of which can be attached to the data coupler.

Reader Service Card Number 8

Reads holes or marks

The Product: optical card reader
Supplier: Chatsworth Data Corp.
Features: The OMR 500 optical card reader reads punched holes, preprinted data or pencil marks on standard OMR cards, using fibre optics technology. Processing speed is less than one-half second for hand-fed cards.

The unit comes with intelligent interfaces for Apple, TRS-80, PRT, and Atari computers, and RS-232 and S100 interfaces are also available.

Reader Service Card Number 9

DATA COMM

Tracks calls

The Product: telephone call recorder
Supplier: ESE Ltd.
Features: The Station Message Detail Recorder (SMDR) is a telephone network management device designed for use with electronic PABXs. It records and stores call records on an IBM-compatible magnetic tape which will easily hold data from a typical 500 to 1000-line system on a weekly basis. The unit can be polled over the direct dial network, and is compatible with the ASCII output from several switches.

The SMDR is compatible with ESE's Telaccount software package, and data may be processed by this accounting system or by the user's software.

Reader Service Card Number 10

Quality maintained

The Product: voice digitizer
Supplier: Centrigram Corp.
Features: The VOPAC voice digitizer converts an analog voice input in real time, full duplex, into a 4800 bps bitstream for transmission over a network. The received voice is as clear as the average telephone conversation, thanks to a technology called parametric waveform coding (PWC).

Since a conditioned leased line can carry 9600 bps, two voice digitizers can carry voice conversations simultaneously, or the channel can be shared between voice and other types of transmission.

Reader Service Card Number 11

Handles 1,232 lines

The Product: communications processor
Supplier: Computer Communications Inc.
Features: The CC-80 enhanced communications processor functions several ways. It can be used as a replacement for IBM 270X/370X controllers, and as such handles 240-1,232 lines in a mixture of speeds and protocols while supporting seven host computers.

It can also function as an independent front end processor or can be incorporated at various points within a network system using CCI's Intercomputer Communications Protocol.

Reader Service Card Number 12

COMPONENTS

Uses less power

The Product: random access memory
Supplier: Integrated Device Technology
Features: The IDT 6116 is a 16K high-speed, low-power CMOS static RAM. Its access times of 70, 90, and 120 ns. are as fast or faster than comparable NMOS memories, while its power consumption is said to be about one-third the operational consumption and one-hundredth the standby consumption of NMOS memories.

Reader Service Card Number 13

Introducing a purchase management system that gives you four-way match, total information and a head start on the evening train.

If you're a purchasing manager, you know the frustration of not having the control you want over every P.O., receipt, invoice and inspection document floating around the company.

If you're an accountant for that same company, you're just as frustrated as the purchasing manager. And if you happen to be neither the accountant nor the purchasing manager – but the data processing manager – you're probably even more frustrated than your two colleagues. Because here you are with your heavy-horsepower IBM 360 or 370 or 303X or 4300. You're staying late at the office. You're hiring good programmers. But the purchasing manager and the accountant still aren't getting the level of control all three of you know ought to exist.

McCormack & Dodge would like to shorten your respective work days. With P/O Plus, a purchase management software package that gives you everything you need in one system. You get four-way matching of order, receipt, invoice and inspection documents. You prevent duplicate payment, you stop accepting goods not ordered, or paying for goods not inspected. You quickly generate reports on receipt status, overdue orders, requisitions, cash commitments, and virtually anything else you need. You easily do in-depth vendor quality analyses.

And because P/O Plus is a McCormack & Dodge system, it can be operated by personnel without data processing backgrounds. We'll teach them how – with a proven user training program that's as far ahead of the field as our software.

McCormack & Dodge. All over North America, prospects who sit down and talk to us do more than just talk. They become customers.

We'd like to show you why.

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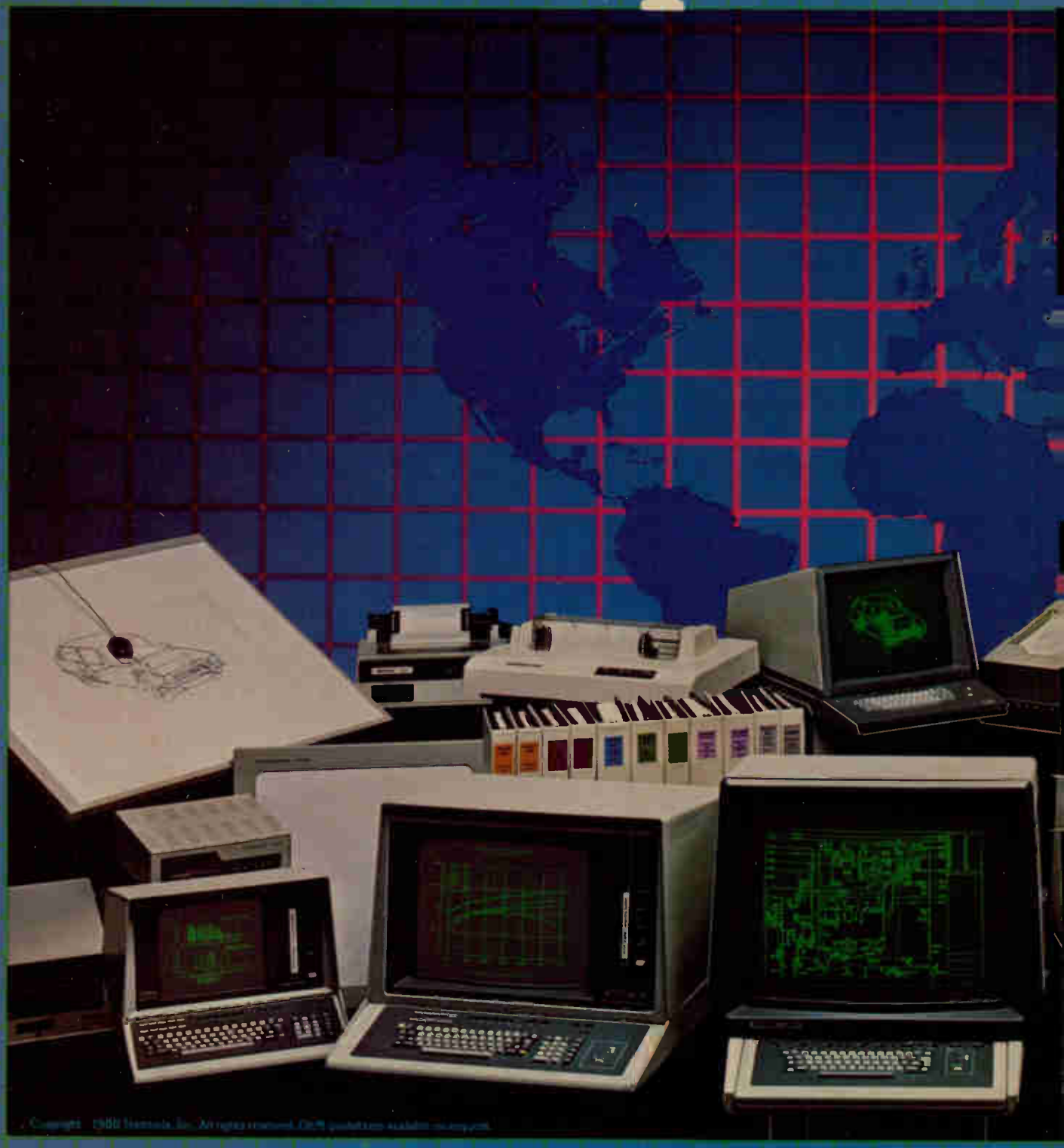
CDS9A

Reader Service Card Number 141

The Graphics



Standard

Graphics, the true universal language.

For 12 years, Tektronix has set the standards by which graphics information is measured:

In resolution. Size. Software. Service. Reliability. Compatibility. And breadth of product line.

Whatever your own standards of productivity and graphics performance, you can turn to Tektronix.

We'll measure up.

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COMMITTED TO EXCELLENCE

or more information circle number 153

Imagine, a VA3400, a 212A, and a 103 in a low profile cabinet designed for remote terminal users.

Racal-Vadic has closed the loop with a direct-connect, originate/answer TRIPLE MODEM for remote terminal users.

It combines a 1200 bps full duplex VA3400, a 1200 bps full duplex Bell type 212A, and a 300 bps full duplex Bell type 103 in a compact low profile cabinet. Including the VA3400 at NO EXTRA COST is very important. After all, Racal-Vadic invented the 1200 bps full duplex modem. There are over 150,000 in operation. Also, the VA3400 can be acoustically coupled while the Bell 212A can't. It has many technical advantages too, which is why major terminal manufacturers are incorporating VA3400 modems into their new equipment.

With TRIPLE MODEMS available for the central computer site, and remote ends of the network, users can lease or buy from Canadian General Electric and satisfy every full duplex switched network requirement from 0 to 1200 bps.

Better phone for the whole story, or send for our new color brochure today.

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VA3450 Triple Modem

Central Computer Sites
VA3467 Triple Modem

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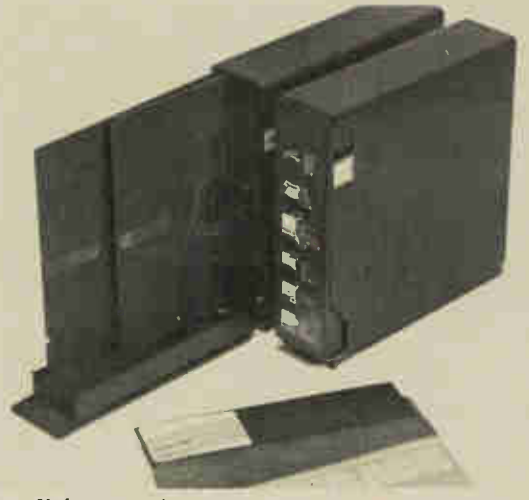
CGE Canadian General Electric

Data Communications Products

AD636 converter



Dennison Kybe magazine

Intimus 444

Draws low power

The Product: converter
Supplier: Analog Devices
Features: The AD636 monolithic rms-to-dc converter is said to be ideal for hand-held multimeter applications. It provides a full scale input of 200mVrms and draws 800μA from a single +5V to +24V or dual ±2.5V to ±12V power supplies.

The converter features 1MHz bandwidth and laser trimmed initial accuracy of ±0.2mV ±0.5 per cent of reading for dc or 1kHz sine wave input. External trimming improves accuracy to a level comparable with hybrid or modular devices.

Two versions are available: the K model meets the maximum specifications and the less expensive J model slightly less.

Reader Service Card Number 14

STORAGE

Size saves space

The Product: flexible disc drive
Supplier: Remex Div., Ex-Cell-O Corp.
Features: The RFD960 5¼ in. flexible disc drive combines 96 tpi data storage with low-profile design. It is 2¼ in. high at the bezel (standard 3.4 in. height is available also) and has a capacity of one megabyte of unformatted data.

Other features are: a direct drive brushless motor which is rated at 30,000 hours; no head solenoid to eliminate recurrent "tap-tap" problems; and an electronic damping of the stepper for excellent positioning. The drive is ANSI-compatible.

Reader Service Card Number 15

Loads automatically

The Product: diskette magazine
Supplier: Dennison KYBE Corp.
Features: The company is offering an automatic-loading diskette magazine for IBM Series 1 System/34 and System/38 computers equipped with auto-load drives. The magazine holds 10 eight-inch flexible discs, so that each magazine can store more than 10M bytes of formatted data. When not in use, the magazine acts as a protective covering for the diskettes.

Reader Service Card Number 16

Controller cuts costs

The Product: disc controller
Supplier: International Memories Inc.
Features: The Model 5000 disc controller is designed for IMI's 5000 5¼-in. Winchester disc drives, and is said to be less expensive than competitors' controllers, making the total cost of a disc system less than previously available ones.

Features of the 5000 system are: self-test and CRC capabilities to map media defects automatically; serial/deserialization; automatic error retry; three logical sectors; a 512-byte buffer; logical or physical sector addressing; implied seek and sector interlacing; overlapped commands; and automatic head and cylinder switching.

Reader Service Card Number 17

ACCESSORIES

Takes crumpled paper

The Product: shredder
Supplier: Datatech
Features: The Intimus 444 shredder will shred crumpled paper so that the contents of wastebaskets as well as computer printouts can be discarded. The feed funnel will take one wastepaper basket or 60 printouts at a time, and measures 20 in. x 14 in.

This model combines shredding with baling and is available with an optional hopper. It stands 27 in. wide, 19 in. deep, and 46 in. high.

Reader Service Card Number 18

Multiple voltages

The Product: voltage suppressor
Supplier: General Semiconductor Industries Inc.
Features: The DQA/DQB 16-pin dual-in-line transient voltage suppressor series gives the user a single protector for multiple power input applications.

Each device offers four TransZorb arrays which permit the user to select either single or multiple voltages from 5 to 50V.

The devices have a response time of less than 1 x 10^{-12} seconds with protection levels from the most sensitive MOS memories and microprocessors, the company says.

Reader Service Card Number 19

Protects equipment

The Product: transformer
Supplier: Dresser Controlled Power Ltd.
Features: The Series 600 Super-Isolation Transformer protects computers and other data processing and electronic equipment from malfunctioning by attenuating common mode and transverse mode noise and transients. It is said to offer 95 per cent efficiency, less than 45 db noise-level on smaller units, and less than 0.1 per cent added distortion.

Single-phase sizes range from 125 VA to 25 KVA, and three-phase sizes range from 3 KVA to 500 KVA.

Reader Service Card Number 20

Holds 1,000 cards

The Product: file boxes
Supplier: RCS/Eichner Systems
Features: A line of microfiche filing trays has been introduced by the company. The "flip-top" plastic trays will hold 1,000 microfiche cards.

Reader Service Card Number 21

Plug into Comterm. Ontario Hydro does.

When Ontario Hydro decided it was time for additional terminals for their computer system, among others, they asked Comterm to tender. That's because as one of Canada's foremost independent computer terminal manufacturers they knew we could deliver on time. And we did.

But there was more to it than that. Our specifications exceeded their own. Our price was right. And when Ontario Hydro completed its extensive test program, they found that our terminals' performance lived up to the promise of the specifications.

They're compatible with other terminals in their system. And unlike many other terminals, they withstand power losses and surges which means reduced downtime. Our twelve month purchase warranty (against the industry average 90 days) was another attractive feature. And if something did go wrong, Ontario Hydro discovered that our service team consisted of problem solvers. Not spare part replacement people.

If new computer terminals are in your future, call us. We're sure you will get a charge out of what we have to tell you.

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Developments in microprocessor technology, applications

Xylogics expands memory on LSI-based micro

The 22-bit memory address of the XL2300 single module system from Xylogics Inc., Burlington, Mass., is now supported under the company's supplied RSX-11M operating system, which allows the user to configure systems from 96 KB up to 4 MB. This feature is normally supplied with larger more expensive configurations from DEC, and does not allow the use of other cost saving devices such as Winchester discs and cartridge tapes, says the company.

The system includes the LSI-11/23 microprocessor, a 20.8 MB Winchester disc with RL02 emulation, a 17 MB tape cartridge with TU10 emulation and up to eight pre-wired RS-232 compatible ports.

Reader Service Card Number 22

HP main memory drops to under one cent/byte

Hewlett-Packard (Canada) Ltd., Mississauga, Ont., has announced a price drop for the main memory on its HP 1000 L-Series microcomputers to less than one cent per byte.

According to Joseph P. Schoendorf, Marketing Manager, HP Data Systems Division, the decision to use 64K RAMs to create the half-megabyte L-Series microcomputer now enables the company to make a 60 percent reduction in memory prices for the product. The price drop was also influenced by the rapid decline in vendor prices for 64K RAMs in the past few months, in conjunction with an extremely high order rate for the HP microcomputers, Mr. Schoendorf adds.

The price reduction applies to all L-Series micros, and to the newly-announced HP 1000 Model 5 Microsystem. The price of the 512K byte memory for the L-Series now stands at $5,964 Can. That lowers the L-Series two-board half-megabyte microcomputer to $8,947 Can.

Reader Service Card Number 23

Zeus 80 system supports Herzing education centre

Opening a new education centre in Ottawa, the Herzing Institute has selected the Zeus 80 microcomputer from Accountdata Corp., Markham, Ont., to provide systems applications to teach programming languages to college graduates.

The computer will be used to train students in Basic, word processing, on-line processing and inter-active processing. The course also provides training in computer languages using Cobol and RPG2, providing advanced programming instruction in an on-line environment. The computer system will eventually provide other programming languages such as Pascal and PL1.

This is the first Zeus system purchased by the Institute and features an 8-user connection to the mainframe. An expanded main memory of 512,000 characters has been added to the basic configuration in order to support Herzing's extra educational requirements.

Reader Service Card Number 24

16-bit micro boasts high speed operation

Claimed to have execution times of 250 ns register-to-register, the F9445 16-bit microprocessor from Fairchild Semiconductor, Mississauga, Ont., uses the company's isoplanar integrated injection logic (I^3L) technology.

The processor has eight program-accessible registers (ACo, ACi, AC2, AC3, SP, FP, PC, PSW) and the capability of directly addressing 128 K bytes (64 K words) with 11 addressing modes. Up to 4 MB of physical memory may be accessed using the F9454 memory management unit. The microprocessor can address 62 I/O devices, handle 16 levels of priority interrupt, and perform fast DMA. It has control lines to provide operator-console functions and has an on-chip self-test program.

The processor's instruction set includes memory reference, ALU, I/O stack, multiply/divide, floating point assist (scale/normalize), instructions with 8-bit byte, 16-bit word, or 32-bit double-word data.

Reader Service Card Number 25

Zenith micro now offers access to most popular OS

Zenith Data Systems, Mississauga, Ont., has released Zenith Standard (ORG-O) CP/M Version 2.2 as an operating system for its Z-89 'All-In-One' line of microcomputers. According to Zenith general manager Brian Winks, programs written under Zenith Standard CP/M can run on any other computer system that uses CP/M.

Three operating system modules are included with the Zenith OS: 'BIOS,' implemented as a disc-resident relocatable file in the Zenith version, contains all hardware-level I/O code; 'BDOS' has all file-level and logical I/O code, while 'CCP' is the transient monitor, providing command-level communications between the user and the CP/M.

Zenith CP/M supports all 5¼ and 8-in. Zenith and Heath disc systems, printers, and hard-copy terminals.

Reader Service Card Number 26

Test station for micros helps repair, troubleshoot

The Series 4500 test station from Millenium Systems Inc., Cupertino, Ca., is designed for microprocessor boards and performs test program development, production go/no-go testing, repair and depot troubleshooting, or fault isolation.

The tester uses emulators to inspect a board range of microprocessor-based systems. Currently, emulators are available for the 6800, 6802, 8080A, 8085A, Z80A, 6801, 6803, 8021, 8041, 8048, 8035, 8039, and 8748.

The tester incorporates time-domain analysis, in-circuit emulation and signature analysis for system testing and troubleshooting.

Because of its simplified operation, the unit can be easily used in production-line testing and repair as well as field depot service by technicians with only a minimum of training. The tester provides results that can be read directly without requiring interpretation for rapid fault location. The test station incorporates a functionally grouped keyboard including direct I/O, memory and register and breakpoint controls.

The device also has optional remote communications capabilities for field service or quality control repair facilities.

The test station runs on the same test software as the Millennium Fastprobe test network which can generate test software and printed fault isolation trees to support the 4500 in remote locations.

Reader Service Card Number 27

SOFTWARE UPDATE

news of software and services

Kit manages discs

The Product: Disc optimization utility
Supplier: Software Techniques Inc.
Features: The Diskit software package is a complete disc optimization "tool kit" for users of the DEC RSTS/E operating system. The package consists of four parts. The major component, the DSU disc structuring utility, requires less than one hour to run and is designed to rebuild any RSTS disc for efficient performance during directory and file operations.

The DSU transfers between unlike discs, saves accounting time, optimizes file clustersizes, places and pre-extends UFDs, allows manual file placement, and provides full logging and statistics.

The system also includes a DIR Macro-11 Fast Directory Program which is claimed to operate at 250 files/sec. It supports all the standard Direct switches (including backwards, up to 1,000 files); and features password lookup, UFD placement, and UFD size.
Reader Service Card Number 28

Replaces IBM DBT

The Product: Name standardizing software
Supplier: Hawkeye Information Systems
Features: Two software systems designed to standardize field and file names are available from Hawkeye for the IBM System/3 and System/34. The first system, Data Base/38, standardizes field names in RPG II programs on S/3 (models 8 to 15D) and S/34. The second system, File Re-Namer/Plus, is available on the System/3. It allows for the standardization of file names and/or labels in OCL and RPG II programs, and provides useful edits and documentation for any installation going through a conversion.

As a replacement for IBM's Data Base Techniques, the software packages are claimed to eliminate most programming time by having standard field names coded on a file-by-file basis instead of the IBM approach of having changes coded field by field.
Reader Service Card Number 29

Stores bill data

The Product: Utility billing software
Supplier: Lawson Associates
Features: This new billing system allows utilities to keep accurate records of customer names and addresses, as well as the services used by each customer. It also allows individual customer meter information to be incorporated directly into the system.

Although the system was specifically designed for use by water utilities, the software can easily be adapted to companies offering other services, including gas and electricity, and allows all utility information to be put on the same statement.

The package automatically produces the initial water bills, plus past due notices for each customer. The water bill is produced on a specific date while the past due and final notices are produced if the first statement is not paid within a specified time period.

Other features of the system include a parameter file which stores information on individual customers; rate information; a municipality definition file; daily audit lists as well as a master file which contains individual customer information.
Reader Service Card Number 30

For business forms

The Product: Forms management package
Supplier: Digital Equipment Canada Ltd.
Features: The "Indent" forms management software package for DEC Datasystem 500 series business computers is designed to enhance interactive data entry applications using PDP-11 Cobol, Basic-Plus-2, or Dibol-11 programming languages. The package also provides an independent data-entry front end to business application programs.

The software can be used in both single and multi-terminal applications. Unlike traditional forms management software, where software copies must be run for each terminal, the new software is claimed to handle multiple terminals simultaneously. Use of the package with multiple terminals reduces system memory requirements and decreases CPU utilization, since it is not forced to run multiple forms management programs.

The package is supported by the RSTS/E operating system, version 7, or the CTS-500 operating system. It is designed for use both by OEMs and end users.
Reader Service Card Number 31

Enhanced accounting

The Product: Enhanced accounting package
Supplier: Mini-Computer Business Applications Inc.
Features: The Release 2 is designed as an improved set of five accounting packages for the Wang VS series computers. It includes accounts payable, accounts receivable, general ledger, payroll, and order entry.

The enhancements allow extensive use of the program function keys in the same manner provided by Wang. This simplifies user option selection and access to the system. Full screen data entry is designed to improve operator speed and enhance system performance. The system also provides a full multi-company and multi-user capability with company consolidation as well as descriptive error messages displayed on the screen in response to invalid input. Fields containing errors blink to draw the operator's attention. All packages can automatically interface to the MCBA general ledger.
Reader Service Card Number 32

Suits desktops

The Product: Application programming language
Supplier: Westico
Features: The PL/I-80 from Digital Research is a powerful all-purpose application programming language for 8080, Z80 and 8085 microprocessors.

The PL/I-80 system comprises four major components: PL/I-80 compiler, Link-80 linkage editor, PL/I-80 run time library and RMAC relocatable macro assembler. The system generates Microsoft relocatable code so users can link load subroutines created by other language translators. Link-80 a disc to disc link loader, can load programs up to the maximum size of the machine. The run time library contains over 300 individual subroutines but loads only those which are used by the operator's program. A program can be as small as 600 bytes.

The package includes three comprehensive manuals and a programmer's quick reference guide. The large number of sample programs included serve as a "hands on" course in PL/I.
Reader Service Card Number 33

NT designs filter chip for signal processing use

Northern Telecom's Semiconductor Components Group in Ottawa recently implemented a programmable transversal filter with 31 taps and 9-bit coefficient accuracy on a single chip integrated circuit.

Applications for the device, which measures 18,000 square mils in area, are in any voice band signal processing system requiring a real time, programmable transfer function. The component was designed for manufacture in a proprietary double polysilicon, NMOS processes featuring high density dynamic logic, low offset analog switches and precision-ratioed, linear capacitors.

According to the company the chip includes such features as on-chip oscillator, direct interface to MOS coefficient memory, 50Hz to 20kHz sampling rates, single power supply operation and a 28-pin dual-in-line ceramic packaging. The new device is an improvement over previous sample and hold designs.

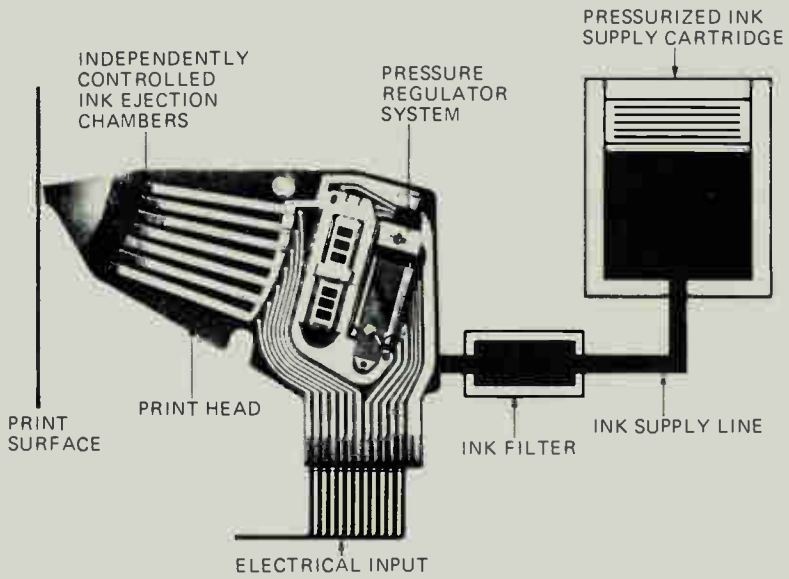
Increased memory in new low-cost, block-mode CRT

Increased memory, display enhancements, screen-labeled, user-programmable keys are features in a new low-priced block-mode display terminal (2622A) introduced by Hewlett-Packard (Canada) Ltd.

The new unit sells for $3,019, and is placed between the firm's character-mode-only HP2621A and the advanced editing HP 2624A.

It is well suited for on-line data entry, notes the company. Format mode, supporting protected and unprotected fields, and an optional line drawing character set enable users to build screen forms that match existing paper forms. Four display enhancements—reverse video, underlining, blinking and half-bright—help make forms easier to read. Standard memory accommodates up to two full pages of 80-character lines, enabling two-page forms to be entered.

Text may be copied from the screen and logged to an optional thermal printer or transferred directly from the computer to the printer. The printer reproduces all screen copy, including line drawings, and also display enhancements. In normal report mode, the printer produces text with 60 or 64 lines per page. In the compressed print mode, 132 column lines can be sent from the computer.



Desktop ink jet printer (Model AJ650), developed by Anderson Jacobson uses 'drop on demand' ink jet printing. Cartridge feeds ink to the print head through a flexible tube. Ink is not exposed to air until the instant it is propelled toward the paper. Closed delivery system avoids pumps or recirculating system. Operation does not produce surplus ink drops. Printer has speeds to 210 characters/second; 90 lpm on 132 characters per line. Cartridge lasts for six million characters, and can be replaced in seconds.

Canterm adds novel ACD/PBX to serve interconnect market

Canterm Communications Inc., Markham, Ont., is strengthening its move into the interconnect market with a novel Automatic Call Distributor and combined PBX system from Solid State Systems Inc. in the US. The Canadian firm was recently appointed Canadian distributor for the soft-ware driven system. The first Canadian installation of the new system went to the Ontario Motor League.

The new system, designated ECD-16 is recommended and used by 15 of 23 US Bell operating companies and is also offered by such firms as IT&T and Continental Telephone. According to Solid State, the system has been well received world-wide with an installed base of over 600 systems.

According to Canterm Product Specialist Bill Marshall the new system offers state-of-the-art technology and includes one of the most advanced management information systems available today. The mini-computer-based management system provides reports on a variety of business activities, such as daily incoming and outgoing call volumes; agent productivity; traffic monitoring; number of calls waiting maximum waiting time, and service levels, as well as other types of management information. Real-time displays, printed reports and special programs are 'designed in', notes the company, to provide complete statistical data for business and personnel management. A number of interactive system programs for a variety of needs are offered.

The new product offering being introduced here offers essentially electronic call distribution and PBX and management information, all in one system. Canterm, which has been active in the Canadian data communications market and the telephone business systems market for some time, sees a continued merging of data and telecommunications. In response to this trend it is stepping up its activities in the latter market, said Mr. Marshall. The company is providing full service support for the new product he said, and staff is being added to that function. The company is also a factory-authorized distributor for Siemens Canada telecom products.

NOVEMBER COMPUTER SHOW EXPANDS TO FOUR DAYS, 95% EXHIBIT SPACE SOLD

Canada's premier computer industry event, the 1981 Canadian Computer Show & Conference, November 16-19, has been expanded to run over four days this year instead of three days as in previous years. Show hours have also been expanded and some 28-30,000 visitors are expected. Last year's show attendance reached almost 25,000, said Show Manager Reg Leckie. Some 95% of the show space is sold out, with about 93% of the total available space having been reserved by previous exhibitors.

The four-day event is sponsored by the Canadian Information Processing Society (CIPS) and produced by Industrial Trade Shows of Canada. CIPS is organizing the conference, being held in conjunction with the show.

According the CIPS, the conference segment of the event has also been expanded to four days, with the last day of the conference devoted to exposing professionals, such as lawyers, managers, doctors, to the types of computer hardware and software which can help them in their professions.

CANADA TRUST SELLS BACK-UP COMPUTER SPACE TO OTHER USERS

Canada Trust, London, Ontario, is offering some 4,000 sq. ft. of raised computer room space to other companies as standby space in case of interruption of their own operations.

Six companies have signed up since the standby space has been offered in July, said J. Brent Kelman, VP Data Resources for Canada Trust. The space is being leased on a three-year basis, he said, at the firm's London headquarters facility.

IBM, FLOATING POINT SYSTEMS EXTEND MARKETING OF ARRAY PROCESSORS TO CANADA

A marketing arrangement enabling representatives of IBM and Floating Point Systems to propose joint meetings with engineering and scientific data processing users of array processors has been extended to Canada. The initial arrangement between the two companies was for the US market only (Canadian Datasystems, Aug. 1981, p. 69).

Under the marketing arrangement, either IBM Canada or Floating Point Systems (Canada) Ltd. may initiate and coordinate joint meetings in which equipment alternatives, specifications and solutions can be discussed with users who have array processor requirements. Such processors are specialized systems which can be attached to central processing units to carry out high-speed arithmetic operations. They are chiefly used in geophysical data processing.

IN BRIEF

Ottawa-based Phoenix Automation Inc., has established a US subsidiary in Boston to market and service the firm's computer aided design and drafting systems throughout the US market. The new operation is headed by Irwin Stone.

Real Time Datapro Ltd., Don Mills, Ont., reports revenues for the year ended February 1981 of $5,126,914, compared with $4,320,807 for the same period last year. Earnings per share are 11.4¢, up from 9.1¢ in the previous year.

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VT 132	CRT Block Mode

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820 KSR	150 c.p.s. Dot Matrix 9600 baud
TI 840	Newest Addition-75 c.p.s., low-cost Dot Matrix printer
TI 940	New CRT - Just Announced, 16 Function Keys

Hazeltine

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Techtran Storage Devices

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Hewlett Packard

HP 2621A	V.D.U.
HP 2621P	V.D.U. with printer
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HP 2624A	CRT (replaces 2645A Series)
HP 2626A	Multi-Port Display Terminal

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4010-1*	Graphics Display Terminal 11"
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9895	Flexible D sk Drive 2 Meg.
2671G	Graphics Printer (Thermal)
2631G	Graphics Printer (Dot Matrix)
2621A	CRT
2621P	with Integral Printer
2622A	Replaces 2640 Series
2624A	Replaces 2645 Series
2626A	Multi-Port Display Terminal
2647	Graphics Terminal
2623P	Graphics Terminal New Just Announced

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DATAPOINT CANADA NOW HANDLES PRODUCTS FORMERLY MARKETED BY TRW DATA SYSTEMS

Sales, support and maintenance of all Datapoint products are being taken over by the newly formed Datapoint Canada Inc., the Canadian unit of Datapoint Inc. in the US. Previously Datapoint products and services were handled in Canada by TRW Data Systems. At press time, approval of the change by the Foreign Investment Review Agency (FIRA) was pending.

The new operation is headed by Glenn Myers, president. He was formerly director of marketing for TRW Data Systems. Staffing of the new operation is made up from personnel which previously handled the Datapoint product line with TRW.

The new unit will operate from 26 service centres and seven sales support offices across Canada. A new head office location is also under consideration.

CANADA'S ELECTRONICS MARKET REACHES $4.6 BILLION

Canadian domestic consumption of electronic products reached an estimated $4.6 billion last year, an increase of 22% from 1979's preliminary total of $3.7 billion. Domestic consumption is calculated by adding imports to Canadian production and subtracting exports. Domestic production in 1980 is estimated at $2,360 million, an increase of 16.3% over the previous year. Canada has long been a major net importer of electronic products. Imports totalling $4,262 million in 1980 compared to exports of $2,069 million pushed the imbalance past the $2 billion level for the first time. The imbalance has more than doubled in the last five years. These highlights are from a new report "The Canadian Electronics Market" prepared for Canadian Electronics Engineering by the Maclean Hunter Research Bureau. Copies are available at $65.00 each.

FACSIMILE UNITS ARE KEY ELEMENTS IN NEW PUBLIC ELECTRONIC MAIL SYSTEM

In the midst of the national mail strike, Toronto-based FacScan Communications Inc., launched its FacScan Electromail service, claimed to be the world's first public electronic mail system with four-hour service from drop to delivery. Developed by Ivor G. Kaye, the system began operations in Toronto, Ottawa, Montreal and Vancouver, with plans to include Calgary, Edmonton, Regina, Winnipeg and Halifax, within a week.

Documents to be sent can be dropped into FacScan mailboxes in various city locations. The boxes are cleared every hour and the document is sent from one of the firm's offices via 9600 3M high-speed digital facsimile units to another unit at the destination city. At the receiving end, the documents are delivered by messengers in sealed envelopes. Transmission of a typical page takes about 15 to 20 seconds and is via telephone lines.

Mr. Kaye told Canadian Datasystems that plans call for upgrading to 3M 9700 facsimile units later this year and a modification is under consideration to permit use of the units with the Datapac service using X.25 protocol.

Response to the new service has been most favourable, said Mr. Kaye and prior to introduction of the service several hundred documents had been sent. The service costs $3.98 for one 8½ x 14-in. page, and $1.98 for each successive page to the same address. Multiple addressing will be available at reduced rates. Original documents can be collected and returned if desired, or can be shredded.

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For more information about our full family of DS990 Business Computers, contact your local TI sales office, or write Texas Instruments Incorporated, Digital Systems Division 41 Shelley Rd., Richmond Hill, Ontario L4C 5G4 — (416) 884-9181.

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Reader Service Card Number 154

Enough of this, let's do it electronically!

If a group of employees were to cause the flow of electricity or water to stop because of a dispute, there would be action. But when it comes to the disruption of postal services, this appears to rate as being less important, even if businesses close doors; jobs are being lost and the enterprising sector of society has to be penalized for being productive. Enough is enough.

At the time of writing, the dispute is still going on, and there's a mere glimmer of progress, indicating that this essential service may be restored.

Much has been written about the devastating impact of such a disruption. It needs little emphasis here. If the well-being of the country is of concern, then some services—including the mail—ought to be maintained. And it is up to the authorities to step in and do something. Heaven knows, government is regulating just about everything else and a little more regulating in getting this service back on stream would indeed be appropriate. Instead, we have the spectacle of our Members of Parliament leaving with undue haste for their summer recess, rather than looking after the nation's business.

Yet if there's one thing emerging from this sad situation, it is the amazing resilience of the business community in coping, if not completely, with this lack of service. To see this resilience is heartening, yet at the same time it may not bode well for the Crown Corporation that is slated to handle the mails.

What has been happening is that businesses, both large and small, have discovered alternate means of reaching customers—of moving their own mail. Courier services are flourishing, but many are also discovering 'electronic mail.'

Increasingly, information is being moved electronically. Telex, facsimile and intra-company communicating word processors and the like are being used. Many firms for the first time assess their internal communications capabilities to handle some of their mail. With this renewed interest, some firms are for the first time becoming comfortable with it and are relying to a lesser degree on the mails. The costs may be higher, but many think it is well worth the price.

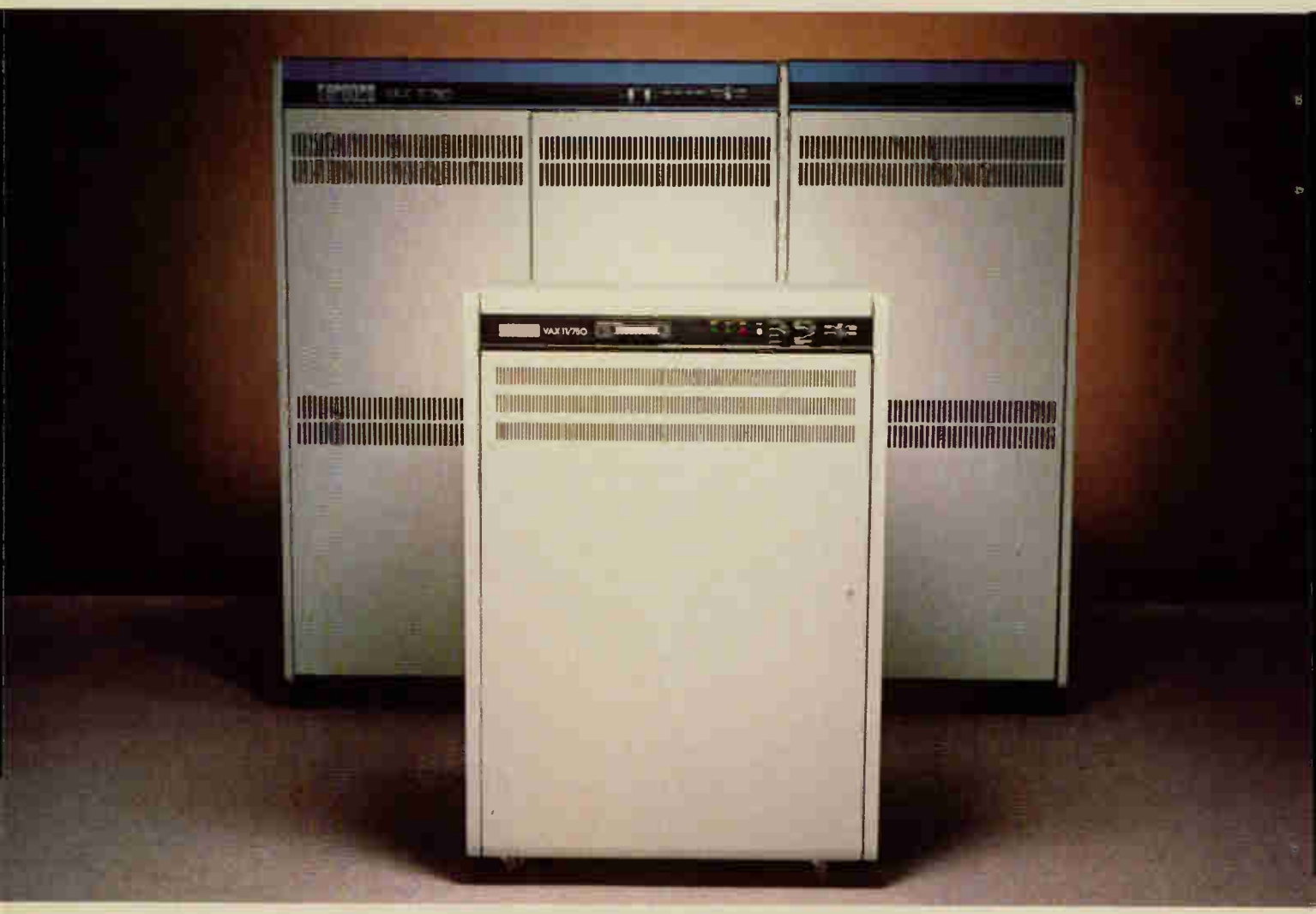
Many large firms already have their own internal electronic mail systems in place and are making good use of them. Some small firms are getting their first experience of electronic communications, often through a simple link between headoffice and branches via a computer terminal. And a Toronto based firm, FacScan Communications Inc., headed by Ivor Kay, made a timely launch of what it describes as the world's first completely automated public electronic mail system, FacScan Electromail, among key Canadian cities in early August.

In self-defence, business is looking to alternatives and finding them. In the process the role of the postal service as the predominant distributor of written messages is being challenged. It does not mean the end of the service, or that everything will go electronic. Not very likely, nor is it desirable. But it is a challenge that shouldn't be ignored.

Reliable and efficient postal service is essential if the country's economy is to grow and to create the jobs needed for the work force. The recent disruption of mail service and business' response should make it clear that business people are enterprising and certainly not averse to trying the electronic route. Let's hope Ottawa reads the message . . . mail strike or not.

Tom Weissmann

The VAX



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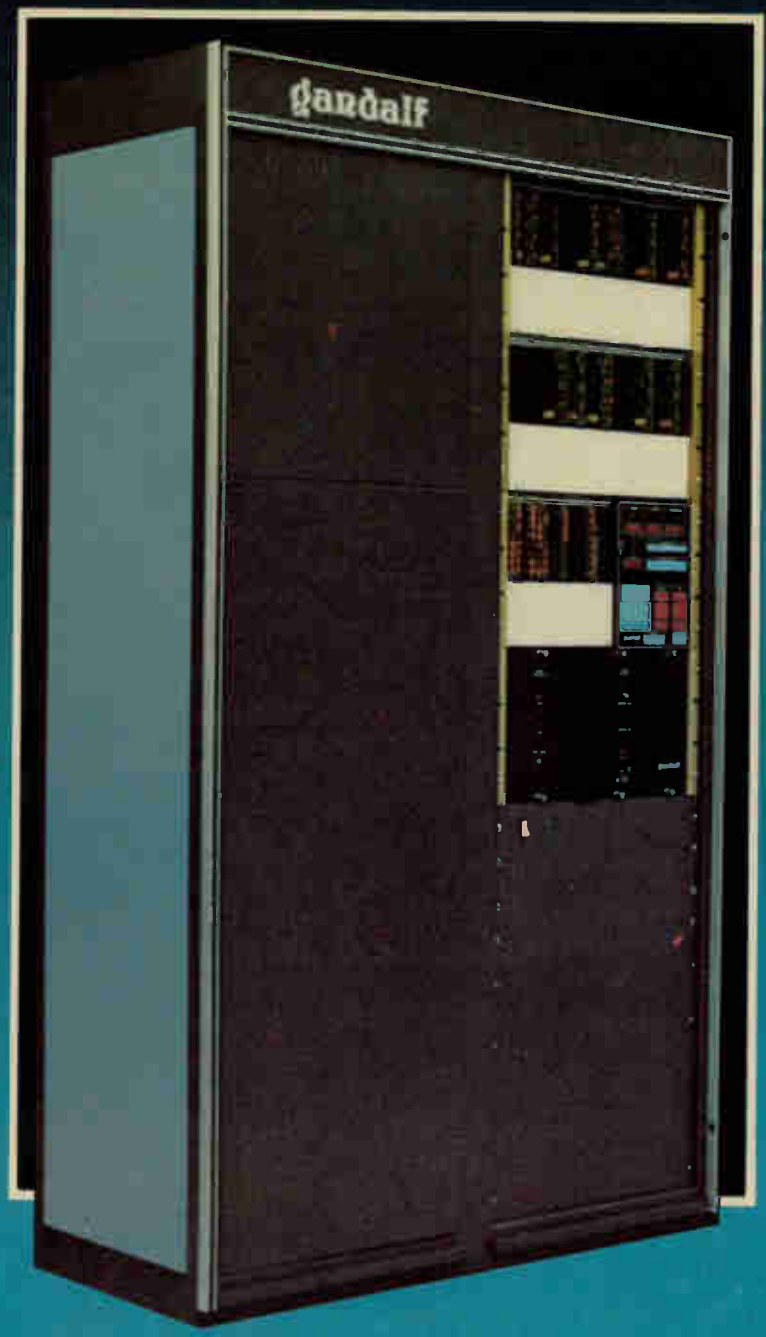

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Scanning devices and front-end checkout units are the most visible part of the move to wider use of POS equipment. Shown is an installation at Food City store in Oakville, Ont.

POS technology expands users' options

By Linde Fistell
Assistant Editor

New POS equipment continues to meet the challenge of diverse and expanding user needs. Suppliers stress multifunctional, modular systems based on new technology and innovative combinations of hardware and software.

AS applications for point-of-sale hardware continue to increase, new technology and innovative combinations of existing technology mark the forefront of the latest offerings.

The primary goal of suppliers is to increase speed and efficiency at the POS consumer interface as well as provide portable control and management of distributed work centres. To meet these requirements, suppliers have focussed on upgrading existing hardware with the use of new technology or else combining different hardware and software configurations for increased multifunctionalism and ease of expansion.

Some of the new methods used to speed POS operations include refinements in scanning, with the use of, for example, a holographic technique developed by IBM, and scaled-down bar-code data entry devices from Norand Corp.

Other POS advances have centred on

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POS technology expands options

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electronic cash registers, expanding and upgrading their capabilities, increasing their flexibility and making them more adaptable to distributed system and changing in-store applications.

As well as innovations aimed at improving existing POS configurations, efforts have been directed at providing lower cost alternatives to the traditional POS set-up. Some of these have come in the form of handheld computers coupled with cash registers, or portable terminals equipped with wand scanners.

What's new in POS

One of the latest innovations in POS technology is a compact holographic scanner that uses a wraparound field of light to scan checkout purchases.

The IBM 3687 scanner's holographic technique produces three-dimensional-pictures in order to "read" Universal Product Code (UPC) on standard or irregularly-shaped articles passing through its field. It is not necessary to maintain precise alignment of each article as it is scanned. As long as the articles pass over the scanner—in any position—the device is able to read the UPC information. This rapid check-through of items speeds up processing and maintains higher efficiency. Claimed to be the first major commercial application of holography in North America, the scanner is scheduled for Canadian release the first quarter of 1982.

Another product designed for scanning functions at a POS station is the Norand 20/20 Instant Bar Code reader, which takes an electronic picture of a bar code without having to make contact with a light pen. Once it is located over the bar code to be read, the 20/20, by touch of a button, automatically reads the code, notifying the operator of a successful input using LED and audible signals. The device does not re-read a code a second time in error, as wand units sometimes do when repeatedly passed over a bar code in an effort to read it. Once the unit registers the input of the code, another impression is not registered until the button is depressed again.

The unit also speeds up processing by being able to read codes in any color, and on variable package shapes, sizes and textures (including light reflective surfaces). The unit will read bar/space widths with a minimum size of 6 mils, a print contrast ratio of 50 per cent, and a maximum length of two inches. The scanner is unaffected by high ambient light and will pick up bar codes at any angle under fluorescent or incandescent light. The device has just been released for Canadian purchase.

Modular systems take hold

Gains are being made in modular and especially portable POS systems. MSI Data Corp., Scarborough, Ont., has given primary focus to compact, portable alternatives to conventional POS systems as well as expanding the use of POS-like devices into other areas of retail management.

MSI's Model 88 Route Manager, for example, is a portable system for collecting and compiling sales and inventory data for route salespeople's daily activities. The entire system is housed in an attache case. For accounting and budgeting needs, the day's inventory can be loaded directly into the memory. Orders can be written on the MSI/88 portable terminal included with the system and invoices are automatically printed. The system keeps tab of all cash, charges, credits, and returns and at the end of the day, the receipts can be quickly balanced in the form of a complete sales and inventory report for each truck or salesperson. All consolidated end-of-day transactions can be transmitted directly to the user's data processing centre to provide a summary of each day's sales, profits, and individual route performance.

The system is fully user-programmable operating with a microprocessor and ROM memory. The terminal is equipped with 27 alphanumeric keys and the programmable operating functions and data recording characters can be organized to the user's specifications.

The route manager also provides a direct connection to every van in a fleet of trucks, allowing remote downloading of customer and product lists, and new pricing information. MSI's TM700 terminal multiplexer system can interface to up to 32 portable route systems, combining all their day's transactions into a single output.

MSI also manufactures a series of handheld terminals designed specifically for continuous key entry or wand scanning of larger-volume inventories. The Series 88 provides extended data storage in segmentable memory, expandable from 16K to 64K in 8K increments. The wand scanning module can recognize and record either UPC, MSI's modified Plessey Code, Codabar, or the European EAN system.

The sales force of the Handleman Company of Canada Ltd., Toronto, is currently equipped with MSI/88 64K

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POS systems support new uses, operate with new software

Point-of-sale technology has entered a wide spectrum of uses, not just in the traditional supermarket field. In the U.S., for example, POS terminals are being used in both lottery ticket applications as well as off-track betting. In Canada, an increasing number of POS terminals are being installed in a lottery setting.

Lottario, an Ontario-based lottery, presently uses more than 1,400 terminal/printer units in lottery outlets across Ontario to process tickets and receipts. The central processing system is located at Control Data Canada Ltd., in Toronto. All hardware in the system including the terminals are manufactured by Consolidated Computer Inc.

When a customer purchases a lottery ticket, a message indicating the sale is entered through the printer into the terminal. The data is then relayed to the host computer which stores the information and initiates a return message that a ticket/receipt be issued.

Lottario is presently installing another 200 terminals across Ontario for a total of 1600 by the fourth quarter of 1981.

While new technology has entered the mainstream of POS applications, existing technology is being boosted by innovative software support. TCS Software, Atlanta, Ga., for example, has introduced an inventory management system (IM) designed for retail/wholesale businesses. The system operates with an 8080, 8085 or Z-80 microcomputer with CP/M operating system, Microsoft Basic-80 and 56 K of user-available memory.

The software package allows for multiple item location, departmental ID, and quantity limitation. An inquiry function uses partial item keys and acts as a rotary file to help find an item. The system also sorts and sells fractional units to three decimal points; keys all reports by department, location or vendor; and provides special updating functions for physical inventory posting and purchase order entry.

The system also keeps track of sales, receipts, returns and reserves. Reports can be based on the entire data base or any subset, and all transactions have a full audit trail. A retail inventory catalogue can also be produced.

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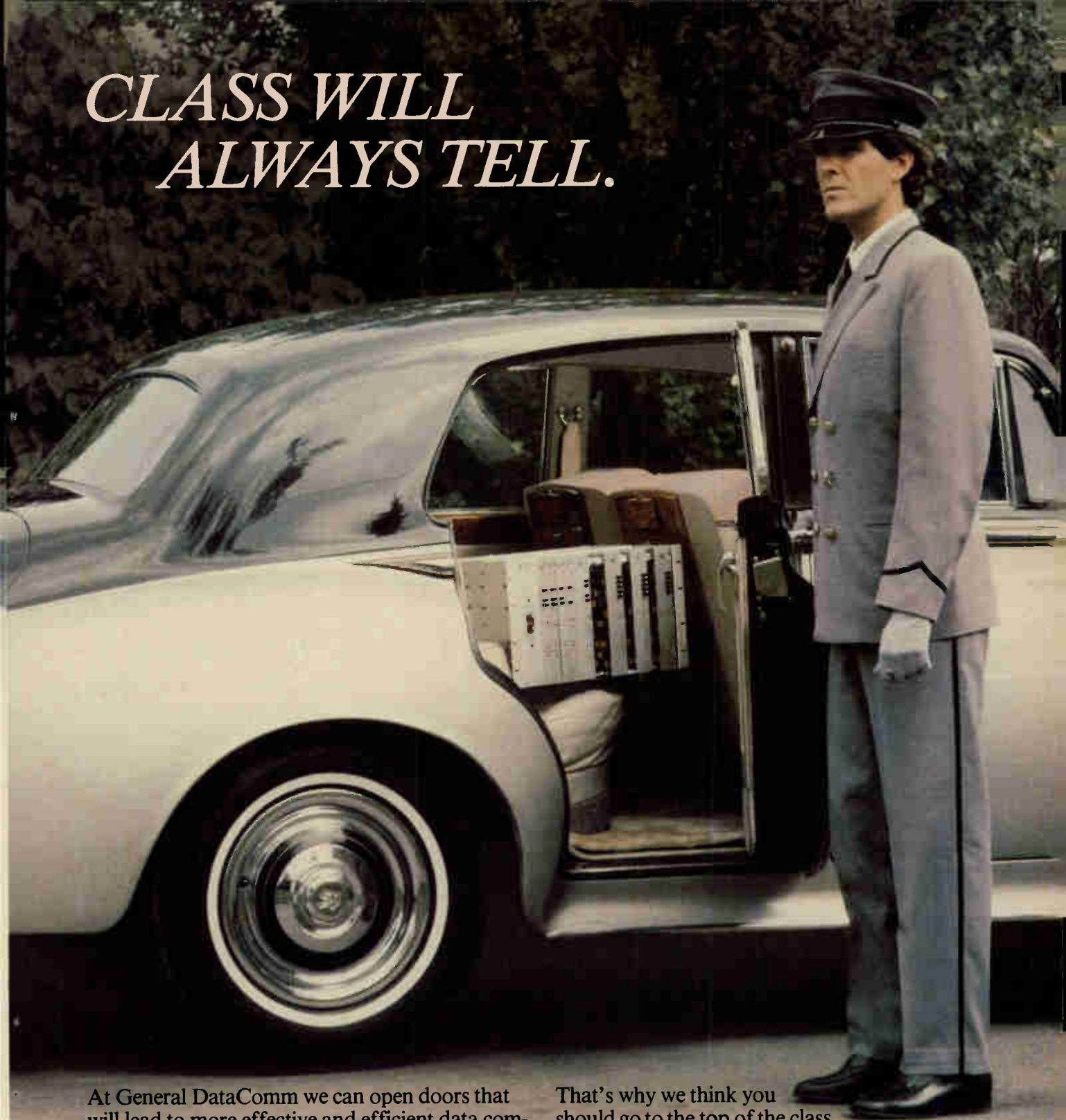

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POS technology expands options

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terminals with wands for use in salesman's order entry functions. The company is a distributor of record albums, supplying records to the Towers and Woolco stores. All records are bar-coded and the labels are used to reorder records and control inventory at the store level.

IBM Canada Ltd. recently released an upgraded version of its 5265 POS terminal. The terminal is part of the 5260 retail system for monitoring, storing and transmitting data for store operations.

The 5265 has a 128K capacity, which represents a 400 percent increase over previous models. The additional storage capacity is designed to increase the size of price look-up and credit status files. Account numbers up to 21 digits in length can be processed, meeting new bank card standards. The upgraded 5265 can now provide central site control, allowing retailers to update pricing files, as well as transit and receive administrative messages at a central location.

The IBM 3683 POS terminals feature IBM's densest memory technology to date. The terminals are based on a new silicon chip with a storage capacity of 72K bits. Each chip can store 8,192 characters—roughly 390 supermarket item look-up records.

The five models in this series can be equipped with modular print stations, display panels, cash drawers and keyboards. IBM's holographic scanner can also operate with the new terminals.

R.C. Allen Co. has made its electronic cash registers the focus of change. The main feature of its ECR line is the ability to change keyboards to adapt each system to particular applications. The latest addition, the Model 3016/32/48-40, has a shift level feature that allows 16, 32 and 48 department identification in a single unit. This capability makes it suitable for small/medium/large fast food industries, the apparel industry, and the tavern/bar industry.

One of the most recent POS terminal introductions to NCR Canada's line of products is a micro-electronic food and beverage terminal. With an emphasis on flexibility, the terminal features a range of automatic and control functions such as preset price keys, an electronic guest check file, hourly reporting, and waiter control reporting.

NCR has also released two software packages designed to give application flexibility to the NCR 8000 series of minicomputers. The package provides retailers with modules to control inventory, sales purchases order management, open-to-buy, and all accounting functions.

Terminal flexibility in the form of hardware changes are featured in the TFC 7880, a terminal recently introduced by TRW-Fujitsu Co., Los Angeles. The system is offered with a choice of several displays, keyboards, cash drawers

New holographic techniques allow bar codes to be read in any position, on articles of any shape.

and memory configurations including up to 1 MB of internal storage based on bubble memory. With these choices, the user can assemble a terminal to match his operating needs.

The system offers the user one of three display types, ranging from a numeric version with basic operator prompting to a full function 320 character version based on plasma display technology. For checkout lanes where operators perform routine transactions, the numeric display may be sufficient. For complex transactions such as layaway plans and returns performed at customer service desks, the plasma display may be required. The system's transaction software works with each of the displays, allowing functional continuity when different display types are used in the same store.

The system is also claimed to be the first POS terminal to offer an optional magnetic stripe credit card reader that is directly integrated into the terminal. The device also provides a choice of two programmable keyboards for sales recording and data entry and can interface to OCR-A wand readers.

Along with software flexibility providing multi-purpose functions for the same terminal, or interchangeable hardware components, companies such as Data Terminal Systems Canada Inc., Mississauga, Ont., have approached the need for multi-functionalism with plug-in modules. The DTS systems, for example,

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Office terminal provides sales reports for store's assistant manager, Carman Colasanta, at Food City.

Customer Service Manager, Edna Simsar, loads front-end program into NCR T8255 store controller at Food City, Oakville.

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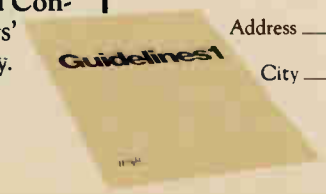

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POS technology expands options

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are designed to adapt to the changing and growing needs of a retail operation by providing upgradeable, multi-function components. The systems allow expansion from department tracking to individual item reporting, incorporate electronic weighing, and easily accommodate the addition of more checkout lanes, as volume grows.

One new modular POS terminal has helped this user achieve "a 142% profit increase . . . and better customer service."

New hardware/software mix

NCR Canada Ltd. has released a wide range of POS products recently, reflecting design improvements geared specifically to increased flexibility. Among these are the 2160 food service system, the 2150 department store system, the 2140 specialty system, and the 2950 general purpose POS terminal.

The 2160 is a modular system based on a variety of hardware pieces and software packages that can be upgraded as requirements change. The modular units make it possible to add or expand data collection, communication and reporting capabilities.

Six of the new 2160 terminals were recently installed in a McDonald's franchise in Kamloops, B.C. The terminals include remote printers and are located in the kitchen and "drive-thru" window. According to D.K. Boychuk, franchise owner/operator, the store profits have increased 142 percent as a result of lower food, paper and labour costs as well as reduced operational expenses achieved with the aid of the terminals.

Customer service has also improved greatly. "Customers prefer our system as the cashier is more organized, plus our customers like getting the printed menu receipt," says Mr. Boychuk. "We have been able to do larger volume hours than in the past and at no time have exceeded five cashiers," he adds.

Future developments of the NCR 2160 system will include expansion of the microprocessor size from 256 KB to 512 KB. With this, the number of terminals per processor can be increased from 8 to 12.

The NCR 2150 retail POS system consists of a microprocessor-based master and satellite POS terminals, data collection and on-line communications links to handle individual merchandising and management reporting requirements at both the store level and at the data processing centre.

The terminal can be used as a stand-alone, in a clustered configuration, or as a real-time on-line system, and replaces the NCR 280 series terminal. The T. Eaton Co. has recently installed 2,000 of these terminals using the Datapac communications network. The terminals interface with an NCR 721 communications processor at the central data processing facility, providing data collection of all sales and positive credit authorization on Eaton's charge card.

The NCR 2950 general purpose POS terminal is offered with a wide range of optional features, allowing it to be tailored to specific requirements. With these capabilities, the terminal can be used in applications from simple data entry to complex remittance control with communications, automated data capture, local printers, and data files.

The terminal's versatility is based on its hardware and software functions. The system operates with the Basic programming language, and has 27 control keys which can perform 108 functions. Up to 25 different language alphabets can be used to display and print a wide range of data.

The key to success for the latest POS offerings lies in their ability to adapt to a wide range of applications, and provide multi-functional capabilities at lower cost. They must operate effectively both as high performance stand-alone components and as part of distributed networks. They must be easily upgraded and expandable as required. In short, they must match their performance and potential to current and future user needs. □

STS awarded contract for retail computer system

STS Systems Ltd., Dorval, Que., has been awarded a contract with Roaman's of New York, NY, for the development and installation of a retail computer network system.

The enhanced version of the STS "STORE" retail management system will be fully on-line, supporting terminals at Roaman's head office in New York and multiple terminals and printers at the Roaman's distribution centre in New Jersey.

The hardware configuration consists of a Data General S/250 processor with 1 MB of memory, 32 terminals, 9 printers and 900 MB of disc. Applications to be installed are purchase order management, receiving, distribution, sales analysis, transfers and markdowns.

Credit terminals linked to POS in Quebec retail chain

A multi-purpose transaction POS terminal used to verify credit and grant credit authorization is being installed in a Quebec buying and retail group of stores. The system will be complete by 1982.

Les marchands RO-NA comprises 450 independent hardware, home renovations, and sports stores throughout Quebec and has its own credit card which is accepted in all the stores. The Vutran terminal, from the Computer Communications Group, Ottawa, will be used along with an NCR 225 electronic cash register and, according to Paul Lambert, director of the RO-NA subsidiary La Carte Inc., the system provides an efficient solution to a variety of data processing problems the company had with a more traditional credit system.

Previous methods of issuing credit created much time-consuming paperwork and difficulty in controlling errors. Telephone credit authorization was also time-consuming and embarrassing to the customer, and it was impossible to eliminate fraud because credit violation lists were rarely updated or consulted.

Using the Vutran terminals, it is no longer necessary to contact the credit bureau by phone or to consult a list for authorization, says Mr. Lambert. The RO-NA credit card is simply put through the terminal's magnetic strip reader to enter the card number and the amount of the purchase keyed in. The clerk presses another button which automatically dials the number to the computer and a credit authorization number is displayed on the terminal within seconds.

To implement credit authorization, the RO-NA stores have been divided into regions, each region being linked to a central computer in Montreal via both local telephone and IN-WATTS lines. By the time the entire system is installed there will be 12 IN-WATTS lines linking all the terminals to the central computer.

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By Jack Curry

DISASTER RECOVERY

PART II

Implementing the recovery procedures

A disaster recovery plan is a logistical plan to provide smooth, rapid restoration of DP operations following major damage or interruption in processing. Part II in this series provides a practical course of action.

The mini-plan covering equipment requirements will be one of the most extensive of the entire disaster recovery plan. So far in this article, the points raised have had general applicability. From this point on, the disaster plan becomes more dependent upon each organization's particular needs. However, there are many similarities in the approach and methods that are consistent throughout, and these will be emphasized.

The primary question in approaching this phase is, "What equipment is needed to support Priority-1 and -2 applications?" Bear in mind we have eliminated Priority-3 applications previously, in Phase I of the disaster plan.

Arrangements for hardware backup can take several forms, or a combination of compatible forms. (1) work can be distributed among other data-processing installations for which you have tested compatibility; (2) agreements can be made with your hardware vendors, to provide backup at their facility; (3) a facility owned or leased by your own organizations already equipped with raised flooring, power, air-conditioning and teleprocessing requirements can be used if this function is needed to support your organization.

In addition to these three forms, it might be advantageous to combine one or more forms to reduce overall costs to the corporation, and to assure enough processing time is available.

If the decision is made to develop a reciprocal agreement with another installation, there is one potential problem that should be considered. If Company A, located across town—having compatible hardware and operating three shifts, five days a week—has agreed to back you up, and you in turn—with a three-shift, five-days-a-week operation—have a similar agreement with them, can this be considered an effective back-up arrangement? *No*, it is not an effective arrangement. In fact, it represents a false sense of security. It would be like trying to pour five gallons of water into a three-gallon can; you have some left over. There seems to be a considerable number of these arrangements in existence today, unfortunately. Can you imagine what would happen if Company A backs up to your door with 1,000 tapes and two truckloads of documentation, and asks for computer time, as outlined in the agreement? There would be *two* disasters instead of one!

Having reciprocal agreements with other data-processing installations can be, in fact, a viable arrangement. However, don't put all of your water in one bucket. The answer is to distribute your work among several installations, thus reducing the impact on any one; consequently, the agreements become more workable for everyone involved with the recovery operation.

Agreements with your hardware vendor to provide compatible equipment might also be considered. For the most part, they are *not* in the backup business. However, they might be willing to provide some relief in emergency situations. If your hardware vendor is unable to provide this relief, they can at least tell you who has the equipment configurations similar to yours. In any event, don't wait until a disaster has occurred to find out. Contact your vendor, and see what he can or can't do in this regard.

Above all, check compatibility—especially of the teleprocessing networks. It is not unreasonable to assume that you cannot find compatibility in TP at another facility. In such cases, on-line systems may have to be modified, or shifted down to Priority-3. However, this decision would be dependent upon the EDP/user evaluations done in Phase I of the disaster plan.

Also, don't overlook existing facilities owned or leased by the corporation. With a little preparation perhaps you can utilize what you already have. The ultimate, of course, is a fully redundant hardware configuration set up at an existing facility complete with dedicated lines, modems for teleprocessing, air-conditioning, heat, raised flooring, office space, etc. This ideal, however, is beyond the means of many corporations.

Combining one or more of the forms (i.e., distributing the work among several data processing installations, plus agreements with your hardware vendors, in addition to existing company facilities) represents another viable solution to the equipment problem. This is especially true for the medium-to large-scale data processing shops, but requires a higher degree of thoroughness in your disaster recovery plan, due to the logistics problem. Distribution, communications, supplies, personnel, etc., become more magnified in this type of environment.

The disaster recovery manual should include a detailed list of your computer configuration as well as support equipment. This list should include description, model type, serial numbers, quantity, vendor name and address, and equipment maintenance people, if different from vendor. And, don't overlook typewriters,

adding machines and duplicating equipment. They represent an essential part of any data processing facility.

Supplies

Do you know how many adding machine tapes are used at your data processing facility for a 30-day period? Exactly how many boxes of two-part paper you use in 30 days? Can you operate for 30 days given the supplies the vendor has overstocked? What type and quantity of supplies should be provided for, either at vendor locations or included at your own valuable records off-site storage location? What about customer forms—can the vendor provide these on a minute's notice, or will he have to order them from the manufacturer, thus causing a delay? Plan in advance for supplies and include this in your disaster recovery manual.

One approach is to determine what forms and supplies are needed to support Priority-1 and -2 applications. Remember to *eliminate* the forms used for Priority-3 applications and jobs.

Department managers can supply the disaster planning team with a list of forms, supplies and quantities needed to support 30 days of operation. This list in turn can be compared with the applications to be processed to determine deletions and reductions. The disaster recovery manual should include form description, number (both your number and vendor number), and quantity needed to support 30 days of operation. Also include the computer application associated with each form, and vendor name, address and telephone numbers (they should also be included in the notification list), plus possible substitutions.

Pay particular attention to backing-up custom forms or printed paper. These are the supplies you cannot function without. Make plans to stock at least a 30-day supply at your off-site storage location, or at the vendor's storage.

Distribution

In the event of a disaster, present distribution schedules will no longer be valid. What are your plans for transporting input data to the backup site and distributing output to the users? Remember, distribution plans can perform a vital replacement for a critical aspect of the data processing operation. If telecommunication lines are no longer available, messenger and air transportation might replace this vitally important function. Therefore, the disaster recovery manual should include provisions to substitute or increase air transportation and motor vehicle services to and from the users. Also, plan for the transportation of the DP employees who will be working at the backup site.

Undoubtedly, there are critical time periods associated with your day-to-day processing. How will your revised priorities affect present data-gathering and distribution schedules? Remember, priority-3 users will be deleted in the revised schedules.

Employee transportation to and from the backup site could become a legal problem if plans were not made and documented in advance. It is advisable to contact your firm's corporation attorneys, insurance department, and labor relations departments to determine in advance the legal implications. Determine that insurance will be in force while traveling to and from the backup site. Do the data processing employees belong to a union? Does the union contract include or exclude the corporation's needs in case of a disaster?

Facilities

The facilities mini-plan should specify the type and class of building necessary to house your alternate data processing center. It will include floorspace requirements by department, air-conditioning, power, heat, lighting, parking, and other requirements.

In addition to the disaster recovery planning team, the facilities design group should also include representatives from your building engineering and management departments. They are more technically capable in matters of air conditioning, heat, power, building structure, lighting, etc.

The following information based on the characteristics of the existing EDP facility should be documented:

- General location requirements, e.g., proximity of users, transportation, communications, distributions. Pay special attention to potentially hazardous areas, flooding, fire, earthquake zones, etc.
- A list of work areas by name, e.g., input/output control, tape library, key processing, computer room, printer room, specifying the minimum as well as the desired square footage, live-load requirements, floor plans, approximate number of employees assigned to each area, and special air-conditioning and electrical requirements.

The site selection requirements will be used by the corporation's building and engineering departments, or other responsible authority to maintain a list of two or three possible locations for reconstruction of the EDP facility. Thus, if a disaster should arise, immediate steps can be taken to obtain and modify one of these locations to accept the EDP operations with a minimum of delay.

The next step is to arrange for new computer hardware. One would hope to duplicate the existing configurations, but due to prolonged delivery time and unavailability, this might not be an easy task. You might even want to consider upgrading present hardware configurations. The point is, document this in the disaster recovery manual. Consult your vendors on availability, delivery and installation time in addition to your long-range equipment needs.

Miscellaneous

This final 'mini-plan' should include provisions for: user instruction in the event a disaster has occurred, plans for the retention and safekeeping of unprocessed work, and copies of vendor and mutual assistance agreements.

In the event of a disaster, users will be required to activate their own individual plans. Included in the user plan will be a list of applications/jobs that they can expect to receive, the new distribution schedules, and other pertinent information that describes actions to be taken by the user in the event of a disaster.

For those applications that can be processed manually, instructions will be included in the user portion of the disaster plan. It is highly possible that alternatives to automated processing are available. This, too, will be included in the user's plan where appropriate.

Responsibility for maintenance of the user manual lies with each user department. The user manual should specify who is charged with this task. A periodic check should be made to ascertain that the various user manuals are current in respect to notifications, application classification, distribution schedules, and plans for manual operations.

Following a disaster, you would undoubtedly have a considerable backlog of Priority-3 applications. Plans should be made for the retention and safekeeping of unprocessed work until such time as you move into the new facility. Where will you store input data? With the user or at a central location? Document and include in the disaster recovery plan.

Maintenance

Once the disaster planning team have completed their assignment, there will be a continual need for maintenance.

All copies of the plan should be updated semi-annually. If done on a quarterly basis, this could be a full-time job, but if done annually, it will become too outdated. However, this choice depends primarily on the length and scope of the plan.

The number of manuals should be kept at a minimum. The more manuals printed, the more likely you are of overlooking some during the maintenance procedure. This is especially true in a large corporation. Moreover, this is a confidential document and should be treated as such.

The preceding information does not, of course, provide all possible points that may need to be covered in your own disaster-recovery plan, which is why there are firms specializing in such analyses. In general terms, however, it is hoped this article will help data processing staff and company management alike to appreciate the vital necessity of doing such planning *today* . . . and not later, when it may be too late. □

Sea to Sea

One of the largest publishers of periodicals in B.C. is Maclean Hunter. We are also the largest publisher of magazines in French Canada, a prominent AM/FM broadcaster in the Atlantic Provinces, a major broadcaster in Central Canada and Alberta, and growing in cable TV. Maclean Hunter is committed to growth in the communications industry where we intend to become larger, to earn a good profit and contribute as much as we can to building a strong, united Canada.

It will not surprise you that about half Maclean Hunter's income is earned by publishing, printing and related services.

However you might raise your eyebrows upon hearing that the other half of our money comes from electronic media.

You can see the thrust of Maclean Hunter ambitions when you examine our spectrum of communications enterprises. Growing briskly are AM and FM radio in many major cities, television and cable properties in Canada and the United States. Consumer magazines and our wide range of business publications remain the backbone of Maclean Hunter, rounded out by trade directories and special-interest magazines. And, still in the theatre of people talking to people, trade shows, business forms, conference management.

Maclean Hunter sells the product of motivated minds – ideas and services. To help cultivate an atmosphere of unity among the varied communications groups within Maclean Hunter, we have created a dynamic new corporate signature (see below).

However apt a corporate signature may be, it can be given meaning only by the people in the organization and the ideas they generate.

Maclean Hunter

This illustration at right appeared in **Canadian Yachting,** *serving Canadian boat owners. Another of Maclean Hunter's special-interest publications is* **Pacific Yachting,** *not to mention* **Ski Canada, Audio Canada, Photo Canada.** *All have avid readership among affluent audiences.*


KC
39009

By ROGER KAYE
and TOBY WALKER

Adding mobility to computer communications

Computers and communications are increasingly affecting every phase of the transportation industry. Here's an overview of current developments on how they give computer communications new mobility.

Computers and communications will increasingly affect every phase of the transportation industry over the next ten to twenty years and they will change profoundly the way in which things are being done.

Twenty years ago the manager of a foreign branch plant or foreign marketing organization of a large multinational corporation was a person of some considerable power and influence. Because of the time it took for corporate headquarters to collect and collate information on worldwide operations, he had a considerable lead time in which to consider what he was going to do next before corporate headquarters had time to second-guess him.

Today that is no longer true. Computers and communications have moved corporate headquarters into every branch operation. The operations, and even the social structure, of large corporations have been changed at a very profound level by this change in technology.

Roger Kaye is Director General, Communications Systems Research & Development, Government of Canada Dept. of Communications; and **Toby Walker** is Director, Radio Systems Research & Development, Ottawa.

Mobile data comm

Over the next ten to twenty years, corporate headquarters, or some other controlling authority, will use computers and mobile data communications to move into every vehicle; everyone will have a back-seat driver. Here are some current innovations at the leading edge of this movement:

A familiar example is the change which has come about in the airline industry as a result of completely automated reservation systems based on computers and communications. Ask yourselves how modern airlines—with their enormous aircraft, tight schedules, vast numbers of daily travellers—could be operated today if we still had to use the reservation systems that were in place in the 1950s and even in the 1960s.

You might say that this example is auxiliary to the transportation itself and occurred in an area where the manipulation of information was the prime function in the first place so that nothing has really changed except in degree. Perhaps that is true.

So, let's take a look at some current innovative examples which are having the effect of moving the corporate office, or some other central authority, into the driving seat of every vehicle much as the corporate office moved into the branch plant.

The airline reservation system, mentioned earlier, might be regarded as being peripheral to the actual flight operations. The flight planning systems of major airlines have also been computerized for some years. In a typical system, a non-interactive, central computer facility is used to generate flight plans based on advance information. In many cases at present, information obtained from external sources and information exchanged between the airline central computer and its offices in various airports is transmitted manually, by telephone and telex or by voice radio from the aircraft.

Manual operations are slow and error-prone, particularly if there is more than one link in the chain. They are also expensive. So airlines are looking for the most cost-effective way of putting completely automated systems in place which will be inter-

active in real-time with dispatchers. It should also integrate into one system the previously separate functions of crew scheduling, aircraft scheduling and so on. Such a system was recently developed for Pacific Western Airlines by MacDonald Dettwiler Associates of Vancouver. It is also being supplied to Texas International, Swissair and SABENA. By tying the aircraft itself directly to this system using data communications, as opposed to voice communications, a completely integrated system can be achieved with great potential for increased efficiency.

Real-time dispatch

In some areas communications systems for this purpose already exist. For instance, in the U.S. there is a system called ACARS (i.e. Arinc Communication Addressing and Reporting Systems) which provides digital radio communications with individual aircraft throughout the U.S. This system is based on VHF radio and is currently unsuitable for application over very large land masses, with light traffic, or for application over the major oceans. To deal with that problem, DOC, together with MacDonald Dettwiler, has been involved in the development of an advanced HF digital radio system which has the capability of operating very reliably over long distances.

These systems will all eventually merge and they will probably also merge with the air traffic control system so that small computers, based on microprocessors, can hold direct conversations with the ground based computer system, with or without human intervention either on the ground or in the aircraft. Once that is done there will be a single computer communications network linking all the flight operations of the airline together with its entire fleet of aircraft wherever they may be in the world. Any piece of information available anywhere in the system will be immediately accessible by any other point in the system.

Down-to-earth uses

What about taxis and buses? Well, Blue Line taxi services of Ottawa together with the Canada Systems Group has pioneered the development of an advanced taxi dispatch system that now includes several hundred taxis. Through a digital adapter the standard taxi radio interfaces to a one-line message display and a small key pad, whilst still retaining a voice capability for emergencies. Telephone orders for taxis are entered by clerks into a computer which automatically allocates them to districts in the city, relays the orders to taxis in that district and, displays the details to the driver.

The system has reduced the number of dispatchers (and the number of radio channels) from four to one, has reduced busy signals on the incoming phone lines, and has expedited dispatches to the point that, even in the worst snow storm, the radio system does not block under overload and a taxi is dispatched essentially on completion of order. Dispatch between districts self-adjusts towards an optimum.

In the field of bus transit systems several interesting systems are being developed in Canada. The "Easy Rider" system developed by Teleride Corp, Toronto, for Mississauga transit is of particular interest. The position of each bus along a route is tracked via a digital radio system reading an odometer connected to the wheels of the bus. The current location of all buses is kept in the computer data base together with the estimated time of arrival at various stops ahead on the routes. Potential bus passengers needing bus schedule information are provided with a small instruction card kept near their phone. If someone wants to know the time of the next #6 bus at stop 22; they might dial 276-0622 and the computer, which answers all calls on the 276 exchange, will answer via a voice response unit: "Welcome to Easy Rider. The next bus on route six will arrive at stop twenty-two in eight minutes. Thank you for calling". Two things are noteworthy: firstly the query is done in a relative familiar manner, that is using the telephone dial or button set, and secondly the response is individualized, reflects current, rather than scheduled, situations and is given via familiar means; that is, voice.

Of Canadian design

Extensive evaluation shows that a significant increase in bus ridership has occurred—the customer finds it attractive to plan a three-minute wait in the snow rather than getting to the stop five minutes before schedule, to

Turn to page 41

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Mobility to computer communications

From page 39

be on the safe side, while the bus arrives fifteen minutes late, due to traffic and weather conditions.

Extensions to provide passenger counts, announcements about probability of getting a seat and so on are being investigated, and linkage to the bus dispatch system will produce extra benefits. But the prime benefits alone justify the system: increased transit ridership and hence revenue, and decreased use of private vehicles; less congestion, less gasoline consumption. The Teleride Corp. is actively marketing the system; one is presently being installed in Ottawa. It was developed, incidentally, under the sponsorship of Transport Canada. The now defunct Urban Transportation Research Branch can take credit for this as well as several other groundbreaking developments in transportation communications.

The transportation of goods is another area where costs and transit times must be controlled and minimized. Two systems, at opposite ends of the user spectrum, are worth mentioning—one in the resource industries and one in urban deliveries. Again, these are systems developed and manufactured in Canada.

The Mine Dispatch Support System, made by Glenayre Electronics of North Vancouver, is a distributed-intelligence system for monitoring and supervisory control of all haulage vehicle traffic in an open cast mine. Data from all operating trucks is sent via digital radio to the central dispatch location. Data collected includes the time of occurrence of major events, for instance: box up (dumping), box down moving, stopped, beacon detection (a radio beacon is located at the loading shovel, at the crusher and at each dump site), and beacon departure. The computer tracks the truck cycle time, queuing time, loading time, shovel idle time and so on and indicates needed changes.

Among the benefits of the system are increased amounts of material moved, close control over material blend entering the crusher, automatic collection of statistics and optimized utilization of equipment.

Document and parcel transportation by courier services is becoming big business. One of the largest such operations in the world is Federal Express, of Memphis, Tennessee. They operate throughout the U.S. with a fleet of thousands of trucks and fifty or more cargo jets.

The business is highly computerized from order taking to tracing misrouted items. The computerized system is now being extended to the trucks which are being equipped with display terminals connected to the computer via mobile radio. The pick-up and delivery instructions can now be presented visually to the driver and recorded in the vehicle for later reference if needed. Response time is improved, errors are minimized, voice dispatching no longer uses up valuable staff time. Spectrum usage—always a concern of the FCC and the DOC—is cut enormously. The original technology was developed by Canadian industry under DOC/RCMP sponsorship for the use of Canadian police forces. The prototype police system in Vancouver is highly successful and is a showpiece of Canadian technology. The company involved—International Mobile Data Inc., Richmond, B.C.—is selling systems worldwide to police, fire, hydro and so on. Their healthy growth points to the importance of the unfilled demand they are addressing.

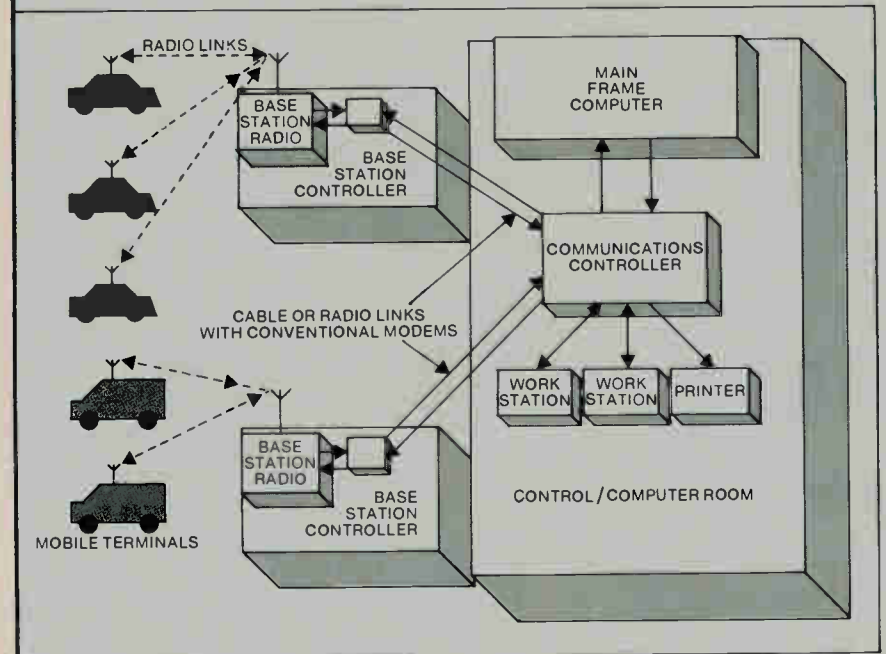

Diagram of a typical remote dispatch system.

"We may expect that computers and communications will become part of virtually every vehicle in every type of transportation system."

What's ahead

Why is all this happening and where will it lead us?

Transportation systems consist of vehicles, goods and people, all of which are increasingly expensive. Every unit of a transportation system represents a sizeable asset and profitability is directly related to productivity in this industry as in all others.

In the transportation industry, companies have historically spent large amounts of money to arrive at efficient scheduling systems in order to improve the utilization of capital and the speed of transit of whatever it is that is being carried or accomplished. It used to be that such scheduling had to be carried out months in advance. With the advent of faster and cheaper computers, and the communications to go with them, it is now possible to revise and modify that scheduling on a minute-by-minute basis according to what is happening in the field.

Consequently we may expect that computers and communications will become a part of virtually every vehicle in every type of transportation system. The rate at which they are introduced will depend only on the productivity gains to be generated from each particular application. Those applications run from ships and planes and trains right through to taxicabs and eventually to private passenger cars. Nothing, eventually, will be immune to the onslaught of computers and communications. □

TI Announces E a Growin

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COMPUTER VISION

Making strides towards better

The generation, display and processing of images in digital computers goes under many names: such as pattern recognition, OCR, robot vision, image processing, etc. Here's a look at the current state of 'computer vision' and a comparison of computational results with human vision.

A bewildering range of activities, going under various names mark the field of 'computer vision'. But essentially it involves the generation, display and processing of images in digital computers. There are activities such as image processing, dynamic scene analysis, computational vision, image pattern recognition, x-ray and remotely sensed image processing, real-time image enhancement, image display, and so on.

To those unfamiliar with these activities, we can use human vision as a standard of reference, and each of these activities can be grouped according to "whose vision beats whose"—ours, that of the computer, or the computer ours.

What's in a picture

From our everyday experience we know that images come in the form of photos, prints, printings, TV displays, films, etc. Our own vision immediately interprets these as representations of scenes, objects, actions, situations, and so on. In our environment we see activity, beauty and thousands of other things, which we in one way or another relate to our own experiences. Even though "beauty is in the eye of the beholder," actually each of his eyes is designed like a rather inexpensive camera with a single deformable lens. In the place of the film there are some 100 million light receptors. The image we see is focused onto these receptors, as it is onto the film in the camera, and each of the receptors transmits a signal related to its incident light. At the very beginning, the image is thus cut into some hundred million little pieces.

The first step in digital image processing is similar, i.e., the image is divided up into little pieces ("pixels"), the light intensity in each individual piece is measured and converted to a number. To the computer the image thus becomes a huge matrix or grid of numbers. Typical sizes of that matrix are 256x256, 512x512, about 600x480 for home TV, and up to 3240x2400 or higher for remotely sensed data.

Each colour band is recorded as a separate image. Consequently, the mathematical treatment may start with: "Let us denote a two dimensional sequence defined on a rectangular grid by u(i, j), . . . When each u(i, j) is a random variable, a given image could be considered a sample function of this random field, . . . "

For the present, however, it is sufficient to note that an image "from the digital computer's point of view" is only a large matrix of numbers. Each number or pixel gives the light intensity ("gray level") of one picture element. The pixels may, of course, also represent distance, temperature, humidity, radiation, magnetism, gravity, plots of mathematical functions, graphic information, printed pages, etc. But such representations we usually call "maps", graphs and charts rather than pictures.

In the human, as well as in all biologically "developed" image processing systems, the individual contributions from the light receptors in the eyes are rapidly integrated into more characteristic and invariant quantities such as edges, given in location, orientation and direction and speed of motion. Except at the very elementary levels, the information processing steps in biological systems are not yet sufficiently well understood to serve as good models for computer programs. The human visual and nervous system is exceedingly complex. However, we know from our own experience that vision is both effortless and absolutely vital for survival. It is estimated that we obtain some 90% of our information via vision. A truly revolutionary advance in the use of computers would occur if we could program computers to fully understand real world scenes and speech.

Some comparisons

In computer processing of the huge matrices of numbers representing images, we actually have many more alternatives than what has been evolved in biological vision systems. Interestingly, however, the

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By DR. T. KASVAND

processing of images

Image processing and graphics should not be confused. In computer graphics there is a well-structured data base; in computer vision there's only a huge matrix of numbers representing the image, and some form of 'knowledge base' to instruct the machine what to do with the information extracted from the image.

better our own visual abilities, the poorer in comparison are the computational results, or in other words, "what we cannot see, we cannot judge." One of the ultimate goals of computer vision is to design vision systems that are as good as or better than our own vision.

Image transformations

There exists a whole spectrum of techniques which can be used to modify or transform the image (matrix) from its original form to some new form, which, when properly displayed, may be more suited to our own vision. Thus, if the image lacks contrast, the small contrast changes can be amplified ("enhancement"), if the image is out of focus, it can be refocussed to a certain degree ("restoration"); if the image is geometrically distorted, for example if one photographs a tall building at close range, the pyramidal appearance of the building can be made to look straight again ("geometric correction), and so on. Some additional techniques are histogram modification, noise cleaning, filtering, pseudo colouring, etc. besides compression and coding. Filtering and some geometrical corrections can also be performed optically.

Our own vision has some ability to enhance contrasts, but generally computer results far exceed our own innate abilities.

Pattern recognition

The above mentioned computer vision endeavours do extract some global information from the image, such as for example its gray level histogram or frequency spectrum, which is then used to modify the image. The term "pattern recognition", however, is normally applied to the extraction of much more detailed descriptors ("features"), in order to match these features either singly or in combinations against a multitude of models, which constitute the "knowledge base" in the system, and in order to achieve automatic object identification.

The methods are extremely varied but, practically without exception, the methods assume certain restrictions on the images and the recognition algorithms are directed toward a very limited set of objectives.

In some applications near 100% recognition accuracy or nearly 0% error is mandatory, such as in optical character reading (OCR) and mark sensing, while for example in particle counting and sizing a statistically valid result is adequate. Furthermore, the logic and combination of the algorithms to solve a given problem are so specific that even a relatively minor change in the input image may result in degraded performance or failure. Minor generalizations in the input image can normally be accommodated by improving the algorithms, but there is an upper limit to the complexity of the algorithms, which, if exceeded, will actually result in degraded performance. Optical character reading devices may be typical examples.

Turn to page 47

A restoration experiment where attempts are made to remove blur from the image. Restoration is from SVPSF or Space Variant Point Spread Function. At left, blurred image with no 'noise'; at right is the restored image using a quadratic programming algorithm. Mottled appearance of photo is caused by Moiré effect between individual pixels in the picture generated by the computer and the printing.

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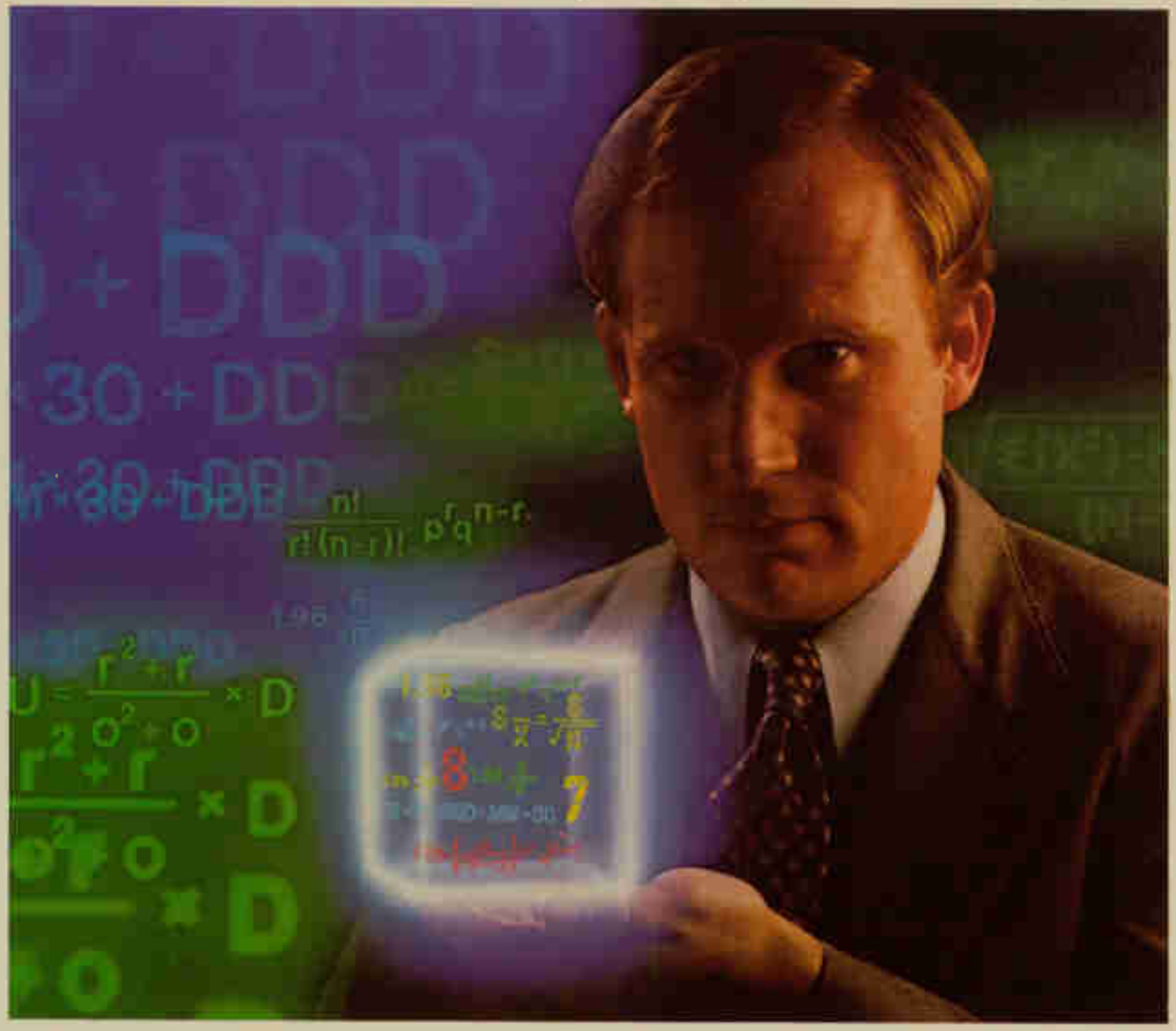

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Reader Service Card Number 148

Computer vision makes strides

From page 45

OCR devices have been on the market for more than 20 years, but we are still asked to use standardized type fonts or to print "approved styles" into little boxes!

When comparing human and machine performance in the area of elementary pattern recognition one has to be fair to the machines. If the human is constrained to work under the same restrictions for which the machine is designed, the machine will beat him in speed and possibly even in recognition accuracy.

In the case of OCR, as a familiar example, the machine "sees" each character individually in black and white or binary form and at a rather low spatial resolution. The character has to be recognized immediately and the machine has no "understanding" of what it is "reading". To reduce the human to this level will require the characters to be presented at random and displayed as binary dot patterns. The resultant lack of context and lack of fine resolution in the image we ourselves would consider quite unacceptable. Such analogies normally cannot be carried too far, but trying to put oneself into the same situation in which the machine has to tackle the problem leads to immediate appreciation of the reasons why the machines have such limited performance compared to our own abilities.

Areas of applied computer vision that are at present being intensively developed are the so-called "industrial vision systems" for inspection, parts locating and recognition, assembly, etc., usually called "robot vision". Providing industrial manipulators with vision and other sensors allows the design of flexible manufacturing systems. Thus, contrary to the present "hard" automation, a transfer line for example, which becomes economical only if millions of items of the same kind are manufactured, most special parts feeding, holding and transporting devices can be replaced by manipulators with vision. Since the manipulator or "intelligent robot" can see the part to be manipulated, the parts need not be positioned precisely. Consequently, the expense of the automated system can be reduced, it can be run for three shifts, and it can be easily rearranged to make small production runs economical. This is particularly important in the Canadian setting.

Scene "understanding"

Research on pattern recognition and the endeavours in artificial intelligence (AI) have now merged in attempting to develop algorithms that can "understand" the content and meaning of an image.

The larger scientific goal of AI is to construct an information processing theory of intelligence.

In computer vision the goal is the same, but the input consists only of images rather than requests to play a game or to prove a theorem. Numerous attempts have been made, but the goal has proved to be very elusive. To quote a well known author: "models of nontrivial classes of images are often very hard to formulate, . . . ; the properties, relationships and constraints that are needed often cannot be defined in any simple way without making the model too imprecise." Our own innate abilities to understand natural scenes are as yet totally unbeatable. Missiles with vision may appear to contradict these statements, since they appear to need to "understand" natural scenes in order to find their targets. However, they only correlate or match remembered images, which may be updated, against parts of the seen image.

Image reconstruction

A cross-sectional view of an object can be formed by recombining the outputs of sets of projected beams which go through the body, such as x-rays, or originate in the body, such as gamma rays. By scanning the body of a person, section by section, and by storing the reconstructed transverse "slices" or cross-sections in a computer, any section through the body can be displayed, and by repeating the process rapidly enough, the motion of the heart, for example, can be seen from any angle. Another form of reconstruction occurs in side looking radar.

The original scanner signals, when displayed side by side, result only in a picture of streaks. Our own vision cannot process these signals in order to recover the image hidden in them. Even though the principle is quite old, much fast computation is required before an image comprehensible to our own vision emerges.

Interactive systems

In areas where our own innate abilities are weak or nonexistent, computer vision serves as an extension of our own vision. In areas where our own abilities are well developed, computer results are far behind. This, however, need not stop

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The minimal system

The structure and power of a system for investigating computer vision problems is dependent on the nature of the problem and the studies to be undertaken. Fundamentally, however, the minimal system will need an image input and an image output device, sufficient amount of storage to contain at least two versions of the image, i.e., the image before and after processing, a computer with higher level language capability and means of interacting with the system.

The now commercially available TV-camera, image buffer and colour TV display combination, interfaced to a minicomputer, offers a reasonable starting point for initial study and development of image processing algorithms. The scene in front of the TV camera is scanned and stored in the image buffer, pixel by pixel. The image or frame buffer is thus one very convenient storage place for the huge matrices of numbers constituting the digital images. Another is the virtual memory system available on many computers.

The image in the buffer is constantly scanned out and displayed on the TV monitor. To utilize the buffer fully, it must be randomly accessible to the computer, both for reading and writing pixels. The buffer should also be "deep" enough to contain several versions of the image in parallel to allow the superimposition of the original and the processed images, and also pseudo and true colour representations, in addition to overlay images for markers, cursor, and alphanumerics. The simplest method of obtaining hard copy is to photograph the TV screen.

Since the data in the buffer is displayed continuously, the results of processing can be made immediately visible to the operator. This provides the potential for creating powerful interactive image processing systems. Experts, however, should be consulted before embarking on a picture processing system, since there are many pitfalls in the hardware as well as in the software methodologies for a given application. A general system is unlikely to be optimal. □

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Computer vision makes strides

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us from applying computers to analyze even very complex scenes. Recognition of objects in a complex scene requires scene understanding which at the present level of knowledge we do not know how to program, except for very simple cases.

Aspects of scene understanding, object recognition and extraction that are either too difficult or cannot be programmed at present are left to the human operator to carry out. For example, the operator may point out the object to be analyzed by encircling it with the help of an online display and cursor or a computer tablet. This isolates the object from the rest of the scene, allowing computer programming to be directed toward the analysis of this isolated object. Another method is to ask the operator to set global parameters, such as the threshold level at which the original gray level image is "sliced" and converted to a black and white or binary image. The operator sees the result immediately on a display and, if adequate, may ask the machine for example to count the number of isolated areas, measure their sizes and shapes, etc. The computer displays the results as an overlay on top of the original image for immediate operator verification.

A third method is to attempt the processing anyway, but to produce immediate feedback to the operator, such as the reading of product (bar) codes at supermarket checkout counters. If the machine fails or makes an error, the operator takes over.

Such interactive systems can be very useful since the problem is divided up according to who does what best. The operator carries out the scene understanding part and the computer the counting, measuring, computing, display and tabulating aspects. Numerous commercial and laboratory systems exist.

There is a variety of other activities which use images as a means of communicating with the human operator. Thus, in computer graphics a carefully designed data base is constructed, which can be modified, manipulated and displayed as an image. This activity is of much artistic, intellectual and commercial value, since it enables one to formulate and display one's artistic or technical ideas, which may then be turned into physical form via adequate automatic machinery. Such activities have, summarily, been called CAD/CAM or Computer Aided Design and Computer Aided Manufacturing. There is a multitude of information systems, where the displays range from pictures to charts to just tables of numbers. Nor should one forget computer games, which in a sense are popular applications of graphics.

In order not to confuse image processing and graphics, it should be emphasized again that in computer graphics there is a well-structured data base from which the image is generated. In computer vision there is only the huge matrix of numbers representing the image, and some form of "knowledge base" to instruct the machine what to do with the information extracted from the image.

Computer vision in Canada

From prior contacts, confirmed by a brief telephone survey, the Canadian situation is approximately as outlined below. However, apologies are offered in advance, since no clear boundaries can be drawn between the activities, considering the magnitude and diversity of these endeavours, as well as the differences in point of view. Computer graphics activities are not included in this outline.

Among the Canadian universities, the greatest effort in computer vision is concentrated in Montreal, at McGill University (computer vision), Montreal Neurological Institute (reconstruction), Concordia University (character recognition), and Université de Montreal. Altogether up to some 10 professors and 30 to 40 students and assistants are working on various aspects of computer vision.

The next largest centre is in Vancouver, centred at The Laboratory for Computational Vision at UBC, with some half a dozen professors and 15 to 20 assistants and students. Their activities are mainly in artificial intelligence and remote sensing.

Activities in computer vision involving one or two professors and some students occur at University of Toronto, University of Alberta, Queen's University, University of Waterloo, University of Ottawa, McMaster University, etc. A fair number of courses in computer vision can be taught only in the larger centres.

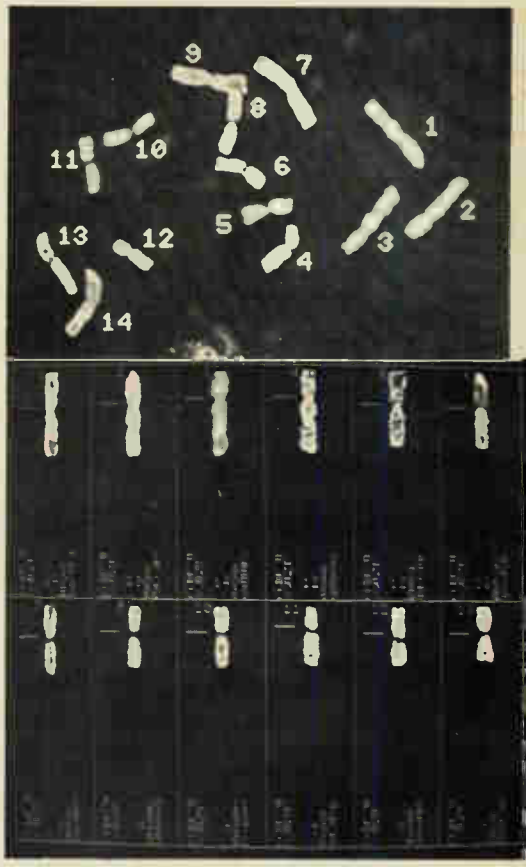
Among the federal research laboratories only CCRS (Canada Centre for Remote Sensing) can be compared to efforts abroad, both in equipment as well as in manpower. CCRS, however, is mainly devoted to remote sensing and associated image processing. Interactive image processing equipment is used in some laboratories. At NRC the effort in computer vision consists of the work of the author and a few colleagues, and three persons developing a visual sensor for the Space Shuttle manipulator arm.

In Canadian industrial research laboratories there is some work in image compression and transmission, character recognition, analysis of mainly remotely sensed data, industrial inspection, etc.

Proportionally, the research and development activities in computer vision are considerably greater in the US, Japan and Europe.

For example, in Japan the Pattern Information Processing Systems (PIPS) project was recently completed at a cost of some $110 million, besides the many laboratories in computer vision and robotics.

In West Germany similar activities are carried out at FIM, Research Institute for Pattern Recognition, Fraunhoffen Institute, etc. In the US, the activity in robotics is also accelerating rapidly. □



The input and output of an interactive plant chromosome karyotyping system. Top photo shows chromosome spread as digitized from microscope with labels added. Bottom photo shows the chromosomes straightened and ordered according to length.

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Word processing: merging word and data processing functions

Rising costs have forced users to consider new ways of combining word and data processing. A range of vendors with a diverse line of products are bidding for attention. Here's a tabular review of some of the new hardware on the market.

By Linde S. A. Fistell
Assistant Editor

THE LATEST word processing equipment shows an increasing emphasis on the integration of word and data processing capabilities in one piece of hardware. Increasing costs in maintaining separate office functions have forced office management to reconsider the options that would combine word and data processing, increase efficiency, and reduce the cost of office personnel.

To meet this challenge, suppliers have gradually moved toward multifunctional word processing equipment that includes data processing capabilities. Some of the newer WP systems use software packages to perform mathematic functions and records processing. Others are capable of handling a full range of accounting functions, or can perform terminal emulations to access EDP data bases. New DP capabilities also include sort and extract functions, programmability in such languages as Fortran, Basic and Assembler, and interface capabilities with mainframe computers to access DP data bases or functions.

The latest word processing equipment also features an increasing number of peripherals options including OCR devices, printers, plotters and graphic display units, communications interfacing, and magnetic data storage of various capacities.

The following tables provide a condensed look at some of the latest word processing equipment now on the market. For a review of general trends in word processing, see *Canadian Datasystems*, June 1981.

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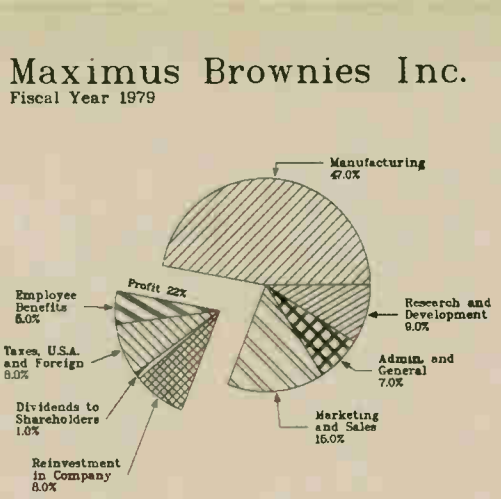
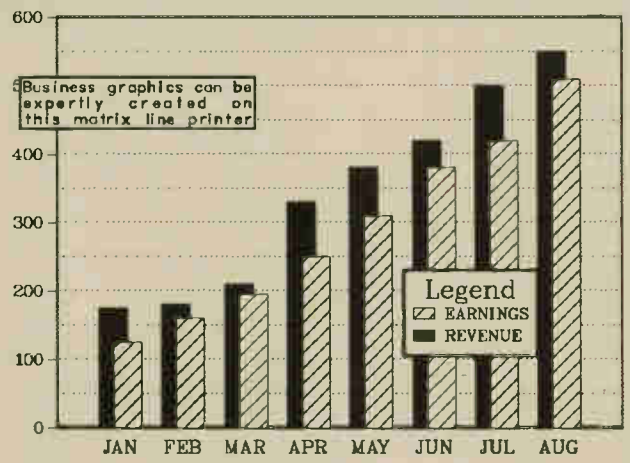
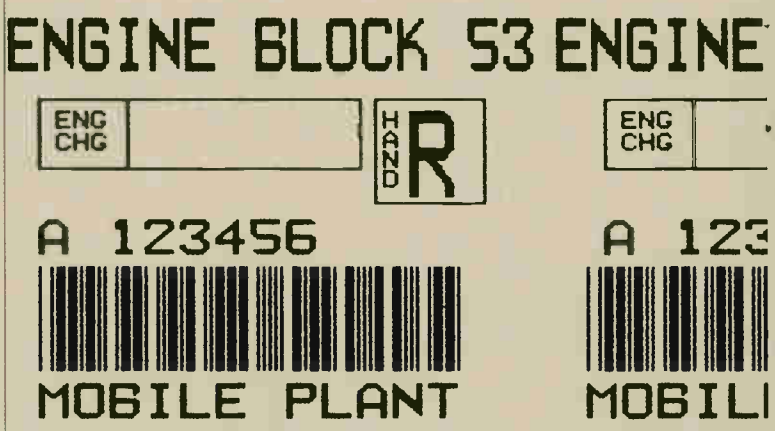
Word/text processing . . . A look at some recently introduced systems

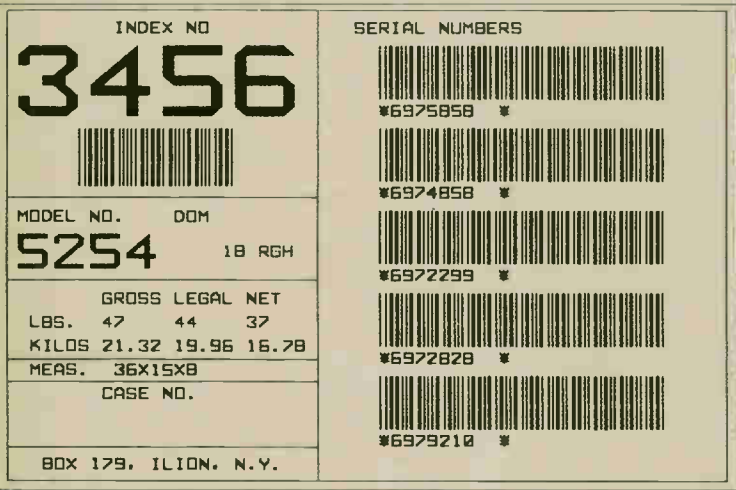
COMPANY	A.B. Dick Co.	A.B. Dick Co.	Ashworth Automation	Burroughs Inc.	Burroughs Inc.	CPT	CPT	CADO Systems Corp.
MODEL	Magna III	Magna SL	D50 Centronics daisy wheel printer	RIII	RII	6000	8000	20/21 C.A.T.
DISPLAY Type, Format Size, (lines/page)	CRT, 20 lines/page	CRT, 20 lines/page	n/a	CRT, 30 lines/page	60 lines	CRT, 54 lines/page	CRT, 54 lines/page	24 lines x 80 columns
PRINTER Speed (in cps)	55 cps, twin track, wide track	55 cps, twin track, wide track	47 cps, letter quality	35 cps or 55 cps	55 cps	45 cps	45 cps	55 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	shared resource, up to 255 devices in a loop	shared resource, up to 255 devices in a loop	receive only printer	(2)	(2)	(3)	(3)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(5)	n/a	(4)	(4)	(5)	(5)	(5) dual-sided double-density
EDITING FEATURES	full range	full range	n/a	standard editing features	standard editing features	simultaneous input/output, move, adjust, auto center, decimal align, etc.	same as 6000 plus advanced printing, recorded programs, sort and math	full range, document-oriented
COMMUNICATIONS COMPATIBLE	standard to 1200 baud asynchronous	standard to 1200 baud asynchronous	n/a	asynch TTY, poll/select	asynch TTY, poll/select	n/a	2780, 2770, 3780 TTY	TWX — Telex
EDP CAPABILITY	via communications	via communications	n/a	software programmable, arithmetic capability	software programmable, arithmetic capability	n/a	business systems including A/P A/R payroll, general ledger, job cost, etc.	business processing; management inquiry & Report Writer
PERIPHERALS	sheet feeder, OCR, twin track, wide track printers	sheet feeder, OCR, twin track, wide track printers	n/a	dual hopper sheet feeder, OCR, shared printer	dual hopper sheet feeder, OCR, shared printer	n/a	OCR, phototypesetter, TermiNet	150 cps matrix printer; self-teaching, interactive programs
PURCHASE PRICE in Canadian dollars	workstation $9,500 printer $7,000	$19,750	$2,950	$9,700	$14,500			$18,890

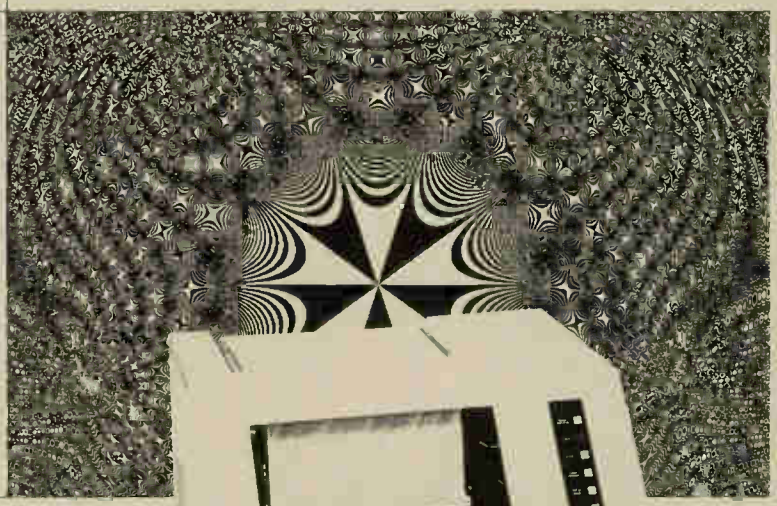
The information supplied for this special report represents a cross-section of the industry and is not intended as a guide to all available products on the market.











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Word/text processing systems

COMPANY	CADO Systems Corp.	Commodore Business Machines Limited	Commodore Business Machines Limited	Compal	Compal	Compucentre	Compucentre	Computer Market
MODEL	20/24	CBM 8032	CBM 4032	8200	EZ Type	Compucorp 675	Compucorp 685	Q 3 10 D
DISPLAY Type, Format Size, (lines/page)	24 lines x 80 columns	CRT, 25 lines x 80 columns	CRT, 25 lines x 40 columns	24 lines x 80 char. CRT	24 lines x 80 char. CRT	20 or 60 lines/page	20 or 60 lines/page	CRT, 24 lines/page
PRINTER Speed (in cps)	55 cps	NEC (55 cps) CBM 4022 (65 cps)	NEC (55 cps) CBM 4022 (65 cps)	55 cps	35 to 55 cps	optional 25, 40, 45, 55, or 150 cps	optional 25, 40, 45, 55, or 150 cps	55 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(3)	(3)	(3)	(3)	(3)	(2)	(2)	(2)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5) dual-sided double-density	(2) (4)	(2) (4)	(4)	(4)	(4) (6)	(4) (6) Winchester 5¼-in.	(5)
EDITING FEATURES	full range, document-oriented	full range	full range	yes	yes	full range	full range	full range
COMMUNICATIONS COMPATIBLE	TWX-Telex	yes	yes	asynchronous 2780/3780 bi-synchronous	asynchronous 2780/3780 bi-synchronous	yes	yes	yes
EDP CAPABILITY	business processing; management inquiry & Report Writer	yes	yes	full range	optional	fully programmable in Basic, Fortran, Assembler	fully programmable in Basic, Fortran, Assembler	interfaces with Univac mainframe computers
PERIPHERALS	four-terminal cluster; 150 cps matrix printer shared disk storage	printers, disk drives, modem, cassette drive	printers, disk drives, modem, cassette drive	sheet feeders, modems, printers, OCR	sheet feeders, modems, printers, OCR	diskette drives, Winchester (2 at 5 MB), OCR reader, printers	Winchester drives (up to 15 MB), OCR reader, printers, 600 series systems	multi-user word processing system
PURCHASE PRICE in Canadian dollars	$28,049	From $6,098	From $5,218			From $17,000	From $19,000	$20,000

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Word/text processing systems

COMPANY	The Computer Shop	The Computer Shop	Datamex Ltd.	Datamex Ltd.	Data Terminal Mart	Data Terminal Mart	Dictaphone Corp.	Dictaphone Corp.
MODEL	Commodore 8032 + WP4	North Star/Word-star, HR2—6KK	CPT 8000	CPT 6000	Wangwriter	Q'Text	Display 2000	Dual Display
DISPLAY Type, Format Size, (lines/page)	CRT 25 lines x 80 char.	Cybernex XL-83, 24 lines x 80 char.	CRT, 54 lines, split screen preview	CRT, 19 lines, split screen preview	CRT, 24 lines x 80 char.	CRT, 24 lines x 80/132 char.	single line x 37 char.	full-page, 66 line x 102 char.
PRINTER Speed (in cps)	C. Itoh daisy 25 cps	C. Itoh daisy 25 cps	45, 55 cps	45, 55 cps	20 cps bidirectional	25 to 200 cps	40 cps	40 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(3)	(3)	(2)	(2)	(2)	(3)	(2)	(2) with shared resource and electronic module
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(4)	(4)	(5) (6)	(5)	(4) DSDD	(5)	(6)	(6)
EDITING FEATURES	full screen editor, cut and paste, merge from disc, global search	full screen editor, cut and paste, merge from disc, global search, replace	text merge, search & replace, delete, block & column move, auto hyphenation, sort, select	text merge, search & replace, delete, block & column move, auto hyphenation, sort	insert/delete characters, words, lines, paragraphs, pages; global search & replace	insert/delete characters, words, lines, paragraphs, pages; global search & replace	search, delete, hyphenation	search, delete, insert, document formatting, hyphenation
COMMUNICATIONS COMPATIBLE	yes	yes	Asynch. TTY 2770, 2780, 3780	Asynch. TTY, 2770, 2780, 3780	n/a	yes	asynchronous TTY; ASCII	asynchronous ASCII
EDP CAPABILITY	yes	yes	supports CP/M for DP capabilities	n/a	n/a	RT11 operating system	n/a	math package; records processing
PERIPHERALS	full range	full range	OCR, mag card reader, wide track & twin track printers, etc.	mag card reader, wide track printer, sheet feeder, console interface	n/a	yes	n/a	printers, training program
PURCHASE PRICE in Canadian dollars	$7,700	$11,995	$17,500	$13,500	$9,500	$15,000	$9,000	$15,900

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Word/text processing systems

COMPANY	DMC Datasystems of Can. Ltd.	Dynalogic Corp.	Dynalogic Corp.	Exidy Systems Inc.	Exxon Office Systems	Exxon Office Systems	Hamilton Rentals	Hamilton Rentals
MODEL	DMC Commfile Datasystem	7042C	7042A	Sorcerer 80/2	Qyx Level IV	Vydec 1800	DEC WS78	Word 11 System
DISPLAY Type, Format Size, (lines/page)	CRT, 24 lines plus status	CRT, 24 lines/page	CRT, 24 lines/page	P-31-CRT 64 x 30 characters	24-character LED (5x7 dot matrix)	CRT (wide document up to 160)	CRT, 54 lines/page	CRT, 54 lines/page
PRINTER Speed (in cps)	45 cps daisy or 180 cps dot matrix	optional 45 cps bi-directional	optional 45 cps bi-directional	daisy wheel 25, 45, 55 cps	24 cps	daisy wheel 32 cps	Diablo, 45 cps	Diablo, 45 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	dual diskdrive, 64K RAM, 3 RS232 ports	(3)	(3)	80/2 (2)	(1)	(2)	(2)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(5) double density, dual sided	(5) single density, single sided	(2) (5) (6)	(4)	(5)	(5)	(6)
EDITING FEATURES	formatting on screen, video attributes, insert/delete/replace etc.	yes	yes	full editing & formatting; 20,000 word dictionary; math capability	insert/delete, erase backspace, forward/reverse skip, amount recognition, find text, etc.	formatting, insert/delete, global search, forms mode, error correction, text movement	full range	full range
COMMUNICATIONS COMPATIBLE	ASCII and 2740/2741	asynchronous	asynchronous	RS232 included, modems optional	Qyx-to-Qyx 1200 baud, Qyx-to-Vydex (1800) 1200 baud, Qyx-to-TTY 150 or 300 baud	2741 Interface, 2780/3780 asynchronous bisynchronous TTY	yes	yes
EDP CAPABILITY	line terminal to host via communications, data entry, timesharing	G/L, A/P, A/R, inventory, payroll, customized packages	G/L, A/P, A/R, inventory, payroll, customized packages	CP/M operating system compatible with EDP software programs	n/a	records processing math pak, terminal emulations access EDP functions	yes	yes
PERIPHERALS	character or dot matrix printer	plotter, graphic displays, mag tape drives via GPIB IEEE 488	plotter, graphic displays, mag tape drives via GPIB IEEE 488	308 or 616K single disk drive, 616 or 1.2m dualdrive/display, 8m disk drive	n/a	OCR, sheet feeder, wide document printer, stand-alone printer	disc drive	printers, CRTs
PURCHASE PRICE in Canadian dollars	$11,500	$16,985 FST included	$14,985 FST included	$6,500 to $9,200	$5,950	$12,200	$11,660	

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Word/text processing systems

COMPANY	IBM Canada Ltd.	IBM Canada Ltd.	IBX Datasystems Ltd.	J. D. Cox & Associates Inc.	JTS Computer Systems Ltd.	Lexitron Corp.	Lexitron Corp.	MCM Computers
MODEL	IBM Displaywriter	IBM 5520 Administrative System	DEC PDP 11/03,/23,/34,/24,/44,/70	JDC/PDP-11 Word processing	Stylus	VT 1201S	VT 1303	Power
DISPLAY Type, Format Size, (lines/page)	CRT, 25 lines x 80 char./line	options: 5253 1,920 char. (24 x 80);	CRT — 24 lines x 80 char.	CRT 24 x 80 & 24 x 132 char.	CRT, 24 lines/page	CRT, 66 lines/page	CRT, 66 lines/page	CRT, 21 lines/page
PRINTER Speed (in cps)	15.5, 40, 60 cps	5219 40/60 cps; 5257, 55 cps	45 cps, daisy wheel 100 to 300 lpm	daisy wheel 45 cps dot matrix 180 cps	25 cps to 600 cps	bidirectional daisy wheel, 45 cps	bidirectional daisy wheel, 55 cps	NEC 55 cps; Centronics 180 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(2)	(3)	(3) any number of CRTs	(3)	(3)	(2)	(2)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5) plus mag card conversion facility	(1) (5) (6)	(6)	(5) (6)	(6)	(4) single drive	(4) dual drive	(6)
EDITING FEATURES	spelling verification aid; text editing; column operations; 4-function math; document assembly; etc.	full range with background processing	electronic file cabinet; delete; insert; modify; global search; document formatting	insert/delete; global search, cut & paste, tabbing, underlining, dating, justification	full range	sequential page/document access; insert/delete/erase; line edit/merge etc.	sequential/random page/document access; insert/delete/erase; reformat; text assembly	full range
COMMUNICATIONS COMPATIBLE	asynchronous, bisynchronous	SCLC binary synchronous; full document distribution	with X25	yes	2780, 3780 bi-synchronous	n/a	asynch ASCII, 2741, point-to-point; synch/bi-synch 2770, 2780, 3780, 3275	yes
EDP CAPABILITY	basic math functions with Textpak 3	yes	full range	full concurrent word & data processing	yes	n/a	via communications interface, Basic interpreter or Records System	yes
PERIPHERALS	n/a	mag card; diskettes; screens; printers	networking of CRTs and printers; up to 1M pages on-line storage	diskettes, hard disk, printers, hard copy & CRT terminals	mag tape, high speed printers	printer multiplexer, accoustical hoods	wide track or twin track, dual tray sheet feeder, OCR, printer multiplexer	any RS232 peripheral
PURCHASE PRICE in Canadian dollars			$40,000 to $500,000	$15,000-$100,000	$30,000 to $100,000	$8,500 U.S.	$13,890 U.S.	

Computer-audit system has wide applicability

What is described as a 'breakthrough' in computer-based auditing has been announced by Clarkson Gordon, a Toronto-based firm of chartered accountants.

Developed jointly by the Canadian firm and Arthur Young & Company, New York (the U.S. branch of the worldwide accounting firm Arthur Young International, of which Clarkson Gordon is also a member), the AuditComputer system offers two major features for improved auditor convenience and efficiency: it can be configured from many different brands of minicomputer and peripherals, and it can access information from client databases virtually irrespective of what computer languages the customer's system employs. Strict data security standards are constantly maintained.

"As use and diversity of computer systems increases," Donald Scott, a senior partner at Clarkson Gordon, explains, "auditing of such systems has become more complex, and it was often necessary to create custom programs for each client so we could obtain and audit the necessary data. Now, the Arthur Young AuditComputer will allow us to audit a client's data more easily and efficiently, using standard programs."

AuditComputer consists of three hardware components: a central processing and control unit, a remote data-capture unit, and a mass data storage unit. Data can be received over standard telephone lines; via direct hook-up to the client's computer; or from IBM 3740-format floppy discs. The fixed-disc mass data storage unit has a capacity of 18.6 megabytes.

"This concept offers quite a bit of versatility," John Swinden, national director of computer auditing at CG, notes. "Our previous computer-audit system essentially required IBM-compatible equipment, but the software we've designed for AuditComputer will capture the client data at machine-language level, allowing the user to not have to be concerned about what operating system or higher-level language is in use."

The CPU for the AuditComputer units being installed at Clarkson Gordon's offices in Toronto employs an Apple-III mini that uses the Pascal language, but subsequent developments by other manufacturers could make other brands appealing, and the system is flexible enough to run on a wide variety of hardware.

New data concentrator has eight times performance

By exploiting advances in microprocessor technology, Micom Systems Inc., Chatsworth, Calif., says it has developed a new data concentrator (Micro800/2), that can offer eight times the performance of the firm's original Micro 800 unit at a lower price.

The concentrator is described as a second generation statistical multiplexor. It is designed to permit up to 16 data terminals, synchronous and asynchronous, to share a single telephone line. It can be installed by a non-technical user, notes the company, without changing existing hardware of software.

Micom notes that it has more than 20,000 units of its earlier concentrator in service, but stresses that the new product includes as standard items many features that were extra-cost options for the earlier model.

According to Micom, the new device's data compression feature makes it more efficient than most other statistical multiplexors and automatic retransmission ensures error-free data communications. It can provide at least twice as much channel capacity on the same phone line. The device sells for US$ 1,850.

The amount of concentration possible with the Micro800/2 depends on the computer application, notes Micom, but a factor of 4:1 usually is achievable.

Word/text processing systems

COMPANY	MCM Computers	MLPI Business Systems	MLPI Business Systems	Micom Co.	Micom Co.	Micos Computer Systems Inc.	Mohawk Data Sciences Canada Ltd.	Mohawk Data Sciences Canada Ltd.
MODEL	MCM 900	D200	DECTYPE 300/500	Micom 2001	Micom 2002 Twin	Micos 100	Series 21 Model 21/40	Series 21 Model 21/50
DISPLAY Type, Format Size, (lines/page)	CRT, 21 lines/page	VT-52 or VT-100 CRT 24 lines/page	VT-100 CRT 24 lines/page	CRT, 33 lines x 80 char.	CRT, 33 lines x 80 char.	Midas IV CRT	CRT, 24 lines/page	CRT, 24 lines/page
PRINTER Speed (in cps)	NEC 55 cps; Centronics 180 cps	45 to 60 cps	45 to 60 cps	45 cps	45 cps	150 cps	45 cps	45 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(2)	(2) (3)	(3)	(2)	2 keyboards; 2 displays; 1 CPU; 1 or 2 printers	(3)	(3)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(5) (6)	(5) (6)	(5)	(5)	(6)	(5) (6)	(5) (6)
EDITING FEATURES	full range	centre screen, cut & paste, swap, jump, search & replace, math, view, specify, centering	same as D200 plus: retrieve from disk, retrieve boiler plate, date & time, "Quit", statistics	full range	full range	full range	full range	full range
COMMUNICATIONS COMPATIBLE	yes	3 modes: document, unattended, and character transmission, public networks	3 transmission modes plus communications with remote processors and networks	asynchronous; bi-synchronous; Miconet*	Miconet*	asynchronous, bi-synchronous	IBM 2780, 3780, 36/20 3270 TTY	IBM 2780, 3780, 36/20, 3270 TTY
EDP CAPABILITY	yes	full concurrent data processing	full concurrent data processing	BASIC	yes	yes	yes	yes
PERIPHERALS	any RS232 peripheral	multiple printers, multiple terminals	all computer systems, IBM, Mag Card I, OCR, phototypesetters	OCR, mag card reader, photocomposer, sheet feeders	wide track, sheet feeders	most types	tape, high speed line printers, multiple CRTs	tape, high speed line printers, multiple CRTs
PURCHASE PRICE in Canadian dollars		$10,000 to $25,000	$15,000 to $30,000	$16,990 to $14,990			$14,000 to $20,000	$20,000+

Datacom makers pool R&D to develop office systems

OTTAWA—Seven service and equipment manufacturing companies have joined together to carry out office communications systems research and development.

The coalition, as it's called, is the first major response to Communications Minister Francis Fox's program aimed at capturing by 1985 a significant share of domestic and international markets for electronic office equipment. Canadian equipment sales last year came to more than $4 billion.

Members of the new company, Office Communications Research Associates (OCRA) are Gandalf, the Ottawa manufacturer of data communications equipment; NABU Manufacturing, the Ottawa computer manufacturer; CNCP, the communications carrier, plus the Canadian cable telecommunications industry through its research arm, the Cable Telecommunications Research Institute (CTRI) and three Ottawa-based distributors, Télécâble Laurentien, Ottawa Cablevision and Skyline Cablevision.

The Department of Communications unveiled last November a $12.5 million program to stimulate Canadian expertise in electronic office equipment. It wants small to medium electronic firms to gain a foothold in this booming market and is obviously aimed at industry giants like International Business Machines and Xerox.

The program expenditures will be beefed up by additional money from the Department of Industry, Trade and Commerce's Enterprise Development Program and the Special Electronics Fund as well as through normal office equipment procurement throughout the life of the program.

"Governments of other nations are assisting their high technology industries," says Fox. "We must do the same or be left behind."

Announcing the setting up of OCRA, Judith Scott, its president, told a news conference that in order for Canada to develop a viable office communications industry, it had to find a means of integrating its equipment.

"The new world of office communications is unbelievably competitive worldwide," she said. "Canadian companies must gain a secure foothold or be out-performed even in the Canadian market.

"OCRA rpovides us with a world class team that can help set the stage for effective Canadian performance in this vital and rapidly growing sector."

Without industry or government activity of some kind, Canada's trade deficit in electronic products could grow to $10 billion by 1990. We could be looking at a $4 to $5 billion deficit by the mid 1980s.

Reader Service Card Number 110

Scott wouldn't say how much the companies behind OCRA are planning to spend on developing new office systems. But she did reveal they are spending about $10 million yearly on research and development in that area.

She said that early next year a prototype of the group's first office system should be test ready. It will consist of data transmission equipment, small business computers and other communications tools.

The cost of setting up the coalition is about $100,000. The board of directors are John Kelly and Gordon Gow of NABU, Judith Scott and Colin Patterson of Gandalf, Oskar Stubits of CNCP, Robert Beauchamp of Télécâble Laurentien, Roy O'Brien of Ottawa Cablevision, Vic Reed of Skyline Cablevision and Joe Halina of CTRI.

Legal counsel to OCRA will be Charles Dalfen who was until recently vice-chairman of CRTC.

The board says it welcomes inquiries from Canadian firms who might foresee a complementary role in this unique initiative. OCRA will be open to other participants through its founding associates.

Its offices will initially be located with those of the Cable Telecommunications Research Institute at 110 - 85 Albert Street, Ottawa.

Tom Messer, Ottawa Editor

Word/text processing systems

COMPANY	Network Data Systems (S.W.O.) Ltd.	Network Data Systems (S.W.O.) Ltd.	Nixdorf Computer Corp.	Northern Telecom Inc.	Northern Telecom Inc.	Olivetti Canada Limited	Olivetti Canada Limited	Pertec Computer Corp. (Canada) Ltd.
MODEL	CADO 2028	Qyx	8840/5	Omni-Word NTI-405	Omni-Word NTI-445	ET 231	ETS 1010	PCC 2000
DISPLAY Type, Format Size, (lines/page)	CRT, 24 lines/page	28 char.	CRT, 24 lines/page	CRT, 24 lines x 80 columns	CRT, 24 lines x 80 columns	gas plasma display 21 char.	80 char./line 25 lines/page	CRT, 24 lines/page
PRINTER Speed (in cps)	55 cps	30 cps	45 cps or 300 lpm	40 cps	40 cps, line printer, 72 cps to 600 cpm	20 cps	20, 30 or 65 cps	NEC 30 cps, NEC 60 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	multiple KB/displays multiple printers (1) CPU (3)	(2)	(3)	Max-1 WP display station, Max-1 WP printer	from 1 to 3 WP display stations, 1 wp printer	(2)	(2) (3)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5) (6)	(4)	(5) (6)	(1) (5)	(2) (5) (3) (6)	no external storage	(5) (6)	(6)
EDITING FEATURES	full range	full range	full range	insert lines, character, delete, multiple line, move copy, merge text, reverse case	insert lines, character, delete, multiple line, move copy, merge text, reverse case	key word search; global search & replace	full range	full range
COMMUNICATIONS COMPATIBLE	2780, 3780, 3270, TTY	Qyx to Qyx, Qyx to Vydec, Qyx to TTY	2780 compatible; 8840-8840 electronic; mail mode	2770-27, 2780, 3780, CDC-200UT Burroughs SDLC-3774	3270, hasp JES 2, JES 3, multi-leaving, 2770 CDC 200UT, 2780, 3780, SDLC 3774	yes	yes	yes
EDP CAPABILITY	accounting, data processing, law office, C.A. client accounting, invoicing	limited	yes	Cobol, Basic, data entry package (TAL), 3270 pass-through utilities	Cobol, data entry package (TAL), 3270 pass-through utilities	n/a	sorting, 4-function math	yes
PERIPHERALS	CRT, memory, printers	system is modular, 5 levels, additional features & capacity	300 lpm line printer	Display Station Max-2, Max-1, and Max-2 printers, Diskette 2014 units	Display Station Max-8, line printers Max-8, WP printers, Disc DM80	sprocket feed, automatic sheet feed	sprocket feed, automatic sheet feed, printers	multi-terminal
PURCHASE PRICE in Canadian dollars	$17,000 to $45,000		$25,000-$50,000	$16,000	$24,000	$3,995	From $9,425	$15,000 to $30,000

Word/text processing systems

COMPANY	Radio Shack Division Tandy Electronics Ltd.	Radio Shack Division Tandy Electronics Ltd.	Datapoint Canada Inc.	Datapoint Canada Inc.	Wang Canada, Ltd.	Wang Canada, Ltd.	Zenith Data Systems	Apple Computer
MODEL	TRS-80 Model II	TRS-80 Model III	Datapoint 1500/1800	Datapoint 3800	Wangwriter	OIS Remote Cluster Facility	Z89	Apple II Plus
DISPLAY Type, Format Size, (lines/page)	CRT, 24x80 char.	CRT, 16x64 char.	24 line x 80 char.	24 line x 80 char.	CRT-24 lines of screen display	CRT 26 lines	24x80 char/line	31, 901 char/file 95 pages/diskette
PRINTER Speed (in cps)	daisy wheel 45 cps	daisy wheel 45 cps	30, 45, 160 cps; 300, 600 lpm	30, 45, 160 cps; 300, 600 lpm	daisy printer, 20 cps	daisy (40 cps) line (450 lpm)	40 cps	Qume sprint 5 45 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(2)	(2)	(2)	(2) (3) (shared resources)	(2)	(3)	(2)	keyboard, monitor, printer
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(2) (4)	(1) (2) (5) (6)	(1) (2) (5) (6)	(4) dual-sided, double density	(5) (6)	(4)	diskette software
EDITING FEATURES	document formatting, error correction, insert, delete, global search/replace, etc.	document formatting, error correction, insert, delete, global search/replace, editing, etc.	AIM (search & locate) formatting on screen insert/delete document, scrolling	AIM (search & locate) formatting on screen insert/delete document, scrolling	full range	full range	simultaneous printing, editing help messages, video editing, word-wrap	cursor control, free memory, disk access, upper case conversion, search & replace, deletions
COMMUNICATIONS COMPATIBLE	two ports: 1) asynchronous/synchronous 2) asynchronous	RS232C asynchronous	asynchronous, synchronous with industry standard protocols	asynchronous, synchronous with industry standard protocols	full range by 12/81	remote node TC to VS; asynchronous 2741; TTY bisynchronous 2780/3780 2770/3270	n/a	via modem
EDP CAPABILITY	full function, general purpose business computer	full function, general purpose business computer	in conjunction with dispersed DP systems & hosts and electronic mail	in conjunction with dispersed DP systems & hosts and electronic mail	n/a	local DP in Basic; full capabilities via TC connection to Wang VS	n/a	yes
PERIPHERALS	audio instruction training program, operator manual	audio instruction training program, operator manual	character printer, diskette, printer in cluster configuration	character printer, diskette, printer in cluster configuration	n/a	printers, OCR, photocomposition, mag card reader	n/a	disk drives
PURCHASE PRICE in Canadian dollars	$8554	$6149			$9500			$6,500

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Reader Service Card Number 134

Word/text processing systems . . . *Late additions at press time*

COMPANY	Account Data Corp. Ltd.	Account Data Corp. Ltd.	AES Data Ltd.	AES Data Ltd.	Northern Telecom Systems Ltd.	Northern Telecom Systems Ltd.	Xerox Canada Inc.	Heath Company
MODEL	9000	9001	AES Plus	AES System C20	NTI 405	NTI 445	860	Zenith Data Systems Z.89
DISPLAY Type, Format Size, (lines/page)	CRT, 24 lines/ 80 char.	CRT, 24 lines/80 char.	CRT, 26 lines/page	CRT, 26 lines/page	15-in. CRT, 24 lines/80 columns	15-in. CRT, 24 lines/80 columns	page	n/a
PRINTER Speed (in cps)	MX-80	NEC Spinwriter	45 cps	45 cps	40 cps, line printers 72 cps-300 lpm	40 cps, line printers 72 cps-600 lpm	45 cps	40 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(3)	(3)	(2)	(2), (3) 8 terminals	max. 1 WP display station, max. 1 WP printer	From 1 to 3 WP display stations, max. 1 WP printer	(3)	(3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(5)	(4), 2 minis	(4) (5) (6)	(1) (5)	(1) (2) (3) (5) (6)	(5) (6)	(4) (5)
EDITING FEATURES	delete/insert, vert/horiz scrolling, search and replace, margin reformat, boldface, subscript	delete/insert, vert/horiz scrolling, search and replace, margin reformat, boldface, subscript	full range plus SSR, line drawing, auto repaginate	full range plus SSR, line drawing, scientific, auto repaginate, proportional spacing	insert lines, character; delete character, word, line sentence, block; multiple line, move copy; merge text	same as 405	yes	print spooling, help messages, word-wrap, print enhancements, flexible formatting, decimal tab.
COMMUNICATIONS COMPATIBLE	asynchronous, bisynchronous	asynchronous, bisynchronous	synchronous, asynchronous, various protocols	synchronous, asynchronous, bisynchronous, various protocols	2770, 2780, 3780, CDC 200UT, Burroughs, SDLC 3774	3270, HASP, JES2, JES3 Multileaving, 2770, CDC 200UT, 2780, Burroughs, 3780, SDLC 3774	3270, point to point, 2770/2780, TTY	yes
EDP CAPABILITY	yes	yes	sort, extract, report, financial	sort, extract, report, financial	Cobol, Basic, data entry package (TAL), 3270 pass-thru, utilities	Cobol, data entry package (TAL), 3270 pass-thru, utilities	supports basic	n/a
PERIPHERALS	hard disc drives, printers, modems	hard disc drives, printers, modems	OCR, paper-punch station dual sheet feeder; line counter	rigid disc, OCR, paper punch; line printer, wide and twin track printer, dual sheet feeder	display station, line printer, WP printer, diskette, mag tape	display, line printer, WP printer, disc DM80, map tape, diskette, cassette	OCR, photocompositor, 9700, 5700/5700	n/a
PURCHASE PRICE in Canadian dollars	$9,280	$13,880			$16,000	$24,000	$15,950	$9,000 approx.

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Word/text processing systems. . . *Late additions at press time*

COMPANY	CES Electronic Systems Group Ltd.	MFC Microsystems Int. Inc.	MFC Microsystems Int. Inc.	Artelonics
MODEL	Northstar Horizon HRZ ZQ-64K	Cromemco System Three, WordStar	Cromemco Z2H Hard Disc	Series 1000 Workstation
DISPLAY Type, Format Size, (lines/page)	CRT 24 lines x 80 columns	CRT, 80 lines x 24 char.	Same as Cromemco System Three	36 lines x 96 char.; 864x512 graphics; 15-in.
PRINTER Speed (in cps)	NEC 5510, 45 cps	spindle wheel printer 45-55 cps	same as Cromemco System Three	QUME 96 cps
CONFIGURATION Keyboard/printer (1), Keyboard/display/printer (2), Terminal/CPU/Printer (3)	(3)	(2) including 64K RAM, 2.4 MB floppy disk storage (3)	(2) includes 64K RAM, 790 MB diskette storage (3)	(2) (3)
MEDIA Magnetic Card (1), Cassette (2), Tape cartridge (3), Mini-diskette (4), Diskette (5), Disc (6)	(5)	(5) diskette 1.2 MB with optional (6) 11 Meg. hard disc	(5) diskette 790 KB (6) hard disc 11 MB	(5) (6)
EDITING FEATURES	move thru document line by line, or by screen; move blocks of text; merge	formatting; insert/delete; global search; move text; document scrolling; auto hyphen	same as System Three; other options include electronic mail, mail merge	word processor; disc processor
COMMUNICATIONS COMPATIBLE	RS232	asynchronous, synchronous, 3780, emulators, optional multi tasking available	yes	synchronous; binary synchronous
EDP CAPABILITY	accounts receivable/payable; general ledger	compatible with all Cromemco products, RS232, S-100	same as System Three	CP/M-86 operations system; Basic 86; Pascal; Cobol 86; MP/86 planned
PERIPHERALS	up to 5 terminals can be added if hard disc used	multi-user; terminals, printers; diskette storage	same as System Three; optional dual 5¼ disc drives	character/line printer; graphic printer; Winchester fixed disc
PURCHASE PRICE in Canadian dollars	$12,999	$15,000 to $35,000	$15,000 to $35,000	$17,160 U.S.

PEOPLE

Allan Crawford Associates Ltd., Mississauga, Ont., has announced three appointments. **Peter Frodsham** has been promoted to regional sales manager, test & measurement division, responsible for Manitoba, Saskatchewan and Alberta. **Gilbert Martel** has been named regional sales manager, test & measurement division, responsible for Quebec. **Lorne Danielson** has been promoted to sales representative for B.C.


FRODSHAM

Ross de Grandis has joined Lanpar Ltd., Markham, Ont., as computer terminals spares coordinator. He will be responsible for all aspects of field service spare procurement and distribution. **Jean-Claude Boucher** has been named service manager for the Moncton, N.B. office. **Yves Lepine** has been named marketing representative for the company's Quebec City branch.


MARTEL

Ron McNabb has been appointed products group manager of Systemhouse Ltd., Ottawa. He has been with the company since 1980 as marketing manager, Toronto. **Bill Stewart** has been named production group manager of the company.

Colin J. Wyatt has joined Nixdorf Canada Ltd., Mississauga, Ont., as general manager. He was previously director of networking systems at Honeywell Information Systems, Toronto.


DANIELSON

David Whiteside has been appointed president, Digital Equipment of Canada Ltd. He was previously Canadian sales manager and succeeds Denzil Doyle who left some time ago to form his own company.

Imrich Singer has been appointed product specialist/printers with Ahearn & Soper Inc., Toronto. He will handle sales support for Printronix printers, interfaces and accessories, as well as Quality Micro Systems and Trilog products.


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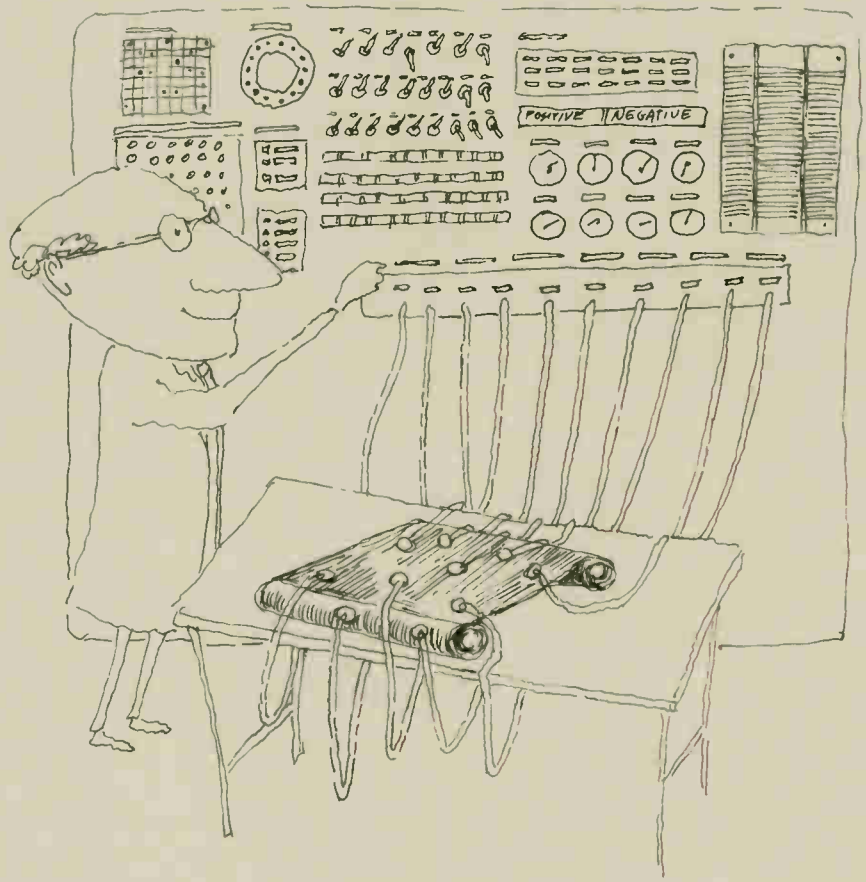

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Reader Service Card Number 136

New OS boosts throughput

New version of operating system for HP 3000 units credited with up to 50 per cent increase in performance, reports vendor.

Up to fifty per cent better performance is being reported by Hewlett Packard on its HP 3000 computers with its new MPE IV version of the HP Multiprogramming Executive Operating System.

Performance enhancements to MPE for more throughput and better response time on the business computers include improvements to the operating system's memory and file system management, as well as to dispatcher-scheduler, spooler and input/output operations.

A new interprocess communications facility has also been added, notes HP, to make it easier for users to share information in multiple-process applications and across data communication lines.

"HP 3000 users with heavy applications loads, relative to their system configuration, will see the largest performance gains with MPE IV," said Robert T. Bond, Marketing Manager for HP's Computer Systems Div. "In a typical large-user system with 24 or more on-line terminals, we expect it to provide up to 50 per cent more transactions per hour and up to 50 per cent faster response time than MPE III—with no additional cost to the customer.

"Customers with light application loads will find they now have more room to grow with MPE IV on their systems, before considering a field-installed upgrade to a higher performance computer" said Mr. Bond.

Performance enhancements

The new memory manager in MPE IV can handle larger memory sizes (up to 4Mb on the Series 44) than MPE III. In addition, the memory manager handles memory requests in parallel, and uses more efficient memory management algorithms.

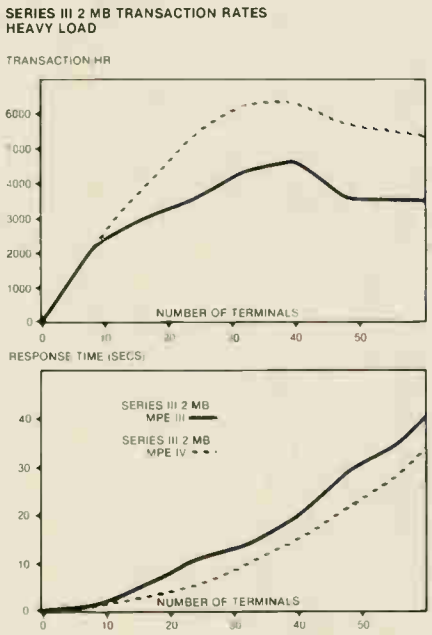
Virtual memory can now be spread across multiple system domain discs, notes HP. As a result, more and larger applications can run simultaneously on any HP 3000. This new capability will also provide users a means to reduce I/O contention on the system domain disc and improve system I/O performance. In MPE III, virtual memory must reside on one system domain disc.

According to the company internal file system management has been enhanced to make internal control block handling more efficient. Many file system intrinsics have been enhanced to operate more effectively. All changes to the file system are transparent to the user, says HP.

The dispatcher-scheduler areas of MPE now gives more control over system workload. Access to discs is queued depending on the priority of the requesting process, to ensure that higher priority processes will receive better access to disc and memory resources. A new 'tune' command is provided in MPE IV to give users control over their system workload. With this command, users can filter out long transactions, such as those in a batch-processing environment, to improve the performance of on-line processing during periods of heavy interactive activity.

MPE IV is software-compatible with all HP 3000 computers—Series II, III, 30, 33 and 44.

MPE IV is available, at no additional charge for customers with HP 3000 Series II, III, 30, 33 and 44 computers. Schedules for field installation of MPE IV on Series II, III, 30 and 33 are determined by local HP sales and service offices. □



Performance test results provided by Hewlett-Packard, for response time and transactions per hour for MPE IV are shown on a typical HP 3000 Series III system with two megabytes of memory. Program mix for testing included on-line, batch and program development in a general-purpose data processing environment.

Microfilm is option for simple, low-cost data storage

"Microfilm is still the only cost-effective alternative to paper or computer storage", says Ron W. Trowbridge, Marketing/Product Manager, Microimagery Division, Bell & Howell Ltd., Weston, Ont.

With the price of paper rising more than 60 per cent and the difficulties of storing, distributing and retrieving data on paper, computer output microfilm (COM) is capable of saving thousands of dollars monthly, says Mr. Trowbridge. Microfilm can reduce paper volumes, handling costs, storage, and retrieval times, he adds.

While the cost of paper has risen over the last few years, the price of printing on microfilm has gone down. According to Bell & Howell, paper currently costs about one cent to produce a single page and 1½ cents per additional copy using a conventional printer.

Microfilm, at a 48-time reduction, provides original pages at approximately .0007 cent per page and the additional copies at .00015 cent per page, says Mr. Trowbridge. This translates into a savings of over 92 per cent for the first copy of a report and over 99 per cent for the additional copies.

The industry has also introduced a 72-time reduction ratio which increases the capacity of a microfiche from 269 computer pages to 675. This is said to reduce the cost of printing to microfilm by over 60 per cent.

Reference time on microfilm is claimed to be at least three times faster than hard copy and there is no limit on the number of clear copies that can be reproduced.

Cost savings are not the only reason for using microfilm data storage, asserts Mr. Trowbridge. Unlike page printers, microfilm requires no expensive blank forms. Microfilm recorders are also claimed to be the fastest printers available, reaching speeds of 26,000 lines per minute.

Implementing microfilm data storage is very simple, says Mr. Trowbridge. The new COM recorders are controlled by minicomputers operating with software that calls up the required job parameters and automatically produces the microfilm. The latest COM recorders can use either "dry" or "conventional" silver film which can both be developed in daylight. This capability is said to make COM processors operational in virtually any environment. □

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While others are reasonably sound at software but at best only fair when it comes to communications.

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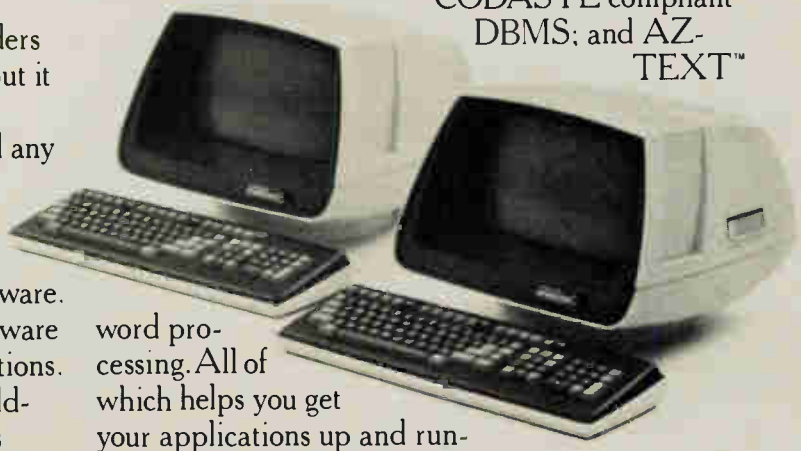

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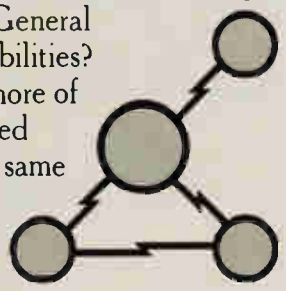

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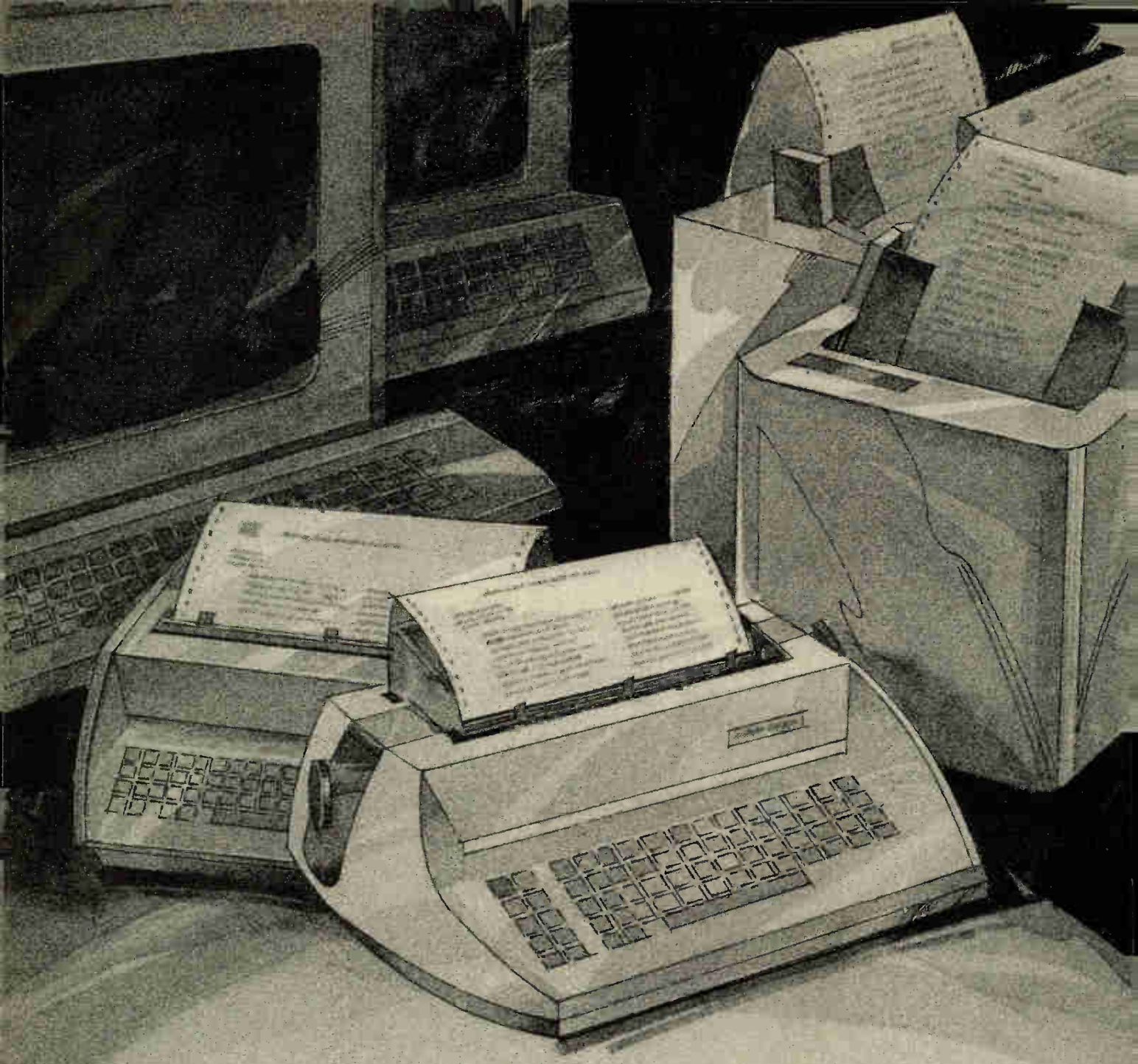

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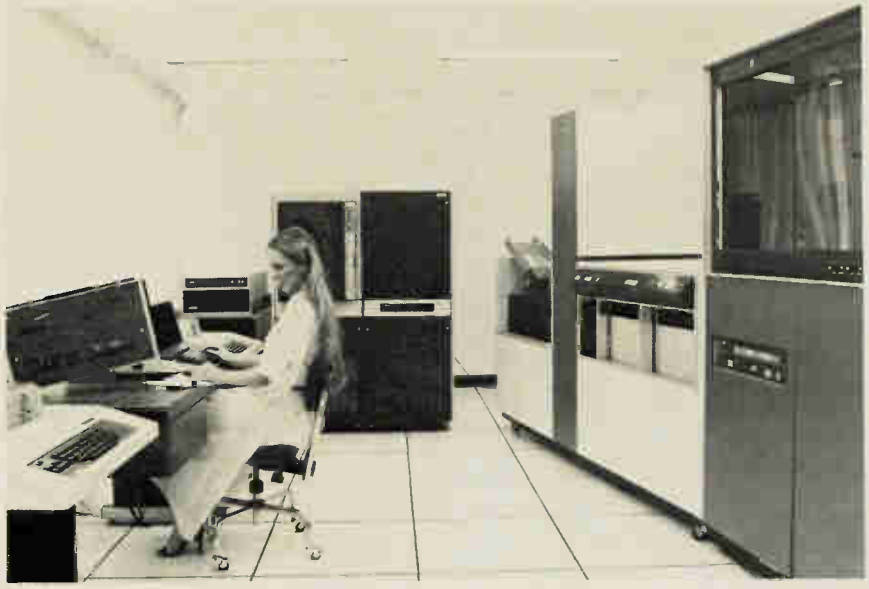


ScanEdit 3500 System is seen here at a CCI showroom.

OCR-scan system aids data entry at B.C. Hydro

The first Canadian installation of Consolidated Computer's ScanEdit system is helping to speed up billing and other data processing chores at a major utility company.

SINCE early 1980, Vancouver-based B.C. Hydro has been converting some major data-entry applications to a high-volume OCR/handprint-reading system produced by Consolidated Computer Inc., Ottawa.

This is the first Canadian installation of CCI's ScanEdit 3500 System, a multi-media scanning/video correction system. A number of similar systems have been installed in the United States through a joint venture of CCI and Scan-Optics, a U.S. firm.

The range of utility services offered to B.C. Hydro customers includes both gas and electrical energy. The scanning system is used in the firm's data entry department as an input device to the data processing operation, providing a high-speed reading capability for high-volume requirements.

The ScanEdit 3500 is a general-purpose data preparation system, capable of reading a variety of OCR fonts and numeric handprint. It is claimed to be the only scanning system with a high-resolution, on-line and off-line correction capability, made possible by the integration of a System 540 reader and a Key-Edit data entry system. Two CRTs, a standard 480-character screen and a smaller unit, are used to digitize unreadable characters. The small CRT is a standard oscilloscope, used by B.C. Hydro in a real-time mode to digitize handprint characters that cannot be read by the scanner. The larger video terminal is used in a batch mode to correct either handprint or machine characters. Corrections made in real-time stop the scanning process. However, operating procedures at Hydro require that all corrections be made to an error batch in an off-line mode.

When the ScanEdit was acquired, it was integrated with an earlier-installed CCI Key-Edit 1000. This enables the ScanEdit to scan data and store it on its own tape or on the tape storage facility of the other system.

"We viewed the ScanEdit as a significant step in the expansion of technology in the scanning field," says Lee Downs, supervisor in the data entry department during the implementation of the new system. "On-line correction, variable type sizes and fonts, flexibility of operation, were all features we needed to meet our current and future data entry requirements."

"Since this installation was the first of its kind in Canada for Consolidated Computer," he adds, "we had the usual frustrations that are typical of the implementation phase of a major system conversion—unforeseen problems, delays in putting applications on the system, etc., but both ourselves and our supplier gained experience in working with the system's sophisticated capabilities.

The CCI system replaces an earlier OCR system and is currently being used in four application areas:

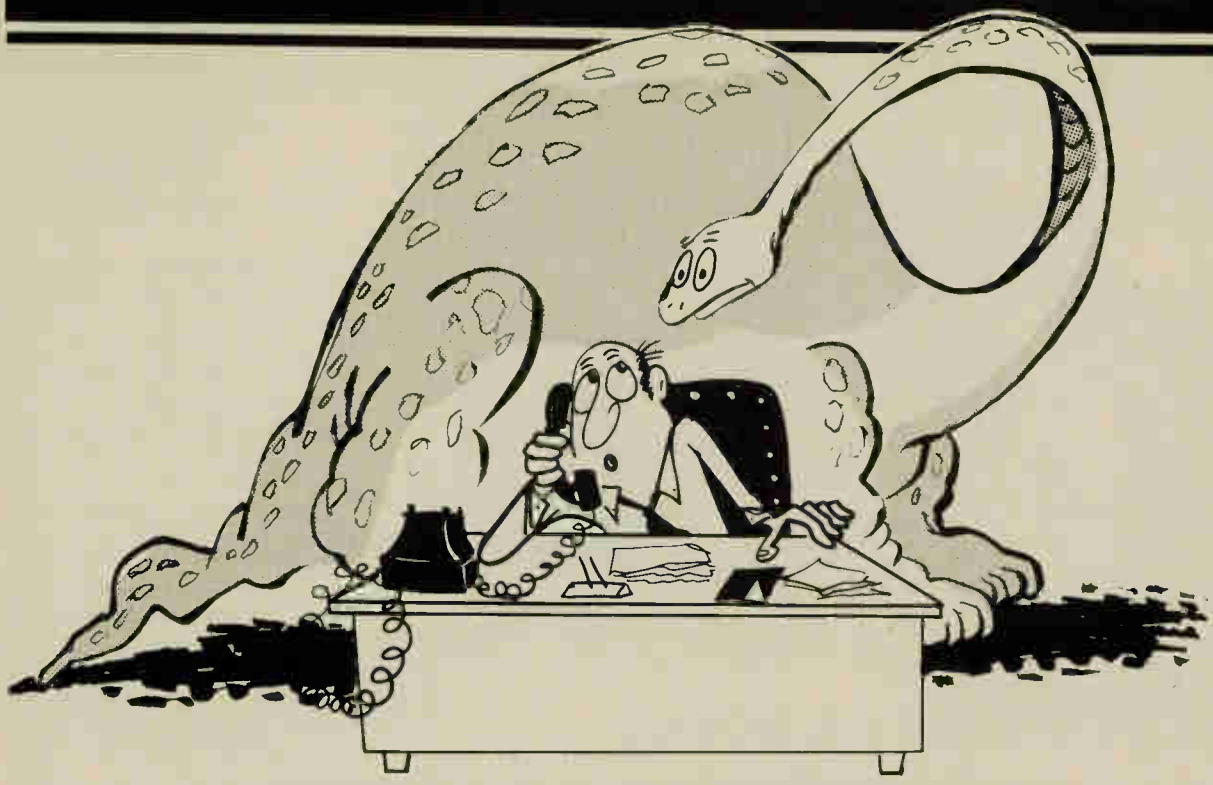
- optical meter readings (OMR)—(scanning and editing of gas and electrical meter reading documents);
- parity bond cheques—(a bank-reconciliation procedure carried out monthly);
- error turnaround documents—(documents which could not be read on the first or second pass are returned to the customer accounts department for correction and returned to data entry for reprocessing); and
- wage and salary cheques—(scanning and editing of wage and salary cheques).

According to Fran Stevenson, data preparations supervisor: "The ScanEdit processes an average of 25,000 to 26,000 documents per day, reading both machine numeric and mark-sense items with a very low error rate, perhaps two video corrections per day. The editing process during the scanning includes verification of data, checking for double hits, a check digit, as well as checking for unreadable machine characters.

"In the optical meter reading application, there are two passes, the first one for gross checking and the second to pick up mark-sense errors and character errors. Error reports produced from both passes are sent to customer accounts for checking and correction and then returned for re-entry. At the end of a batch on the second run, we scan documents to the Key-Edit disc, and if video errors are detected, the batch is opened and errors corrected."

Optical meter readings are the highest-volume activity at the B.C. Hydro facility. In the bank-reconciliation application, a relatively low volume of about 21,000 items is scanned once a month. No video corrections are performed during this run, which produces an error report from the Key-Edit system.

Today the new system meets the performance requirements established prior to the conversion process, and the period devoted to overcoming some of the initial installation hurdles has proven to be time well-spent, in the words of hydro officials. Both supplier and user learned a lot during the installation phase, and B.C. Hydro is now achieving the anticipated benefits of the new technology. □



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Reader Service Card Number 108

news and events in the Canadian computing industry

Canadian firms set sights on Europe's insurance market

Two Canadian firms are teaming up with a new joint venture firm to provide computer-based turnkey systems to the general insurance industry throughout Western Europe.

The new venture was launched by Real Time Datapro Ltd., Don Mills, Ont., and Geac Computers Ltd., Markham, Ont. The new firm called, Real Time Insurance Systems, went operational in London, England, and makes use of Real Time's policy management software using Geac's line of 6000 and 8000 computers.

The combined software/hardware package is a front-end system for insurance policy management, designed to feed transactions to existing systems for accounting and central management information.

"This system is one of a few real-time policy management systems available in the world at this time," said Gerry Meinzer, president of Real Time Datapro and chairman of the newly formed company. Robert K. Isserstedt of Geac Computers is managing director of the new firm in London.

The Canadian turnkey package was recently demonstrated to insurance companies in England and one major insurance company, Red Star of Lloyds, has opted for the system. Value of that order is about $800,000, said Mr. Meinzer. The package will operate with a Geac 6000 unit linked to about 150 terminals. It is expected to be operational later this year.

While this order is the first one for the newly-formed company, Mr. Meinzer and his associates are looking for about $2.3 million worth of business in that market over the first year of operation. Four people are currently based in London to handle marketing and maintenance.

Chuck Williams, Geac's General Manager noted that the joint venture move also coincides with his firm's 10th anniversary. He noted that the firm has been experiencing considerable business expansion, reaching $24 million revenue for the fiscal year ending April 30, 1981. For the coming year he anticipates the firm's revenues to reach $36 million.

The new company selling the insurance turnkey system expects to move into other European countries following the installation of the first systems in England, said Mr. Meinzer.

"Insurance automation is still an area where Canadian expertise is in the forefront," he said, "and there is a big opportunity to apply it in the European market."

Real Time Datapro president Gerry Meinzer (left), and C. M. Williams, general manager, Geac Computer Corp., signed joint venture forming Real Time Insurance Systems, London, Engl. The new firm will provide turnkey computer-based insurance packages to general insurance industry in Western Europe.

Victoria Hospital to install financial management package

Systemhouse Ltd., London, Ont., has been contracted to supply a $1 million computerized hospital financial management system to Victoria Hospital in London.

The first phase of the three-phase system, including general ledger and management reporting, will be implemented by October, 1981. The second phase, personnel and payroll, is scheduled for April, 1982 and the final phase including purchasing, payables and inventory will be in operation in October 1982.

"The new system will release administrative staff from routine reporting and allow them to concentrate on more productive management responsibilities," says Hal Finlayson, Director of Electronic Data Processing, Victoria Hospital. "The system also greatly increases our ability and flexibility in generating reports," he adds.

Victoria Hospital operates from two locations and treats more than 30,000 inpatients a year, together with 125,000 emergency and outpatients. The hospital has 4,000 employees and a medical staff of 500. Its budget for this year is approximately $100 million.

Paradyne keyboard display is compatible with Datapac

Paradyne Canada Ltd., Willowdale, Ont., has announced that its Pix/Pixnet/PDS-270 keyboard display system is now compatible with the Datapac-3000 service of the Trans-Canada Telephone System.

Pix/Pixnet provides networking for IBM and compatible mainframes, and is in wide use around the world. Public packet-switching networks such as Datapac give a cost-effective shared data communications service for interactive terminals, which are able to directly attach using the X.25 protocol interface.

Surcharge dropped on commodities data base

The subscription fee and restricted access to Eurocharts commodities data base was recently dropped by I.P. Sharp Associates, Toronto.

Following agreement between Eurocharts Ltd. and I.P. Sharp, users will be able to access the data on the IPS timesharing system without surcharge. Access to the system is available from 400 cities around the world.

The company also announced that data for the US market is now available a few hours after the markets have closed. Previously US data was available 16-20 hours after market close. Additional markets such as T-bills and T-bonds were added to the service on July 1.

According to I.P. Sharp, the commodities data base currently contains over 10,000 daily and monthly time series of prices and volumes for all major commodities traded on the London, New York and Chicago futures markets.

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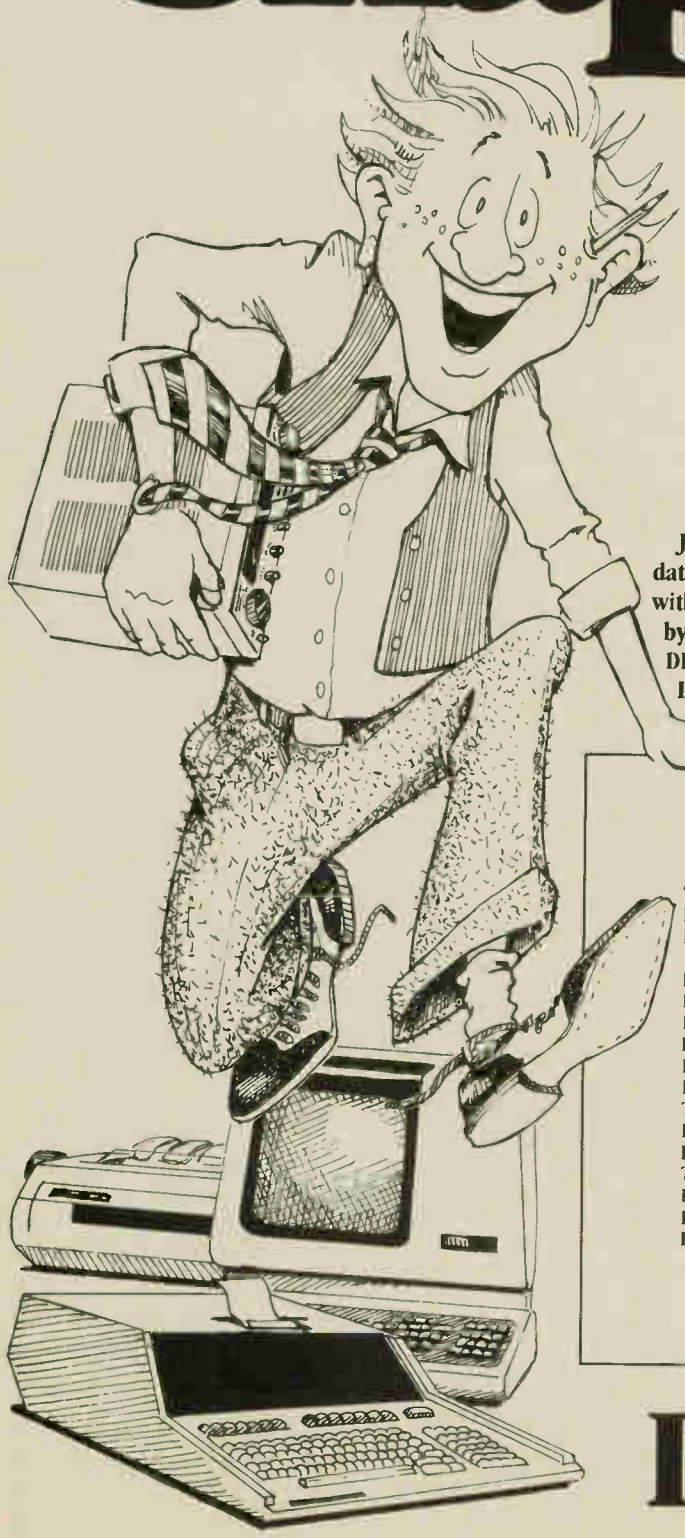

hwip′r snap′r *MDu wippen, MLG snappen: sharp as a tack.* 1) motivated employee with an eye on the executive suite. 2) idea person with one foot in the mailroom and the other in his mouth. 3) genius who calls Leasametric to rent data processing terminals. *Motto: To get across an idea, wrap it up in a person.*

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HP	1640B	Serial Data Analyzer
Brush Gould	260	Six Channel Recorder
HP	3582A	Real Time Analyzer
HP	8640B	Signal Generator
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Reader Service Card Number 140

Technicians from the People's Republic of China recently visited the offices of Ahearn & Soper Inc., Toronto, for a one-week familiarization program on Versatec plotting equipment being supplied by the company. The equipment is part of a computerized geophysical exploration system purchased from Scintrex Ltd., Toronto.

Northern Telecom gets LSI contract from Cdn. government

The Semiconductor Components Group of Northern Telecom Ltd., Mississauga, Ont., has received a contract to supply custom large-scale integrated circuit components to the federal government.

Valued at $150,000, the contract follows the completion of federal contracts to Bell-Northern Research Ltd. to design and develop custom LSI circuit devices for advanced digital communications systems.

Six custom devices have been designed including codecs, which convert analog voice signals into digital code and back into voice signals; modems; and logic devices to control electronic systems and facilitate interfacing.

The devices will be manufactured in Ottawa and will be supplied to the Department of Communications Research Centre at Shirley's Bay, near Ottawa.

Nabu buys three firms, plans second mfg. plant

Nabu Manufacturing Corp., Ottawa, a firm created earlier this year as a general microcomputer and cable systems manufacturing company, has announced the acquisition of three companies, plus plans to build a second plant.

The three firms bought are: Andicom Technical Products Ltd., which specializes in Z80-based small business computers and analog and digital circuitry design; CompuShop Canada Ltd., which has been amalgamated with the Nabu-owned personal/business computer retailing chain Computer Innovations; and Mobius Software Ltd., a software development firm specializing in application programming for the personal and small-business computing markets.

Nabu's present manufacturing plant, located in Almonte, Ont., will be joined by a second facility near that town sometime before the end of 1984. Plans have not yet been finalized for the new plant, but a 15-acre tract in an industrial park has been bought.

Nabu was formed this past spring through the amalgamation of Bruce Instruments Ltd., MFC Microsystems International Ltd., and Computer Innovations Ltd.

Edmonton bank opts for facilities management

Systemhouse Ltd., Ottawa, has recently begun an on-line facilities management program for the Canadian Commercial and Industrial Bank, Edmonton, as part of a follow-up to a contract to automate the bank's information and records system.

Initially contracted to install and modify U.S.-based financial/banking software packages for the company on IBM 4300 series equipment, Systemhouse is currently studying automation at CCIB of mail, word processing and the bank's data entry/enquiry system.

Operations support from Systemhouse has been implemented to keep up with the bank's rapid growth. "In the last year, our bank has increased assets by 80 percent," says Gerry McLaughlin, Executive Vice-President and Chief Operating Officer of the bank. "Before the Systemhouse projects we were doing all our processing manually," he adds.

New terminal control unit becomes 'virtual controller'

A terminal control unit (AJ771) from Anderson Jacobson permits the firm's CRT and printer terminals to emulate the full screen capabilities of IBM 3277 and 3278 display stations, while at the same time providing dial-up terminal access.

The new unit becomes a 'virtual controller' notes the company, supporting a community of occasional access terminals far in excess of its actual port configuration. It permits users to mix up to four terminals on a single control unit.

According to the designers, the device can coexist with other IBM 3270 BSC control units and other AJ terminal control units on a multi-drop leased line, and be 'indistinguishable' from a real IBM 3270 to the host.

Based on on-line terminal use factors, the AJ terminals may be connected directly to the control unit or via dial-up access, notes the company. The control unit may be located at the computer site or remotely. The unit handles data rates up to 9,600 bps and supports up to 15 AJ terminals and printers.

Texas Instruments announces data dictionary for DS-990

Texas Instruments, Richmond Hill, Ont., has released a data dictionary software package, the DD-990, to support the firm's DS-990 family of computer systems.

Features include the ability to use TI's Query-990 software to locate information stored in conventional files (multikey-indexed, relative record, and sequential); as well as providing the ability to generate a variety of reports describing organization and analyzing the impact of proposed changes in the user's data.

The dictionary enables users to set up and maintain definitions of not only DBMS files, but also conventional files stored in their computer database. Information stored can include a list of categories and subcategories in a file, an explanation of abbreviations used in the files, the program format of each file, a list of programs that access a file, and the actions a program performs on a file.

A major feature of the package is the 'what-if' capability, whereby a user can analyze the impact of proposed data changes before they've actually been made. If data definitions have been set up, reports can be generated to show what systems, programs, files and records are affected by the change.

In Brief:

□ **Kaysea Consultants Ltd.,** Toronto, has been appointed exclusive Canadian distributor for the Paratext word processing package by Para Research Inc.; the package runs on IBM System/34s.

□ **Acumen Software Services Ltd.,** Vancouver, has been named North American distributor for the Australian Atomic Energy Commission's recently released Pascal 8000/Version 2.0, a compiler for IBM mainframes.

□ **Repron Scientific Instruments,** Hamilton, Ont., will represent the Commander Computer product line for Columbia Data Products Inc., of Columbia, Md. Repron's telephone number is (416) 529-1566.

□ **Small Business Computing Ltd.,** Toronto, is now marketing the Zeus-80 microcomputer customized for the needs of chiropractors in the southern Ontario area. The Zeus-80 is made by Account Data Corp., Markham, Ont.

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The System/23 Datamaster from IBM is the company's smallest and lowest priced computer. Prices start at $5,645.

IBM aims Datamaster at first-time users

IBM is not ignoring the first-time computer user, and with its recently introduced System/23 Datamaster, it is setting its sights on the low-end of the small business computer market.

Billed as the smallest and lower-priced business computer introduced by the firm, the system combines data and word processing in a single product that many smaller businesses could not previously afford, says Barry Clark, Vice-President, General Systems Division, IBM.

According to the Venture Development Corp., a Wellesley, Mass., market research firm, the market for small business computers priced below $20,000 is growing by 33.5 per cent per year.

Offered at a base price of $5,645, the system is available in several configurations, up to $16,477. It is available for purchase only.

Flexibility allows the user to start with the most simple configuration and expand to a larger System/23 version; or, the user can start with the system and convert to a different, more powerful system with the aid of compatible computer languages and files.

Designed in several configurations to suit both small businesses and larger companies with standalone data processing needs, the system features storage capacities ranging from 0.3 MB to 2.2 MB expandable to 4.4 MB with an optional diskette unit.

Two available printers, operating at 80 and 160 CPS, can be used with an optional word processing package to integrate data processing functions. For example, the system can access its DP files for overdue accounts and use the word processing feature to print individualized past due notices.

A typical workstation also includes a 12-in. video screen with a main memory capacity of up to 128 KB in 32 KB increments.

The system is supported by a broad range of business application software compatible with the IBM System/34, notes IBM. Written in Basic, the programs include billing, inventory accounting, accounts receivable/payable, and general ledger. They can be purchased for a one-time charge of $1,530.

A program is also available to help users of the IBM 5110 and 5120 computer systems convert their programs to the System/23. The 5120 will now be available in Canada only under limited production.

Cdn. industrial computer meet calls for papers

The Canadian Conference on Industrial Computer Systems, scheduled for May 3 to 5, 1982 in Hamilton, Ont., has issued a call for papers on topics covering the entire range of computer hardware and software applications and industrial requirements.

Papers will be solicited from all industries and suppliers involved in the use of computers in a technical environment, and sessions will be organized to highlight the techniques used in an interdisciplinary format.

Abstracts are requested by the program chairman by November 1, 1981, with complete papers expected by March 1, 1982. Correspondence should be directed to: Dr. J.D. Wright, CCICS, Program Chairman, Xerox Research Center of Canada, 2660 Speakman Dr., Mississauga, Ont. L5K 2L1. Tel. (416) 823-7091.

Texas Instruments expands mini line

Designed to extend the hardware and software capabilities of the TI DS990 line of minicomputers, Texas Instruments, Austin, Tex, has released three systems, the Models 7, 9, and 29.

Basic configurations of the mid-range Models 7 and 9 include an error-correcting disc controller, 128 KB of memory, a 13-slot chassis with programmer panel, and one Model 911 video display terminal. The cartridge disc of the Model 7 features a total of 32 MB of mass storage, 16 MB in fixed disc and 16 MB in removable cartridge disc. The Model 9 has a 96 MB cartridge disc system with 80 MB of fixed disc and 16 MB of removable storage.

The basic high-end Model 29 includes an error-correcting disc controller, 256 KB of memory with cache, two Model 911 video display terminals, and a 17-slot chassis with a programmer panel. Mass storage is provided by the CD1400/96 cartridge disc.

SNA-compatible software offered by Data General

Data General (Canada) Inc. has developed a communications software which lets the DG Eclipse information systems operate within IBM's System Network Architecture (SNA). With this release, DG claims to be the first non-IBM vendor to offer SNA compatibility on a 32-bit computer as well as on a wide range of other computer types.

The software, known as DG/SNA, runs concurrently with the company's X.25-based Xodiac network management software, giving users a means to match up the SNA network with the X.25 network.

The software system consists of three modules that, with the company's communications interface board, make Eclipse systems compatible at all six levels of IBM's SNA network.

An Eclipse system running DG/SNA appears to the IBM host in the SNA network as a Physical Unit Type 2 (PU2). The PU2 is the principal type of device used in SNA networks. It is a full-fledged node that supports a number of end users which may be an operator, a device, an application program or a software/subsystem. DG/SNA supports up to 16 end-user to end-user sessions.

The software runs under the Advanced Operating System (AOS), and a 32-bit version runs under the Advanced Operating System/Virtual Storage (AOS/VS) on Eclipse systems.

Since DG/SNA runs as an operating system process, the Eclipse system need not be dedicated to SNA but can run other DG communications products concurrently, including the Xodiac network management software.

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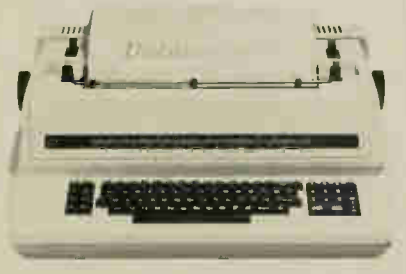

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5 200 LPM MATRIX PRINTER

Reader Service Card Number 166

6 900 LPM LINE PRINTER

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$30-M federal program to aid product creation

A $30-million federal program has been announced by the Ministry of Supply and Services, the Ministry of Industry, Trade and Commerce, and the Ministry of State for Science and Technology that is aimed at giving financial assistance for development of products for which the government will subsequently contract.

The Source Development Fund (SDF) will be budgeted at $10 million per year for each of the next three years; funding will be provided only in conjunction with contracts for which there is a firmly identified government requirement.

All claims against the fund must meet the basic test of long-term industrial benefit to Canada, with emphasis on the potential contribution a contract award can make to a new product innovation; to improving existing Canadian capabilities so a supplier can reach or remain at the fore-front of technology; to regional industrial development and R&D; and to the growth of small and medium-sized businesses.

Telidon to test Teletext in $6 million project

A $6 million nation-wide teletext project conducted by Telidon, the Department of Communications, and the Canadian Broadcasting Corp., has been slated for testing and development throughout 1982 and 1983.

Teletext, the broadcast version of Telidon, Canada's two-way television technology, can be used to broadcast information encoded in a normally unused part of the TV signal (the black band that separates TV picture frames). A television station can broadcast up to 300 pages of information, and with the aid of a teletext decoder the viewer can select desired pages for display on his television set which has been adapted for this purpose.

Managed jointly by the Department of Communications and the CBC, the project will include tentative plans for the development of a TV guide, a news-headline service, captioning for the hearing impaired, English and French sub-titles for programs originating in the other official language, and audience research surveys.

The first phase of the project will include two parallel systems in French and English. Testing will be conducted primarily in 150 homes in Montreal and 150 homes in Toronto. The second year's research will include 250 homes in Montreal, 150 in Toronto, and 150 in Calgary as well as those in public places across Canada.

Canadian Datasystems welcomes comments from its readers. Please address letters to: Editor, Canadian Datasystems, 481 University Ave., Toronto M5W 1A7

Venezuela Telidon system goes into operation

A $750,000 Telidon system was recently inaugurated by the president of Venezuela at ceremonies in Caracas, the national capital. The system, consisting of 30 user terminals and six information-provider terminals, is for use by citizens to get access to free government information on health programs, education, statistics, and social and other services.

More than 4,200 pages of information have already been created by Canadian-trained technicians, with an eventual goal of 50,000 or more pages.

The sale was handled through Infomart, Toronto, which markets Telidon internationally. Officials there indicate that if the present system is a success, the Venezuelan government may order additional terminals for a total of 70 by the end of the year.

Systemhouse expands in U.S. with ten new offices

Systemhouse Ltd., Ottawa, is scheduled to open ten new offices in the U.S. during September, 1981 and a further ten offices over the next two years.

The computer software consulting and product development company opens the new offices under the name of Systemhouse Inc., a U.S. company wholly owned by Systemhouse Ltd.

Opening in major U.S. cities, the company hopes to take advantage of anticipated increased demand in the U.S. for software products and services. According to J.R. Davies, President, Systemhouse Ltd., "Software revenues in North America are growing at a compound annual rate of 29 per cent to about $27 billion by 1990."

Systemhouse has concentrated its U.S. offices in the northeast and Pacific southwest, both highly industrialized, high technology areas. The company plans to expand into the south and southeast in the near future.

Science Council report urges gov't to aid micros

A recent report from the Science Council of Canada says that this country may become an industrial also-ran if financial backing for microelectronics firms isn't stepped-up.

The report warns that use of microcircuitry will soon spell the difference between prosperity and failure of Canadian firms in all lines of business, not just electronics. Current government aid programs to microelectronics companies were described as 'token gestures' compared to the levels made available by countries such as Japan, West Germany, England and France.

The report, which is not an official policy statement from the Council, contains proceedings from a workshop held last year. It will be followed this fall by recommendations from a council committee on computers and communications.

Communications is key to future of WP market

Communications capability is the key feature to a successful growth in the U.S. word processing market, says a report from Frost & Sullivan, a New York business research firm.

Despite an annual growth rate of 28 per cent to reach $6.8 billion in 1985 from $2 billion in 1980, success in the word processing market will depend on the vendors' ability to make communications technology tie together word processing hardware with OCR, phototypesetting, message switching, intelligent copiers, DP activities, and voice/graphics requirements.

Parallel trends are also anticipated for the Canadian word processing market.

Within this changing U.S. market, partial page displays which currently dominate the market, accounting for 61 percent of units installed in 1980, will continue as the fastest growing display type, says the report. By 1985 this display type will represent 84 percent of total units shipped and revenues will have more than quadrupled over the five-year period.

Word processors having no display, currently accounting for 13 percent of total shipments, will decline to represent less than one percent of the market, virtually disappearing by 1985. Full-page displays, accounting for a 23 percent market share currently, are also expected to decline, with unit shipments maintaining only a 13 percent market share by 1985.

According to the report, shared logic systems, which account for 25 percent of the total marketplace in the U.S., will decline to a 22 percent market share by 1985. Distributed resource-type word processing equipment, however, is expected to rise to 30 percent of word processor revenues.

Within the I/O equipment sector, dictation will become the largest means of data entry in the word processing marketplace, says the report, and intelligent copiers will become the primary output medium.

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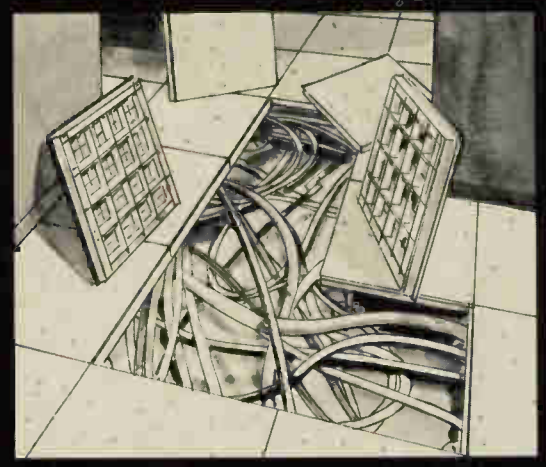

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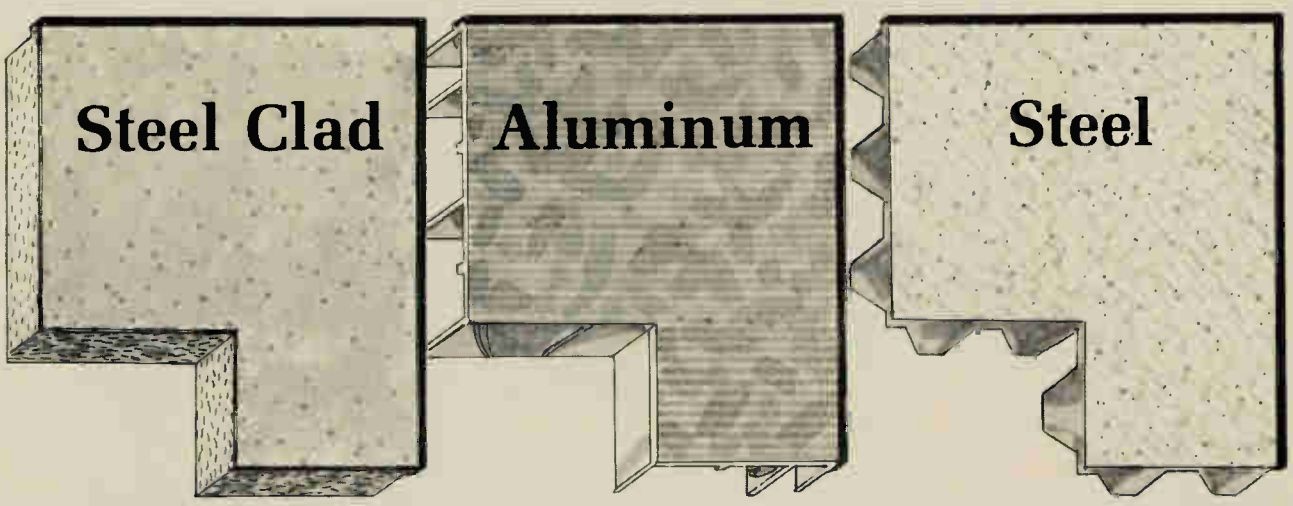

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EDP LAW:

Appeal court refuses patent for computer program

After a lengthy period of uncertainty on the question of whether computer programs are patentable in Canada, the Federal Court of Appeal has handed down a decision which should put the matter to rest—at least for the time being.

In the matter of Schlumberger v. The Commissioner of Patents, Schlumberger sought to overturn a decision of the Commissioner rejecting an application for patent. The subject matter of the application was an invention which, according to the reasons for judgment, had the purpose of facilitating the exploration for oil and gas. In such explorations, boreholes are dug through geological formations which could contain hydrocarbons, and measurements are taken of the characteristics of the soil.

The invention contemplated combining and analysing the measurements by recording them on magnetic tape and feeding the tape to a computer programmed with mathematical formula to convert the measurements to useful information such as charts, graphs, tables, etc.

The Commissioner rejected the application as claiming a monopoly for the computer program. The Commissioner further contended that computer programs are not patentable under Section 2 of the Patent Act which defines an invention as " . . . any new and useful art, process, machine, or composition of matter, or any new and useful improvement in any art, process, machine manufacture or composition of matter."

The Court held that this definition did not exclude the possibility of patents for computer programs. However, in examining just what it was that the applicant had discovered, it was determined that the invention consisted of " . . . various calculations to be made and of the mathematical formulae to be used in making the calculations." The Court held that a mathematical formula constitutes a "mere scientific principle or abstract theorem", and section 28 (3) of the Patent Act prohibits the granting of patents for such subject matter. The Court also considered that, absent a computer, the calculations would be affected by a series of "purely mental operations", and it pointed out that such operations are not contemplated as patentable subject matter by Section 2 of the Act.

In view of the above reasoning, the Court upheld the Commissioner's decision to refuse the grant of a patent.

The wording of the decision would appear to eliminate any possibilities of patents for computer programs *per se* in Canada. However, it does not treat of the question of the patentability of a system including a computer programmed to perform given functions. Nor does it consider the question of whether a computer program, which is part of an operating system, would be patentable within that system.

Insofar as the subject matter of the Schlumberger application is concerned, the decision of the Appeal Court can, of course, be appealed to the Supreme Court of Canada. Thus far, such an appeal has not been launched. Should the appeal be taken, the entire question will once again be open.

—Melvin Sher
Montreal

A few lines on increasing the productivity of your computer.

You'd find it hard to be productive, too, if you were right in the middle of manipulating important data, and you suddenly received a request for information you hadn't thought about for nanoseconds.

Yet, your very expensive, highly advanced CPU has to put up with interruptions like that all day long.

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Fern Computer to market NEC Astra systems in Canada

Fern Computer Systems Ltd., Markham, Ont., has been named the Canadian dealer for the newly introduced Astra computer systems from NEC Information Systems, Lexington, Mass. Fern Computer will market and support the complete line of Astra computers including sales, programming, and field engineering. Marketing will focus initially in the greater Toronto area. First shipments from NEC began in August, 1981.

Fern Computer Systems Ltd., Markham, Ont. has become the Canadian dealer for the NEC Information Systems Astra series of business computer systems. Four models are available.

The Astra series includes four software-compatible processors including peripheral devices as Winchester-type disc drives, printers, diskette drives and operator stations.

The Model 205 is a single CRT-station system with a main memory of up to 256 KB and up to four 1.2 MB of diskette storage. All systems include four turnkey business application programs for accounts payable/receivable, inventory control, and text processing.

The Model 210 supports up to four operator stations with a main memory of up to 256 bytes and from one to four diskette storage subsystems. It is upgradable to the 230 and 250 computer systems.

The Model 230 supports up to four operator stations and a main memory of up to 256 KB. Diskette or Winchester-type fixed-disc drives with capabilities of 20,40 or 80 MB can be used. The Model 250 supports up to 16 operator stations and main memory up to 384 bytes. Storage is up to 160 MB.

Optional data communications support is available on all models ranging from a single fully duplexed line on the Model 205 to four lines on the Model 250.

I.P. Sharp APL enhancements claimed most in a decade

I.P. Sharp Associates, Toronto, has announced a recent release for Sharp APL that, it says, contains the most significant features since files were first added to APL/360 in 1970.

Included in the new features are three operators: 'with', 'on', and 'over', as well as three new primitive functions: 'enclose', 'disclose', and 'match'.

Also, Sharp APL now handles enclosed (generalized) arrays within its normal operating environment; supports 'complex numbers' to return complex results where called-for and accept complex arguments; and gives full-screen management support for IBM 3270-series terminals using VTAM and running the MVS operating system.

Further enhancements include an S-task facility, whereby a Sharp AP-1 auxiliary processor communicates with the APL interpeter like an anonymous terminal controller, but using shared variables for I/O operations; the AP-370 that allows a user to pass instructions to the MVS operating system with shared variables; and other features including speed-ups to inner products and user-settable CPU limits.

New package measures HP 3000 performance

Detailed operating information on the performance of HP 3000 computers can be obtained with a new measuring package, OPT/3000, introduced by Hewlett-Packard.

The interactive performance measurement package provides software and training to permit users to determine current workload, memory usage, CPU activity, and I/O traffic. Based on this information users can tune individual applications, says HP, balance the CPU workload, optimize system performance, and plan future capacity. The software operates on HP 3000 Series 30, 33,44,II or III Computers with the MPE IV version of the firm's Multi-programming Executive Operating System.

According to HP, the software produces performance information on six general categories of system resources: global overview; memory; CPU memory manager; I/O; Process; and system tables.

Up to 23 different interactive displays may be selected for increasing specific details on performance. All selection commands consists of a single ASCII character. Automatic prompts appear on the display if additional information is needed to specify a command.

The OPT/3000 software obtains information via a measurement interface integrated into the HP 3000 Multiprogramming Executive Operating system. It can also be used in batch mode to log information to files. Current delivery estimate for the package is ten weeks.

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Functions combined in data centre mgt. system

An event and problem management system that tracks a range of functions in a data centre is being introduced here by University Computing (Canada) Ltd., Toronto. The new system has been under test in four sites in the US for eight months, handling major data centre operations in several large companies.

Called UCC EIGHT/CRISP, it provides the tools to monitor, control and manage problems, activities, projects and inventories that are critical to the day to day operations within a data centre. It also provides for planning for future data centre growth and expansion.

Among items that can be tracked are hardware and software outages, customer calls, hardware configurations, data centre changes, hardware commitments and others. It also allows users to monitor the activities related to outside customer support and service, said product manager Meier Deutsch.

When used to keep track of all data centre or remote hardware and software, the system provides the ability to monitor a multitude of information, including equipment inventory, software inventory, physical location and price information, said Mr. Deutsch. The system also addresses the management of the on-line control centre, he noted.

"Line problems and terminal problems can be resolved quickly and easily using the configuration data and equipment location and inventory information," he said.

In a project control situation the system provides for the planning and tracking of events or activities which make up a project and span a period of time. Project control can be used when new hardware is installed or when a new software application is to be added to the current production system.

According to University Computing the purchasing price for the system is US$45,000 or US$1,895 per month on a 36-month lease/purchase plan.

Canada Development Corp. acquires Sentrol Systems

Sentrol Systems Ltd., Toronto, has been acquired by the Canada Development Corp., a wholly Canadian company which invests in growth industries in the resource, manufacturing and high-technology sectors.

CDC will pay $24 million to acquire 85 percent of Sentrol with the remaining 15 percent currently owned by Sentrol's management being purchased over the next six years. CDC will invest a further $20 million in Sentrol over the next two years.

Sentrol is involved in the design, manufacture, installation and service of computerized process control systems to the forest products industry. The acquisition of Sentrol represents the initial step in CDC's program to build a worldwide industrial automation company. It plans to acquire other high technology firms whose products complement those of Sentrol. □

Digital Equipment of Canada Ltd. recently opened a new branch office near Hamilton, Ont., that will serve customers in the Dundas, Ancaster, Hamilton, Niagara, Oakville, Kitchener-Waterloo, Guelph, and Brantford areas.

Seen at the ribbon-cutting ceremony for the office at 3390 S. Service Rd., Burlington, Ont., are (left) DEC Canadian sales manager Dave Whiteside and sales unit manager Andy Hay.

Firms team up to enter satellite terminal mart

OTTAWA—Electrohome Ltd., of Kitchener, Ont. and Microdesign Ltd., of Toronto, have formed a joint venture corporation called Gensat Communications Corp. which will give both companies entry into the booming private satellite television earth terminal market on an international scale.

On the basis of the impending partnership, Microdesign recently obtained a $6 million contract to supply 5,000 satellite receivers to a US buyer. It should create 50 new manufacturing jobs in Canada.

Electrohome will bring to Gensat initial capital, its technology, know-how and manufacturing experience in the new higher frequency 14/12 Gigahertz band, a distribution network and administrative services.

Microdesign will provide to Gensat its existing 6/4 GHz technology, the $6 million US product order, and carry out ongoing design. Both firms will provide marketing expertise.

Gensat will introduce this fall two new products employing microprocessor technology and digital logic which is unavailable in competitive products today. Gensat plans to have a full range of products within the next 12 months, thereby ensuring a major position in the North America TVRO (Television Receive Only) markets.

Computer stocks in perspective

Here's *Canadian Datasystems'* review of shares of some of the computer service companies. This monthly trading summary indicates centres of activity in the industry, but is not designed to provide a guideline for the purchase of these stocks.

STOCK	JULY				1981	
Company	High	Low	Close	Change	High	Low
Computel Systems	$18.00	12.00	15.00	+2.00	18.00	3.30
Computrex Centres	.37	.30	.31	−.09	.80	.20
Comtech Group	5.50	5.00	5.00	−.50	6.00	3.50
Cons. Computer common	.57	.35	*	—	.60	.17
Cons. Computer special	No trades				.28	.28
Dataline Systems	No trades				$13½	6½
Digitech	$10¼	8.00	8.00	−2¼	$12½	8.00
Greyhound Computer	2.50	2.00	2.00	−.30	3.10	1.85
Polycom Systems	2.00	1.63	*	—	2.00	1.25
Riley's Datashare	2.80	2.43	2.43	−.42	3.25	2.25
Sydney Devel. Corp.	3.15	2.40	2.48	−.57	3.45	1.80
Systemhouse Ltd. 'A'	$13	10	10¾	−1¾	$13	7¼

*Closing prices are not available for unlisted stocks.

Source: The Financial Post Computer Services

Mitel expands with plants in Ontario, New Brunswick

Mitel Corp., Ottawa, has announced plans for construction of two major plants for the manufacture of telecommunication exchange components and printed circuit boards. Both a single plant at Renfrew, Ont., and two plants at Bouctouche, N.B., are to be recipients of federal monies through the Department of Regional Economic Expansion.

The plant at Renfrew will receive a $4.3-million grant against the $28.6-million cost of the project, and is expected to be in production by the spring of 1983 with 700 employees manufacturing microprocessor-controlled private branch exchange (PBX) telephone switching systems.

Two plants at Bouctouche will together represent a $48-million investment by Mitel, with $15.7 million coming from a DREE grant. The plants will create about 1,000 new jobs in the region, with the first plant manufacturing printed circuit boards and plastic mouldings, while the second will produce advanced components for Mitel's PBX system.

CALENDAR

OCTOBER

6-8. Toronto
Micro-Mosiac '81. The annual exhibition and conference of the Canadian Micrographic Society will focus on the merging of micrographics with other information processing technologies to increase office productivity. Contact: 3M Canada Inc., Micrographic Products, P.O. Box 5757, London, Ont. N6A 4T1. Tel. (519) 451-2500.

7-8. Ottawa
Ottawa Computer Show. Sponsored by the Computing Equipment Association. Contact: Whitsed Publishing, 55 Bloor St. W., Suite 1201, Toronto, Ont. M4W 3K2. Tel. (416) 967-6200.

13-16. Montreal
1981 Conference and Telecommunications Exposition. Sponsored by the Canadian Industrial Communications Assembly. Contact: CICA, 15 Toronto St., Ste. 702, Toronto, Ont. M5C 2E3. Tel. (416) 362-4500.

28-29. Calgary
Western Computer Show. Sponsored by the Computing Equipment Association. Contact: Laurie Whitsed, 55 Bloor St. W., Suite 1201, Toronto, Ont. M4W 3K2.

28-30. Vancouver
International Commercial Crime Conference, sponsored by The Continuing Legal Education Society of British Columbia. Location: Hyatt Regency. Contact: May Tong, #203—1148 Hornby, Vancouver, B.C. V6Z 2C3, tel.—(604) 669-3544.

29-30. Montreal
Montreal Office Exhibition. Contact: ECM Exhibition & Conference Management, 2 Robert Speck Parkway, Suite 750, Mississauga, Ont. L4Z 1H8. Tel. (416) 273-3910.

NOVEMBER

1-4. San Francisco
Data Processing Management Association 30th Anniversary International Conference & Business Exposition. Contact: Conference Coordinator, DPMA, 505 Busse Highway, Park Ridge, IL 60068. Tel. (312) 825-8124.

4-6. Cologne, Germany
IFCOM Telecommunications Fair. More than 100 international telecommunications companies will present language, data, image and text communication technology including radio installations, telecommunications equipment, network management, wideband communication, individual components, and component assemblages. Contact: Messe- und Ausstellungs-Ges.m.b.H. Köln, Messeplatz, Postfach 21-07-60, D-5000, Köln 21, Germany. Tel. (0221) 821-1, Telex: 8-873-426 a-mua-d.

9-11. Los Angeles
ACM '81. Exhibits will include a range of computer-oriented products. Technical programs and seminars will cover: software, data base design, security, management, and graphics. Contact: ACM '81, P.O. Box 24059, Village Station, Los Angeles, CA 90024. Tel. (213) 536-9735.

12-14. Reno, Nev.
Accounting and Information Systems Expo '81. Contact: Leanne Stone, University of Nevada-Reno, Division of Continuing Education, College Inn, Reno, NV 89557. Tel. (702) 784-4046.

16-19. Toronto
Canadian Computer Show & Conference. The show has been expanded to a fourth day to include exhibits and topics of interest to doctors, lawyers, etc. Contact: The Canadian Computer Show & Conference, 36 Butterick Rd., Toronto, Ont. M8W 3Z8. Tel. (416) 252-7791.

16-19. San Antonio, TX
Computer Performance Evaluation Users Group Meeting. Sponsored by the U.S. National Bureau of Standards. Contact: Theodore F. Gonter, U.S. General Accounting Office, 441 G Street NW, Room 6011, Washington, DC 20548. Tel. (202) 275-5040.

DECEMBER

1-4. New Orleans
CMG XII International Conference on Computer Performance Evaluation. Sponsored by the Computer Measurement Group Inc. (CMG). Contact: CMG, P.O. Box 26063, Phoenix, AZ 85068. Tel. (602) 995-0905, or Donald Deese, FEDSIM, 6118 Franconia Rd., Alexandria, VA 22310. Tel. (202) 274-8461.

BOOKSHELF

Microcomputers for External Control Devices, by James A. Gupton, Jr., published by Dilithium Press, Forest Grove, Oregon, 279 pp., softbound, $13.95 US.

This text is designed to show the reader how to use microprocessors to control devices in both the home and business environment. The book covers principles of data acquisition and conversion, remote control one-chip microcomputers, programmable control, control related interfaces, automating your home, and microcomputer-controlled robots. A discussion of control design prototype development is also included.

Structural Cobol: A Self-Teaching Guide, by Ruth Ashley, published by John Wiley & Sons, Inc., New York, N.Y., 295 pp., softbound, $8.95 US.

This guide serves as a convenient way to learn structural Cobol. Using a step-by-step approach, the book provides instruction on how to create programs for solving a wide range of business problems, including inventory control, personnel file maintenance, payroll processing, and customer account records.

Computer Security: A Management Audit Approach, by Norman L. Enger and Paul W. Howerton, published by American Management Associations, New York, N.Y., 264 pp., hardbound, $21.95 US.

Intended for managers in private and public organizations, this book attempts to fill the gap in the literature of security and privacy by reviewing current information on personnel, system development, input controls, on-line processing, software security, output controls, operations environments, physical security, contingency plans and backup, auditing, and risk analysis.

A list of supplementary readings is also included.

an open forum for readers' views relevant to the industry

Canada could win big if we develop our software industry

Canada has some unique strengths upon which to build new national industries that would meet the demands of the world informatics revolution. But will we choose wisely?

By John H. Brace

THE information revolution in the decade ahead will bring social and economic change dwarfing anything we have experienced to date since the computer's commercial introduction. The significance of this to Canada is enormous in determining the industrial strategies necessary for us to remain a viable trading nation in the international marketplace.

The reality to which we are all just beginning to adjust is that international competitiveness is going to depend on how well we apply microelectronic technology and information technology to reduce production costs and increase economic efficiency—for that's what the information revolution is all about.

Well, let's look at the Canadian 'informatics' industry. By any yardstick, it is of major magnitude. I believe few Canadians appreciate this, largely because the industry tends to be perceived in bits and pieces rather than as an integrated or inter-dependent package.

Last year, revenues for the informatics industry in Canada, including business telecommunications, business forms, and revenues from computers and other office equipment totalled $9 billion. Sales of word processors, business computers and data terminals represented one-third of this total and during the next four years alone revenues from the sale of such equipment will exceed the value of the present installed base.

Such values make the informatics industry Canada's ninth largest industry; almost as large in sales revenue as motor vehicle manufacturing in Canada at $10.1 billion. At the present rate of growth of our informatics industry, it is reasonable to forecast that it will rank by mid-decade among Canada's six largest industries.

Of the $9 billion of industry revenues last year, 65 per cent was accounted for by business telecommunications charges, a segment of the industry which is almost totally Canadian-owned and highly concentrated in a small number of firms. The other components of the computer industry accounted for nearly $3 billion, and this segment is largely dominated by a few U.S.-based companies.

It is interesting to see the rapid proliferation and growth of *Canadian* companies in the *service* of the computer industry sector. I particularly want to single out software services, because they account for about 25 per cent of that $3 billion figure for computer industry revenue. Software service is the fastest-growing segment of the whole informatics industry, at about 25 per cent per annum.

Within the next three to four years, the software industry in Canada will, alone, generate annual revenues in excess of $1 billion. It is this development that represents Canada's best opportunity to establish a distinctive role on the international informatics scene.

I do not feel we should be concerned because Canada's informatics industry is heavily weighted towards the supply of services rather than the manufacture of hardware—which some people myopically consider to be the only route to go. In my opinion that is not where our interests lie. Computer systems have been and will continue to decline dramatically in price. For example, if you bought a computer in 1975 with a given performance capability, that same capability could be bought today for one-half the price, and by 1990, it will be available at not more than one-tenth of the 1975 cost.

Furthermore, all of that cost reduction is occurring on the *hardware* side, rather than in software and maintenance services. In 1975, the hardware component of a typical system accounted for about 85 per cent of the total cost, with maintenance and software services accounting for the other 15 per cent. By 1980, the hardware component was down to 60 per cent of the total, with maintenance accounting for 14 per cent and software accounting for 26 per cent of the total cost of the system. By 1990, it is anticipated that the hardware component will be down to 15 per cent, maintenance will account for 20 per cent and software will account for 65 per cent of the total system cost!

It has been estimated that the total value of all the software in place around the world is something in the order of $200 billion, or approximately twice the value of all installed hardware. Most of the software is developed by the user companies themselves so it doesn't appear as computer industry revenue. But, if it did, it would show that the software industry, in total, is bigger than the hardware industry.

We have two competitive advantages

John Brace is president of Honeywell Ltd., Toronto. These remarks are extracted from an address to the Canadian Standards Association.

in Canada in meeting critical future software requirements. The first is that we have a number of educational institutions, notably the University of Waterloo and Carleton University, which have established themselves as world leaders in software development and are producing large numbers of qualified graduates.

Secondly, we have a number of unique national institutions in Canada, unlike the United States, such as our banking industry, our transportation industry, and to a lesser extent, our medical/hospital system. These are institutions highly concentrated and centrally-controlled, permitting easier and more efficient development and installation of integrated data processing systems. I believe this, in turn, will create special opportunities for us to develop software application packages with export marketing potential.

At the same time, the market in Canada today for small business software is phenomenal. There are some 4,000 large companies in this country whose annual sales exceed $10 million, and these companies already have an average of three computers each. In addition, there are at present some 56,000 organizations whose annual sales are between one-half million and one million dollars. All of them are potential candidates for the new generation of low-cost computers, and all of them will be looking for people to implement their business applications.

It is generally acknowledged that a small country, such as ours, cannot hope to compete in an across-the-board technological race with the giants of this industry in the United States, Japan and Germany, who are so firmly established and so far ahead in microelectronics and computer technology.

But, in view of the fact that these technologies represent a declining proportion of the total cost of providing our information industry needs, it would seem logical that Canada should concentrate its efforts in those areas where we have some demonstrated capability, and where the growth opportunities are the greatest.

". . . the market for small-business software is phenomenal"

- We have exceptional expertise in telecommunications technology and the industry base is big enough and strong enough to compete in the world marketplace.
- We have a number of world-scale industries and institutions around which highly sophisticated information applications can be developed.
- We have world-class software development expertise and one of the best-educated populations in the world upon which to draw to expand that expertise.
- We have a mature information technology user base to provide employment for our developing expertise.
- We are a world leader in the application of micro-processor-based industrial control systems for such industries as petrochemicals, pulp and paper, and steelmaking. We are seeing today a convergence of the technologies associated with business data processing and resource processing, creating an opportunity for us in the development of totally integrated, multi-level business data and resource processing systems.

My concern is not the lack of opportunity for Canada to establish a competitive information industry. My concern is the task of putting our act together to overcome the inertia born of our diverse regional and political interests, and our limited financial resources from either public or private sources. It becomes imperative, then, that we should develop only those applications which provide the basis for competitive advantage and provide us with viable substitutes for industrial technology. Applying such an industrial strategy will permit a Canadian-based informatics industry to generate wealth in its own right by improving productivity, thus enabling us to compete with our goods in the international marketplace. □

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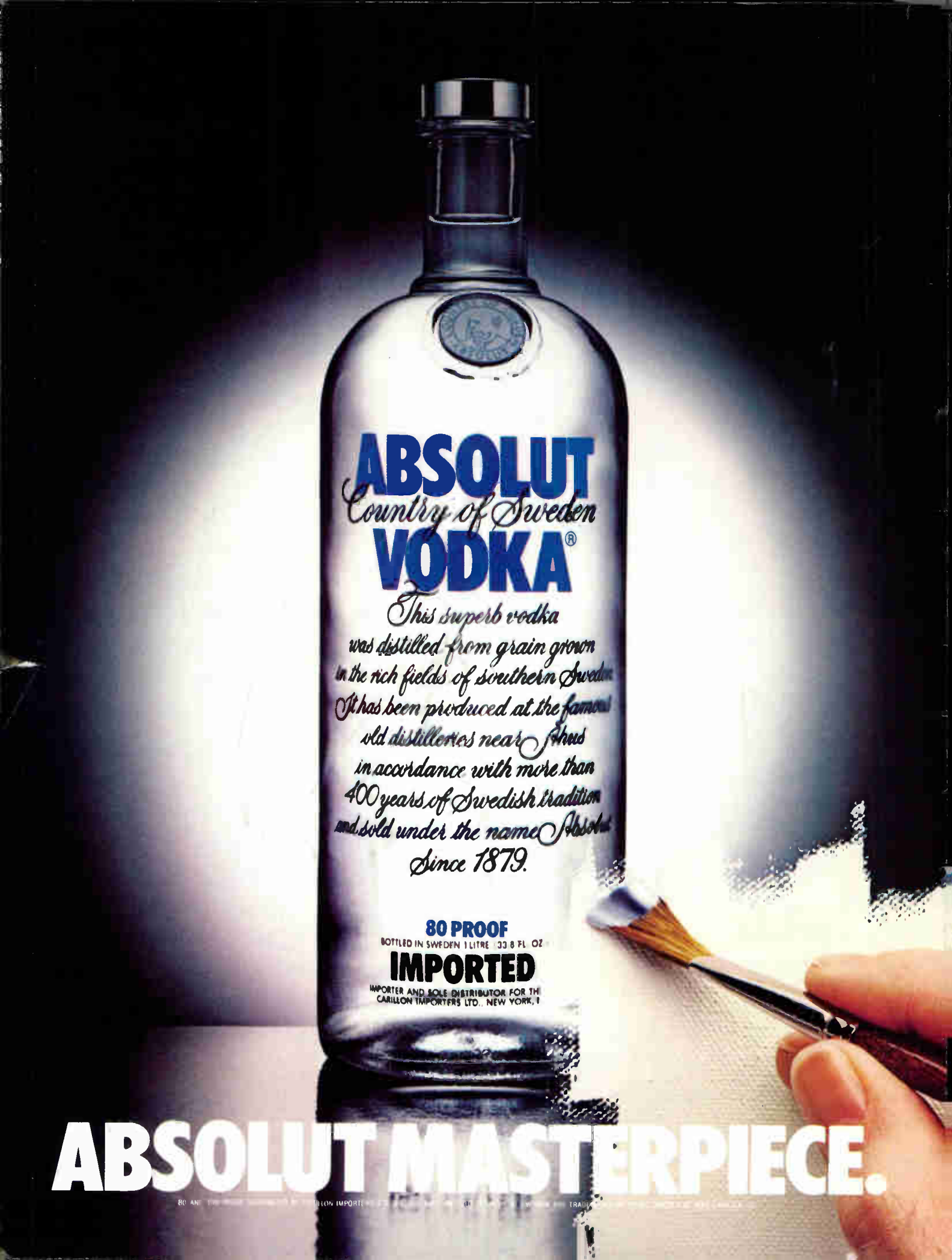
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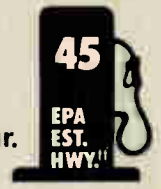

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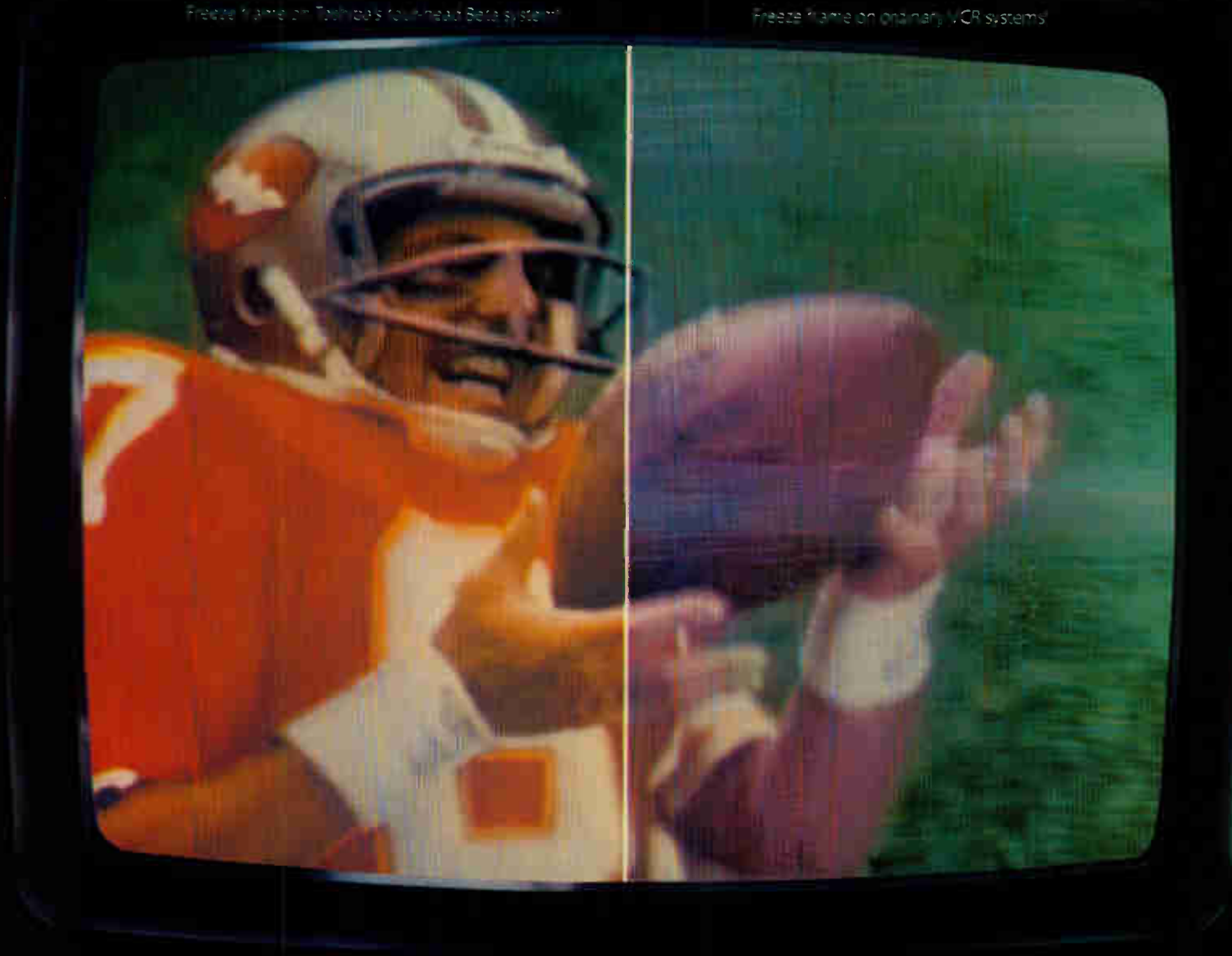

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*Actual TV picture.

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COLLECTION OF BENJAMIN OLKEN
BOTTOM, PHOTO BY HERB SNITZER

ROBERT LIGHTFOOT

51 Passing the test

PETER HUDSON

72 High-quality vinyl

MICHAEL BLASER

33 Ocean mining

EDITOR'S NOTE

"We got trouble, right here in River City . . ."

I remember the first and only time I was hustled at the pool table. It was a Saturday night in early summer about 25 years ago. I arrived with two friends at Ames pool hall on Manhattan's West Side about 9:30, and we went up and got a table and a rack of balls. Then, with all the nonchalance I could muster, I pulled the pieces of my grandfather's inlaid, ebony pool cue from its black leather carrying case, screwed the stick together, and started lagging the cue ball at our corner table. You really need only two other details to get the scene. Ames pool hall was as unregenerate a commercial establishment as 99 percent of the population would ever want to experience. The fact that *The Hustler* with Paul Newman and Jackie Gleason as Minnesota Fats was shot at Ames may have lent the place some celebrity, but it did nothing to improve its ambience. The second fact is that I had graduated from prep school two days before. Although I had played pool off and on since I was 13, I walked into Ames that night with my custom cue, dressed in my chino pants, polo shirt, and penny loafers—all 17 years of me—ripe for the plucking.

I got plucked, all right, by Dino Defasio from Astoria, Queens. Dino wasn't any older than me, but he'd been around the block a few times, as they say, and had been playing pool, he told me later, every day since he was seven. But to me, warmed up and ready to shoot straight pool, Dino looked easy. We started playing at a buck a ball, and I broke and ran maybe eight balls. Dino jumped down from the windowsill

where he had been sitting cleaning his nails and ran a little more than three racks. So it went. I lost nearly $50 ($20 of my own and every cent my friends had with them). We left Ames at 1:30 A.M. and walked home. We couldn't even stop for Cokes.

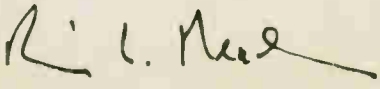
Through most of high school and college, pool was my game. For my brother-in-law, 12 years my junior, pinball was the rage. Now it's Pac-Man. Pool, pinball, Pac-Man—manual, mechanical, electronic—the point doesn't seem to have changed: Kids will get together and try to outscore each other pushing little globes around a rectangular frame. Such games of skill aren't dangerous or particularly expensive to play (if you're any good at Pac-Man, you can play all afternoon for a couple of quarters). They create spaces that are exciting to go to, places to see others and to be seen. Granted, there is an intensity in the Pac-Man phenomenon that is unparalleled. But I suspect that says more about the era we live in—its rapidly obsolescing technology—than about our kids. In the same way that Space Invaders (an electronic incarnation of another old standby, the shooting gallery) was zapped out of video-arcade preeminence after a lifetime counted in months, the kids know that as Pac-Man crests, the next wave is forming. And they're ready to jump.

Still, it's nothing short of mania, equally visible in parents. They're reacting true to form: "We got trouble . . . with a capital T and that rhymes with P and that stands for . . ." Pac-Man. Across the country town councils, boards of aldermen, and other official guardians against civic turpitude are closing arcades and impounding the machines, thus restoring to pizza parlors, bus stations, bowling alleys, and other after-(school)-hours spots their former uplifting atmospheres. Where the kids congregate to play wicked games, evil will transpire.

To the right-minded it must be a relief to see Pac-Man come into the home, where its use can be supervised. And coming home it is, with a vengeance, as author Steve Ditlea reports on page 24. Coleco's stock raced to the front of the Wall Street pack in the first quarter of 1982 with the announcement that it was introducing a home version of Pac-Man.

I'm not surprised by the Pac-Man hysteria, on the part of the kids or their parents. And the home version of Pac-Man will undoubtedly continue to enjoy record sales until the next wave overtakes it. But those right thinkers shouldn't let down their guard. I doubt if Coleco or Atari, which is marketing a home-computer version of Pac-Man, will be any more successful domesticating youthful energies than Sears was in my day selling pool tables for the family rec room.

The last time I saw Defasio he was studying to be a CPA. Wherever he is today, if he's a parent, I'll bet his kids are Pac-Man champs. And I'll bet he hasn't increased their allowance one dime, either.



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LETTERS

Nuclear-Waste Disposal: A Gamble?

The article "Hot Garbage" [April/May] leaves one crucial point regarding radioactive waste unstated. No matter how many calculations are made, nuclear-waste "disposal" remains a gamble. Our best intentions notwithstanding, the radioactive waste we bury today may escape to contaminate future generations.

The most important part of containing radioactive wastes is stopping their creation. Fortunately, there is no need for nuclear power. We can—indeed we must—make the transition away from dangerous, expensive, and limited nuclear and fossil fuels to the only long-term alternatives available: solar space and process heating and cooling, wind-generated electricity, photovoltaic cells, methane and alcohol-based fuels from plant matter, and geothermal and ocean-thermal energy.

Edward Gogol
Evanston, Illinois

Exploiting Solar Energy

I enjoyed your interview with Ted Taylor in the April/May issue, and I concur fully with his engineering philosophy. Solar energy requires elegant engineering solutions; nevertheless, it is the only source of energy that we may use indefinitely without greatly disturbing our environment. In order to exploit solar energy to its fullest, we need a major effort in both technology and economics.

Ray F. Shaw
C.G.S. Systems
Huntington Beach, California

Smuggling Weapons

In "How It Works" in the April/May issue, Charles Mann says it is possible for "a determined hijacker with a thorough understanding of how a particular detector works . . . [to] easily smuggle a weapon past it."

After reading his excellent description of how weapons detectors work, I


BRUCE SANDERS

am puzzled as to how this could be possible. How could the hijacker hope to mask the magnetic field that a metallic object will produce as it passes through the detector?

Patrick G. Henry
Florence, Arizona

Who wants to know?

Solving Crimes with a Ouija Board

One statement by John O. Sullivan, former manager of forensic science programs for the National Institute of Justice, really was an eye-opener ["Sherlock Holmes Goes High-Tech," April/May]. After two years of surveying crime labs, he concluded that some technicians would do as well with a Ouija board as with a high-tech piece of lab equipment. Having been a jury member on a murder case, I can just imagine someone convicted or, for that matter, set free due to a botched job by a lab employee. Defense lawyers take note!

Myron N. Boxer
Albuquerque, New Mexico

Wood Engineering

I applaud your magazine and its efforts to synthesize technology into readable form. However, there are limits to how far accuracy should be sacrificed for readability. A case in point is "Engineering With Wood" [Feb./Mar.] and Mr. Pittman's discussion of perishability. The sapwood of a tree is by no means waterproof. If it were, the tree would have some difficulty, since the sapwood contains the major transport system for fluids between the roots and crown.

A grosser error is the implication that removal of water from wood reduces its strength. On the contrary, mankind has benefited for years from the increased strength of dry wood over green wood. Additionally, drying wood reduces its susceptibility to biological deterioration and improves its adhesion characteristics in laminates described in the article. Unquestionably the epoxy resin described in the article would retard severe cyclic moisture changes and weathering. These may have an effect on the material and would have been a more appropriate point for discussion.

Thomas E. McLain
Assistant Professor, Wood Engineering
Virginia Polytechnic Institute
and State University
Blacksburg, Virginia

Chemicals in the Kitchen

I must draw attention to a photograph showing unsafe use of chemicals on page 20 of "Home Color Printing" [April/May]. The photo shows print washing and photographic processing being done in a home kitchen where cooking items and drinking glasses are present. This is a dangerous practice, since even the most careful technician will splash hazardous chemicals. Removing these items from the photo would have promoted better safety practices.

Joseph Cwiertniewicz
Syracuse, New York

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Correction: The address for Hear Saver ear stopples, described on page 13 of the April/May issue, is Health-Saver, P.O. Box 39, Grimsby, Ontario, Canada L3M 4G1.

Mother Nature's Very Special Old Reserve.

"It's as if Mother Nature had stocked up on some of her best oil, and hidden it so deep and so carefully that nobody would ever get at it," says Jim Hooks, General Manager of Exploration for Gulf's Rocky Mountain District. "There's a tremendous amount of oil in the Overthrust Belt area. But when we first went in there in the early 70's, we missed a lot because we just didn't have the techniques to locate it.

"We're a lot smarter now, with advanced geophysics, three-dimensional seismology and other new technologies. We're learning about the unusual geology of this region, learning how to drill through some very tough rock.

"It'll take a lot of money and time and talent, and some very innovative approaches to exploration. But there's a lot of energy down there in the earth, and a lot of energy up top in the Gulf people working on the job. And if everything goes according to plan, that ought to produce a lot of energy for tomorrow."

Gulf

Gulf people: energy for tomorrow.

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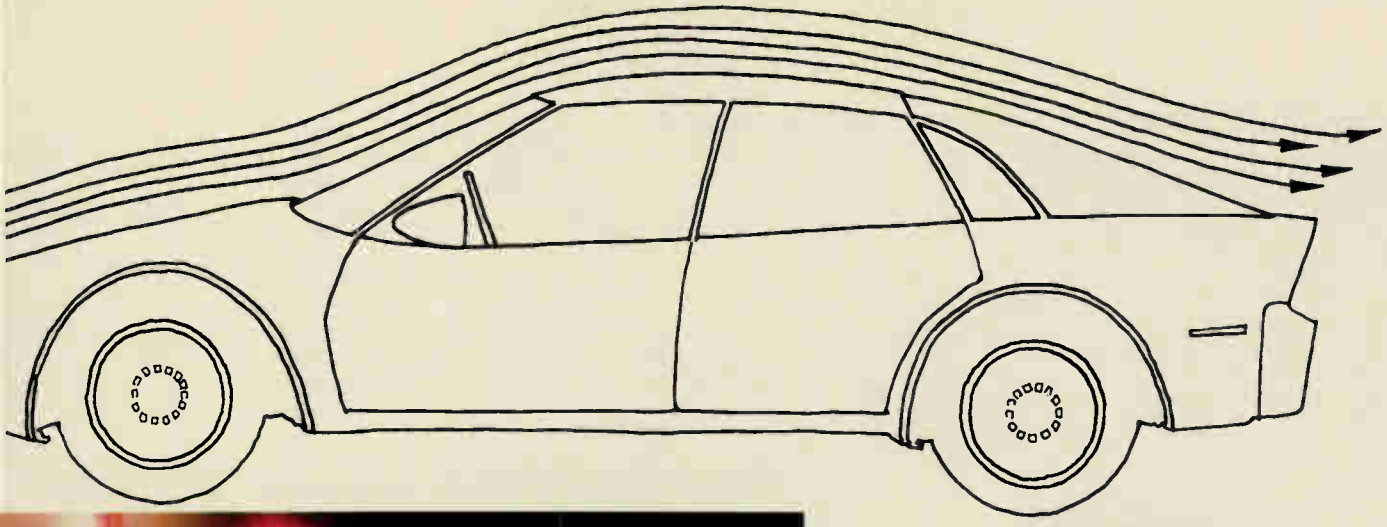

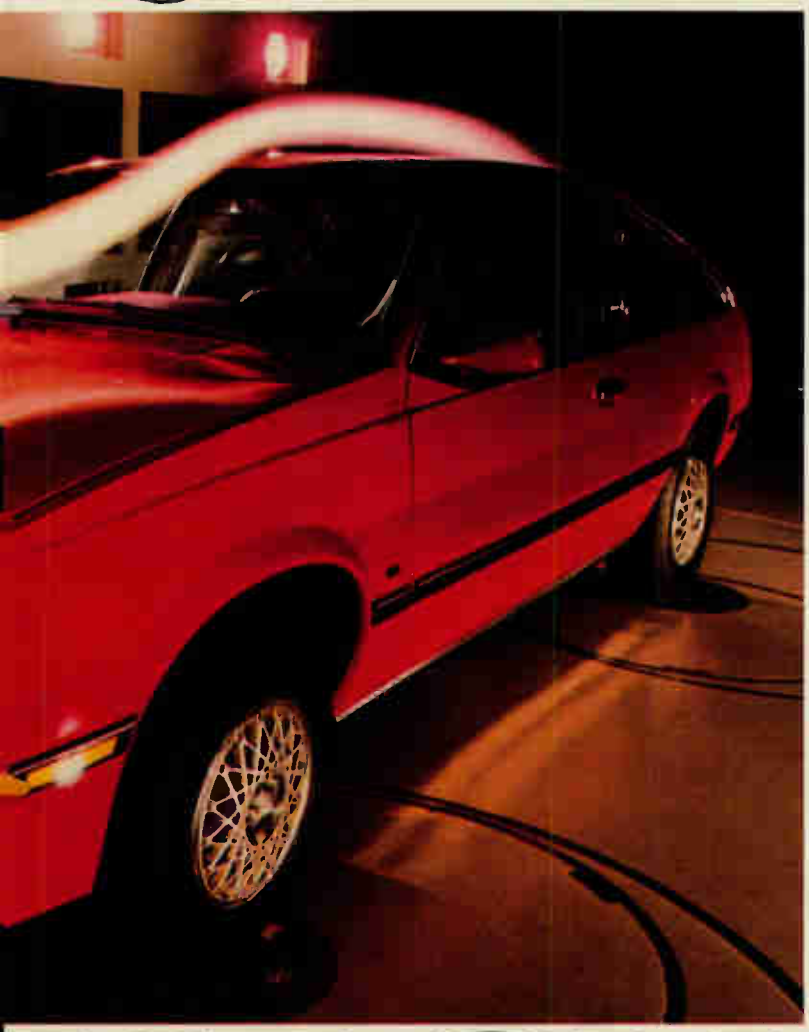

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Agent Orange Eaters

Not only does 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) have a jawbreaker of a name, it is bad news when loose in the environment. This highly toxic defoliant herbicide, the major component of Agent Orange, can work its way up through the food chain and contaminate wildlife. It is also thought to cause birth defects, genetic abnormalities, and possibly cancer in human beings.

While the substance is biodegradable, the bacteria that metabolize it do so only very slowly and do not break it down completely. In simple terms, the bacteria can eat the chemical, but they do not thrive on it. Unlike 2,4,5-T, few naturally occurring organic compounds contain chlorine, so metabolic pathways for biodegradation of chlorinated compounds have not evolved. To adequately dispose of the defoliant, a specialist bacterium using 2,4,5-T as its sole source of carbon and energy is needed. Professor Ananda Chakrabarty and his colleagues S. T. Kellogg and D. K. Chatterjee at the University of Illinois Medical Center in Chicago are close to developing such a bug.

The "instructions" bacteria use for metabolizing chemicals are contained in small DNA structures called plasmids, which reside in bacterial cells. Knowing that plasmids are capable of recruiting genes from other plasmids, the research team hit upon a strategy. They cultured bacteria found in chemical-waste dumps (and therefore at least partly acclimated to chemical toxins) together with bacteria containing plasmids known to direct the degradation of a variety of chemicals. By feeding the bugs on a chemical "soup" in which the proportion of 2,4,5-T was slowly increased, the team developed a strain that could remove more than 95 percent of the herbicide in a soil sample in 7 to 10 days. At the same time, the number of bacterial types present declined from eight to four.

According to the scientists, continued culturing with even higher concentrations of the toxin may lead to the emergence of a bacterial strain that will live on 2,4,5-T alone. Better yet, the technique—plasmid-assisted molecular breeding—can be used to develop microbes that will feed on other environmental pollutants. *—H. A. Rodgers*

Pions Blast Tumors

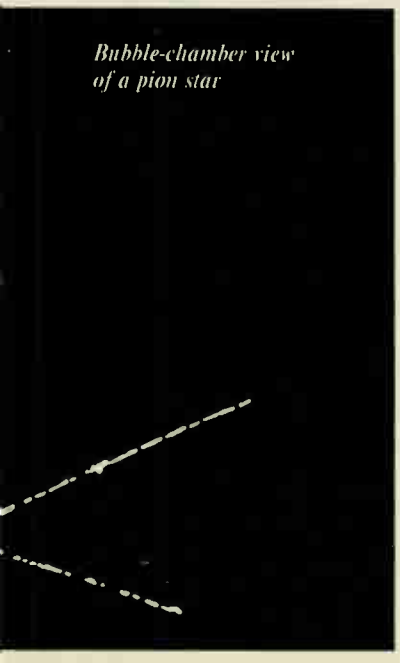
Pions, or pimesons, subatomic particles created in collisions involving high-energy protons, are being put to practical use. The Pion Generator for Medical Irradiation (PIGMI), developed after five years of work at Los Alamos National Laboratory in New Mexico, consists of two main parts: an accelerator that smashes protons into an appropriate target material and a channel that collects and beams the resultant pions. When these particles are shot into a tumor, each one bursts into a "pion star," a shower of secondary particles that destroys the cancer cells.

"Pions are the only known particles that explode when they stop moving; therefore, determining how far to inject pions into the body can be tricky and requires careful planning," says Dr. Donald Swenson of the Accelerated

Technology Division at Los Alamos. PIPLAN, a sophisticated computer program that aids in treatment planning, has been developed along with PIGMI. Dr. Swenson explains, "A thorough compilation of a patient's medical data and the properties of the pion collection channel are fed into the computer, which then calculates the dose and range of the pions to be injected." If, say, the pions were to be beamed 100 millimeters into the body and the range of the prescribed dose was 200 millimeters, then a 100-millimeter tube of wax would be placed in front of the body. The pions would then be shot through the wax so that they would explode on target.

"The research is finished, and the prototype has been developed," says Swenson. "All we need now is a customer." That customer will need millions of dollars and an enormous amount of space—a compact model of the PIGMI would be about the length of a football field.

—Zephyr Twombly



Bubble-chamber view of a pion star

Computers Against Disaster

In the unlikely event of a nuclear power plant accident resulting in a serious escape of radioactive material into the environment, local radiological health authorities would have their hands full. To deal with the situation, they would have to rely on thick loose-leaf binders containing step-by-step instructions, key names and phone numbers, and locations of emergency equipment. According to William A. Wallace, a management professor at Rensselaer Polytechnic Institute in Troy, New York, such slow access to information is a severe handicap. "We sometimes forget that it is the local officials—the county executives, sheriffs, public works commissioners—who have to decide how and when to respond to these accidents," says Wallace. "That decision may involve asking people to leave their homes or relocating school children or hospital patients."

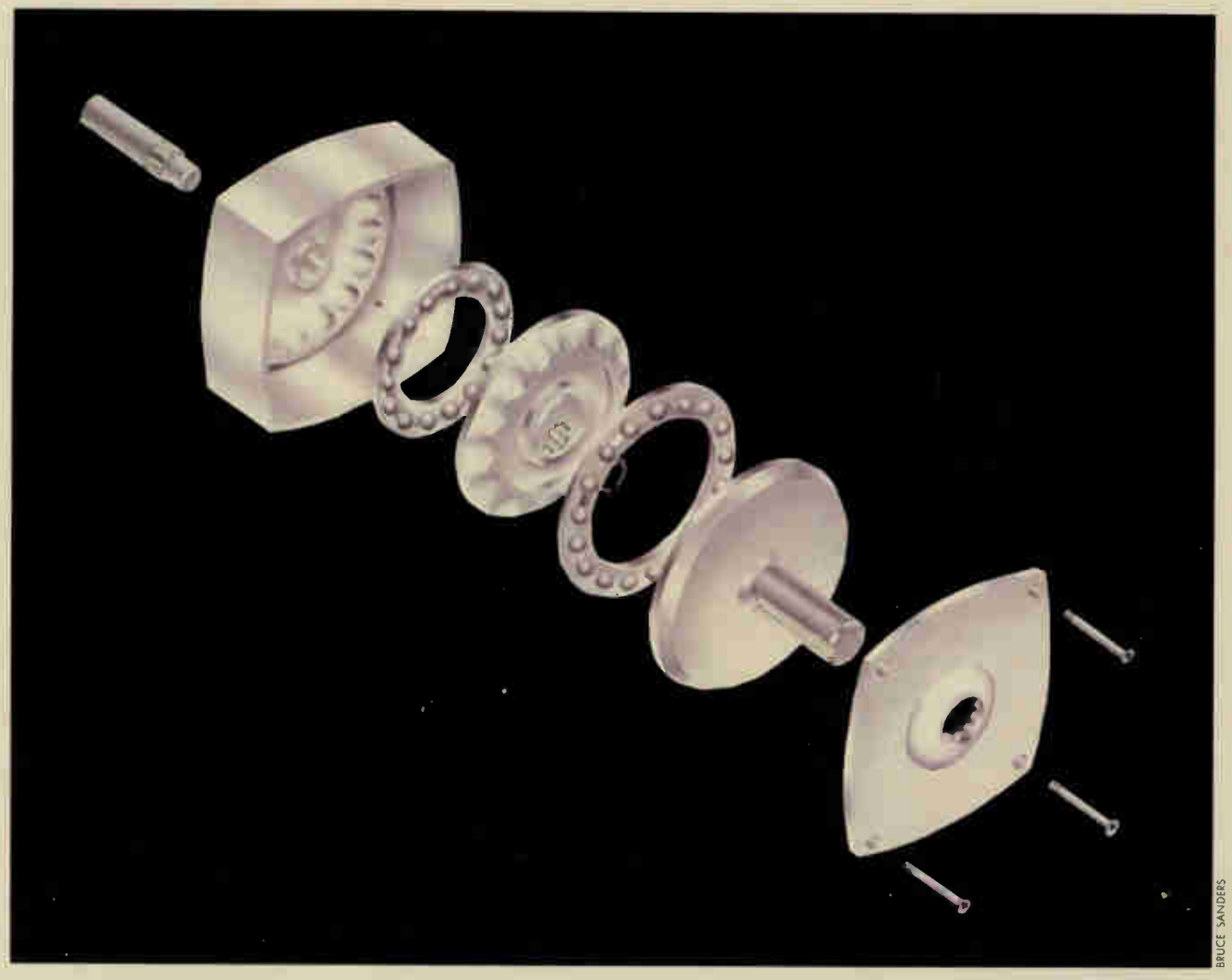
Wallace has developed a computerized disaster-preparedness system that could be used by officials of communities surrounding nuclear power plants. The system, he says, has the potential to give an instantaneous graphic and written report of crucial information. It is already in limited use at the Indian Point nuclear facility at Peekskill, New York.

Using a microcomputer as its central element, Wallace's decision support system is designed to combine static information—the type in the loose-leaf binders—with dynamic data from monitors stationed at locations around the plant. Within seconds of an accident, the system gives plant personnel and public safety officials the information needed to evaluate and control the crisis.

Simulated displays of radioactive plumes from Ginna Station, Rochester (above), and Indian Point plant, Peekskill, N.Y., are outlined in orange and purple. Semicircles in Ginna show distance.

In the event of a radioactive leak, for example, the system monitors the wind speed, precipitation, temperature, atmospheric stability, and other factors. From this it can generate both a video display and a printed map indicating the shape, direction, and speed of the contaminated air mass. Properly programmed, the computer also could display guidelines suggesting an appropriate course of action. If a radioactive plume were headed toward a school during the daytime, the computer would display the names and telephone numbers of the school officials along with specific instructions on how best to protect the children. If evacuation of an urban area were indicated, the system could retrieve data outlining procedures, shelters, and escape routes—and determine to whom it should be sent. According to Wallace, a system of this type would help assure that response to a threatened disaster is both timely and appropriate.

—Robert Vogel



BRUCE SANDERS

Gearing Friction Down

In a system designed to transmit mechanical power, friction is an enemy that wastes energy and lowers efficiency. Therefore, the sliding motions that occur as the teeth of conventional gear drives mesh and unmesh are something to be avoided if at all possible. A new type of gear drive developed by Advanced Energy Technology (AET) of Boulder, Colorado, in effect replaces the sliding motion of gear teeth with the rolling motion of ball bearings, dramatically reducing friction.

The Anti-Friction Drive, as the device is called, transmits rotary motion between disklike plates separated by steel balls. The balls are confined to races cut into the faces of the disks. Each race takes on the shape of a complex closed curve known as an epitrochoid (the path taken by the moon as it journeys with the earth around the sun is an epitrochoid). Speed reduction—and torque multiplication—is determined by the relative dimensions of the curves on the two facing plates. Several such stages are used in a single drive.

Since at any given time 40 percent of the steel balls are in a driving mode (rather than a few teeth that are in mesh doing all the work), an Anti-Friction Drive can be considerably smaller than a conventional gear drive doing the same job. Moreover, its efficiency is higher and does not degrade when large reduction ratios are necessary. Such loss of efficiency is a problem with conventional gears. Also the "slop" or "backlash" that may let the input shaft of a gear drive turn without moving the output shaft (or vice versa) is absent, making the device suitable for precision applications such as robotics. Perhaps the most notable limitation of the Anti-Friction Drive, which should become available late this year, is that it is now available in fixed ratios only. However, a company spokesman indicates that AET believes the drive can be made with variable ratios, and a program to develop this capability is already in its early stages. *—H. A. R.*

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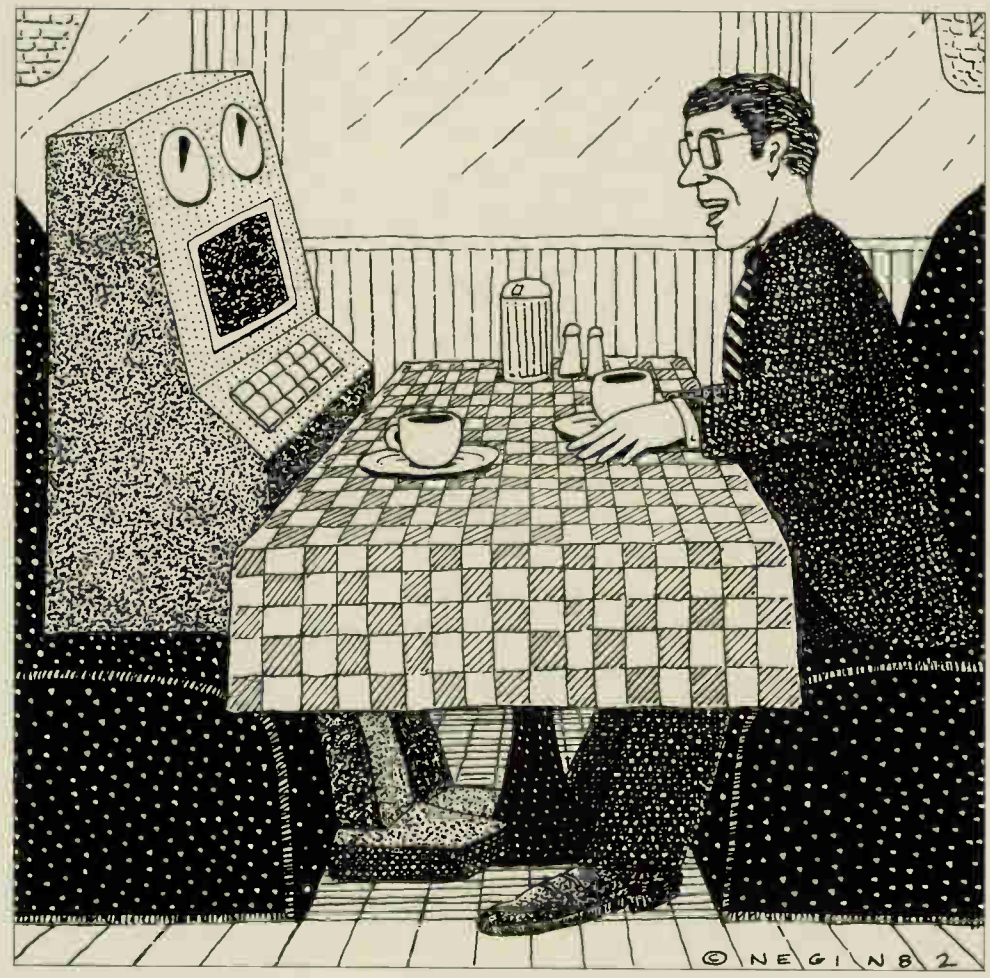

ELLIOT NEGIN

Talk and Type

Computers that could respond to speech would revolutionize the transfer of information. Unfortunately, it is extremely difficult to make a machine that can do this. No one is completely consistent in pronunciation of words, and even when great care is taken, the same word may sound different in various contexts. Another stumbling block is that in order to recognize a word, the computer must compare the spoken input against each item of the vocabulary stored in its memory. For a large vocabulary of, say, 500 to 1,000 words, the process can become time-consuming for even a very fast computer.

TALK & TYPE is a computer program developed for the U.S. Air Force by Threshold Technologies of Delran, New Jersey. It is used with computer hardware that includes a keyboard. The user simply types the first letter of each word as it is spoken. This greatly reduces the number of words through which the computer must search and eliminates the possibility that words such as *fill* and *sill* will be confused. However, it does require the user to have a free hand and to be able to devote attention to the keyboard. With vocabularies of up to 1,000 words or so, TALK & TYPE has been shown to exceed straight typing in both speed and accuracy, even when the typist is highly skilled. At entry rates of 160 words per minute or more, a moderately experienced speaker would be expected to achieve recognition accuracy exceeding 99 percent. It is necessary, however, that the speaker "train" the computer by making a separate entry of every word in the vocabulary before using the system. —*H. A. R.*

Explosion Snuffer

Liquid fuels, from gasoline to hydrocarbons stored under pressure, pack a lot of energy into a small volume. With such packing comes the danger of explosion. Under certain conditions, a single gallon of gasoline, for example, can explode with as much force as seven or eight sticks of dynamite. The Explosafe Explosion Suppression System, developed by Vulcan Industrial Packaging of Ontario, Canada, reduces the hazard.

Explosafe is a batting made of aluminum mesh slit to form a hexagonal pattern. Filling the inside of a fuel tank while displacing only about 1 percent of the volume, the batting divides the space up into tiny cells through which a flame cannot propagate rapidly. And it absorbs heat.

Should ignition occur in a localized region of the tank, the batting limits the spread of the burning and prevents complete combustion. This limits the rise in pressure inside the tank so that the tank does not rupture. A container exposed to direct flames will take longer to rupture if protected with the material, and if suitable pressure relief is provided to vent the vapors, it may not rupture at all.

Explosafe must be tailored to a particular application because for best results it must fill the tank volume quite completely. So far, most uses for Explosafe are industrial and military. (In a series of tests conducted by the U.S. Air Force, it has been shown capable of protecting the fuel tanks of combat aircraft and vehicles.) So far, the only notable consumer application is in portable gasoline containers. —*H. A. R.*

THE GRAPES OF REMY MARTIN. THE PRIVILEGED FEW.

For over 250 years, the house of Remy Martin has refused to compromise.

All of Remy Martin's cognac is made exclusively with the grapes from the two best districts of Cognac: Grande Champagne and Petite Champagne.

Of the six grape-growing areas within the Region, these two areas are indisputably the finest—and the only areas Remy Martin deems suitable for the making of its cognac.

But Remy Martin does not owe the quality of its cognac to these vineyards alone.

From time immemorial, Remy Martin has used only the finest oak from the majestic Limousin Forest in the making of its casks and cooperage.

It has used, exclusively, the traditional copper, onion-shaped "Charentais pot-still" to ensure the perfect and proper distillation of the young white cognac. A still that's smaller in volume than the stills used by every other major cognac house.

Yet it is, above all, the skilled craftsmanship and pride of the cognac-maker, who in harmony with nature, makes Remy Martin the finest of cognacs.

Doubtless, there will forever be less costly, less time-consuming, less painstaking ways to make cognac.

But the proud house of Remy Martin will continue to create cognac as it always has in the past; cognac of exceptional body, bouquet and character. Remy Martin.

Cognac without compromise.

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NLS

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Xerox has developed a wide selection of machines to help you answer yes. Machines that not only produce better looking originals, but also help people improve the quality of information in those originals.

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Any similarity between the Jeep Wagoneer Limited and a conventional two-wheel drive wagon is purely coincidental.

Because no conventional full-size wagon gives you all the security, luxury and economy of Wagoneer.

For security, it's the Wagoneer's sure-footed four-wheel drive, performing deftly under all kinds of pressure...snow buried highways, icy roadways, torrential downpours. Or just digging in off-road to take you far from the maddening crowds.

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And for economy, it's better EPA estimated mileage than *any* full-size two-wheel drive wagon.*

Luxury, economy *and* the security of four-wheel drive. With all this, and surprisingly affordable prices, why would anyone drive anything else?

The Jeep Wagoneer Limited. We call it the Ultimate Wagon. You'll call it *beautiful*.

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*Use these figures for comparison. Your results may differ due to driving speed, weather conditions and trip length. Actual highway mileage lower.

Nikola Tesla's Power Play

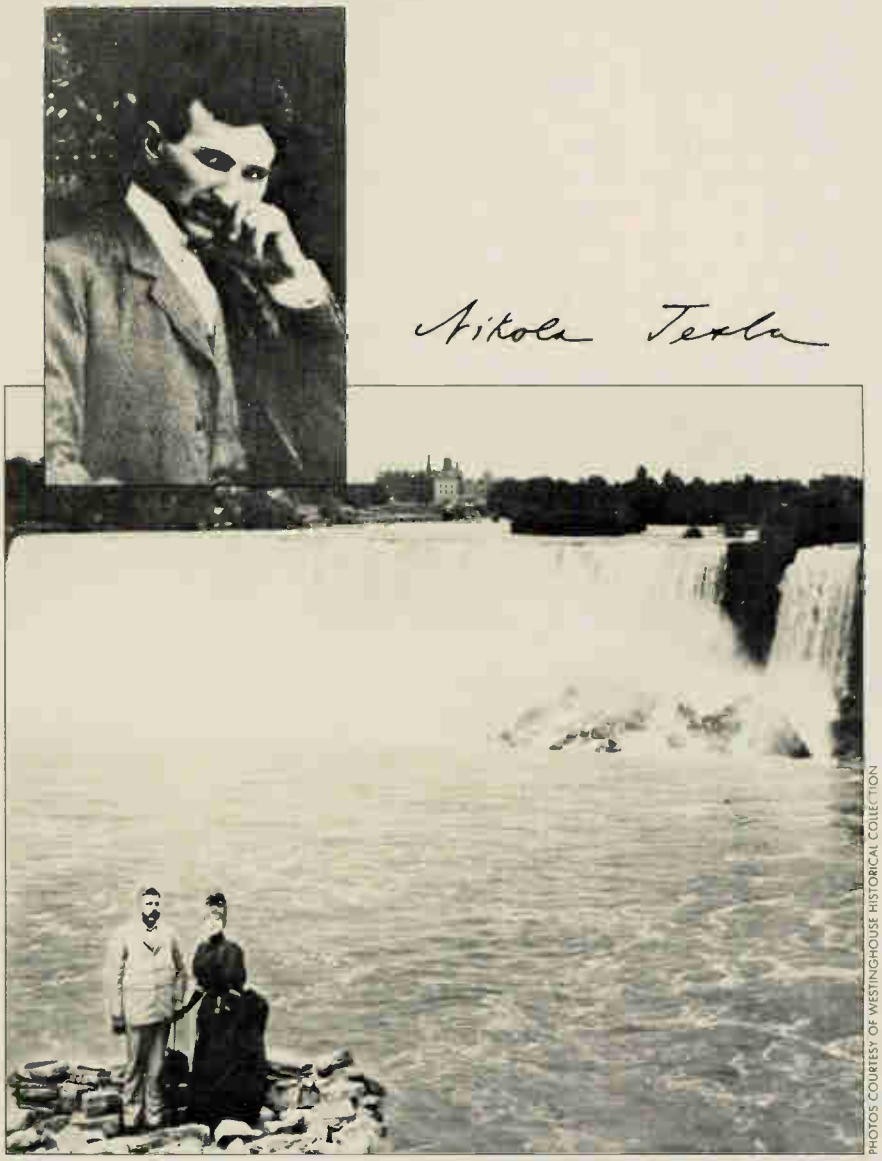
TURNING POINT

The success of our modern technological society hinges upon having energy available when and where we need it, in large doses or small. By the mid 1880s, it was clear that electricity was a good idea. Electric lighting companies were flourishing in large cities, and a few factories were using powerful direct-current (DC) motors to run their equipment. Unfortunately, the DC power systems were relatively inflexible. Voltages ideal for lighting were not ideal for motors, and there was no convenient way to step direct-current voltages up and down.

This inflexibility also created problems in power transmission. The power transmitted through a wire is proportional to both voltage and current. Resistance losses, however, vary only with current. It's therefore desirable to transmit small currents at extremely high voltages. Direct-current generators can produce a few thousand volts, but that's inconvenient for lighting, and it's dangerous as well. At lower voltages, resistance losses become severe.

In the 1880s, however, alternating-current (AC) systems didn't look much better. As its name indicates, alternating current reverses its direction of flow many times a second. Unlike steady-flowing DC, AC voltages can easily be stepped up or down with transformers, a big advantage. But the AC generators of the time were inefficient, and no practical AC motor existed. And except for light bulbs, most existing DC equipment couldn't use AC.

One man who considered alternating current practical was the Serbian engineer Nikola Tesla, who came to America in 1884. Tesla was confident that the minor problems with AC could be solved. As for the major problem, the lack of a good AC motor, Tesla envisioned a way to create a rotating magnetic field around the rotor of an elec-



PHOTOS COURTESY OF WESTINGHOUSE HISTORICAL COLLECTION

Top: *Nikola Tesla, who competed with Marconi on developing radio, is best known as the father of alternating current.* Middle: *In a pointed illustration of his relationship to the power he harnessed, George Westinghouse and his wife are superimposed on Niagara Falls.* Bottom: *The Tesla AC motor of 1888 was rugged, efficient, and had few moving parts to wear out.*

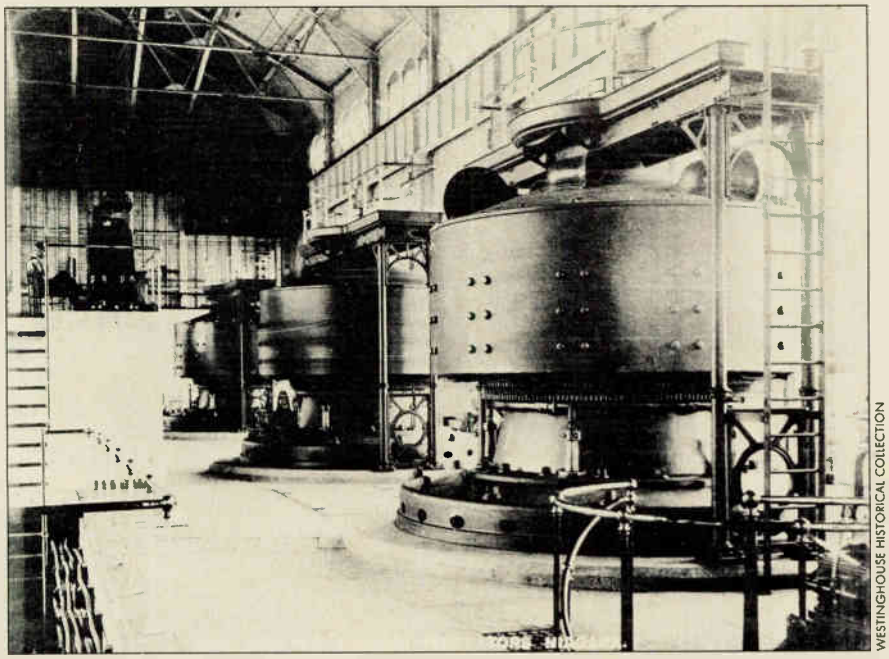
tric motor by using two or more alternating currents out of step with each other.

After a brief stint with Edison, Tesla started his own company, and in 1888 he patented his revolutionary induction motor. The new motor—rugged, efficient, and with few moving parts to wear out—caused a sensation, and George Westinghouse recognized that it was the key to a complete power system. Westinghouse, famous as the inventor of the railway air brake, already controlled several patents on AC generators and transformers and owned a small AC lighting company. Tesla and Westinghouse soon joined forces.

Westinghouse was already locked in an incredible propaganda battle with Edison, the so-called battle of the currents. Edison claimed that alternating current was unmanageable and exceedingly dangerous, and he orchestrated a vicious propaganda campaign against it. (One of his employees toured the country, publicly electrocuting stray dogs with alternating current—"Westinghousing" them, he said.)

Meanwhile, the Cataract Construction Company had been seeking a way to harness the enormous power of Niagara Falls. The local demand for energy was small, so they planned to transmit most of the energy produced to Buffalo, New York, about 22 miles away. Transmitting low-voltage DC that far was out of the question, and numerous other power-transmission schemes were considered and rejected. In 1893 the company decided to try the AC power system envisioned by Tesla and developed by Westinghouse and his associates.

The electrification of Niagara Falls was a dramatic success. Westinghouse had already demonstrated a complete AC system at the 1893 World's Columbian Exposition in Chicago, running lights and machinery throughout the exhibit area, but now the system was reproduced on a monumental scale. The Niagara Falls project required 4,000-kilowatt AC generators, a big step up from the generators then in use. In addition, the project needed transformers, switching systems, and power lines that could handle such an output. Transformers boosted the voltage for efficient transmission to Buffalo, where the voltage was easily stepped down to whatever level was needed for lighting or for running the induction motors that Tesla had invented. Every component of the system—generators, transformers, motors, and lighting—Tesla had either improved on or invented outright. When completed, the Cataract system didn't differ materially from what we have today.



WESTINGHOUSE HISTORICAL COLLECTION

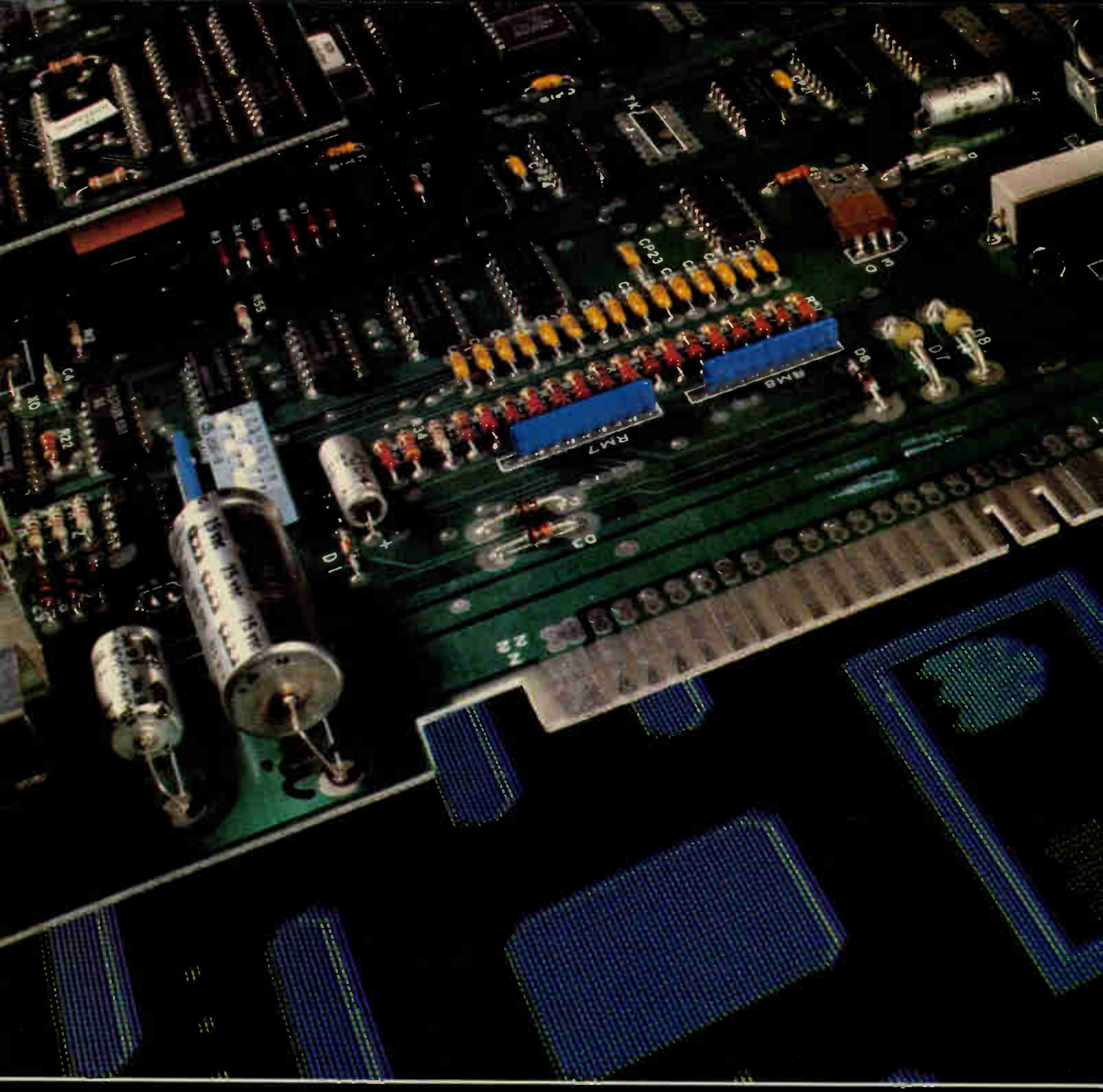
Envisioned by Tesla and developed by Westinghouse and associates, the alternating-current power plant at Niagara Falls was a dramatic success. Of the three 4,000-kilowatt generators at the heart of the system, only the middle generator was rotating when this photo was taken.

The success of the Niagara Falls project was the knockout blow in the battle of the currents. Edison, forced to swallow his enormous pride, was soon producing AC equipment.

During the next generation, the AC power system was improved and standardized, and America was electrified. Today the average U.S. household contains over 30 small electric motors plus lights and electronics, and industry depends heavily on electric power.

It all seems so obvious now. Yet before the Cataract Construction Company settled on Tesla's AC system, they were planning a pipeline that would have carried energy all the way to Buffalo in the form of compressed air. Who knows, were it not for Nikola Tesla's breakthrough, we might today be plugging our appliances into air hoses instead of wall sockets.

—Robert J. Schadewald



Inside Pac-Man

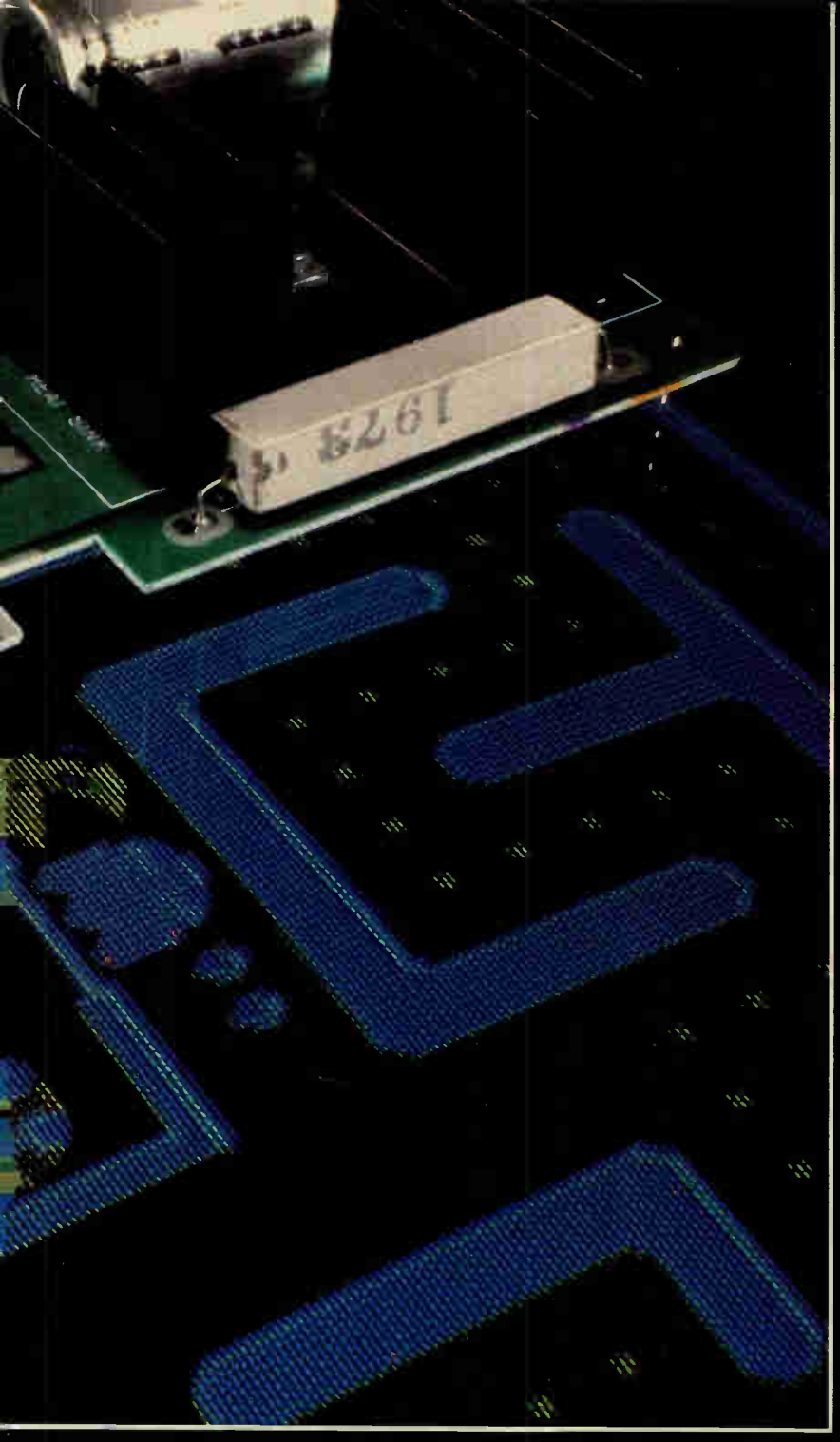
With 84 circuit chips on its main logic board, a Pac-Man arcade game is hardly a child's plaything.
by Steve Ditlea.
photography by Frank Siteman

The Pac-Man video game has by now become an international classic. In just two years over 300,000 of the original Pac-Man games found their way into arcades, stores, social clubs, and taverns around the world. Gobbling up quarters, kroner, and yen as voraciously as the little yellow Pac-Man character devours dots, the games have been an entertainment industry phenomenon.

The release of the home version of Pac-Man earlier this year was more anxiously awaited than any popular movie premiere in recent memory. In fact, the home video-game version of Pac-Man was able to generate huge profits for the Warner Communications conglomerate (through its Atari division) at a time when its moribund movie and record divisions couldn't. Pac-Man is the first arcade game to attract female players in large numbers; according to one Freudian explanation, the Pac-Man character, suggesting a smile-button face seen in profile, engulfs its prey rather than shooting it, making it more enjoyable for women.

The mechanical, electronic, and video systems that allow a player to control Pac-Man's movement are virtually identical to those of previous microprocessor-controlled video arcade games. By substituting a few integrated-circuit chips, Masaya Nakamura, the Walt Disney of video games, and the design team at his Japanese firm, Namco, created the Pac-Man character, along with four bright-colored, ghostlike monsters who pursue him pop-eyed through the game's phosphorescent maze to the accompaniment of electronic sound effects and music.

What goes on inside a Pac-Man arcade game—or any video arcade game,



Above: *A part of the circuit board and playing screen for Ms. Pac-Man, which is more challenging than the original Pac-Man game.*

for that matter—that manages to turn a color video screen into an addictive adventure?

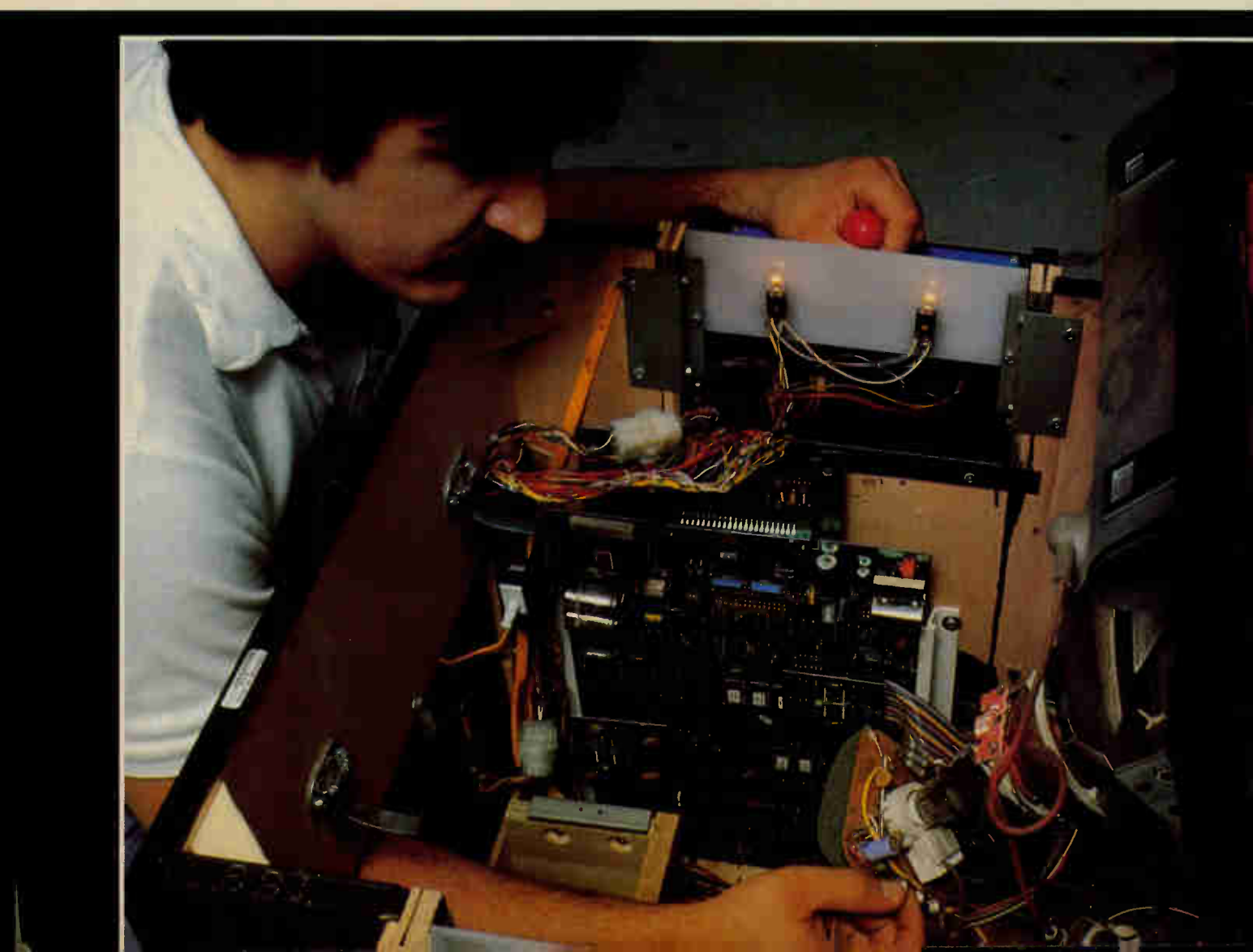
Perhaps not surprisingly, the inside of an arcade game, with its single main logic board bearing dozens of circuit chips, resembles the electronic section of a personal computer [see "Anatomy of a Personal Computer," April/May 1982]. In fact, the Z-80a microprocessor chip that operates the game is used as a central processor by Radio Shack, Sinclair, and numerous small-business microcomputer systems. Unlike a general-purpose computer, which has the flexibility to execute a wide variety of tasks depending on what programs are loaded into it, an arcade game's computer is a "dedicated" system. Serving as a responsive intermediary between humans and video screen is its only duty. Freed from the necessity of dealing with data from a keyboard, human-oriented languages, mass-storage devices such as disk drives, and links to a printer, a video arcade game can employ its integrated circuits (Pac-Man has 84 on its main logic board) to create more detailed video images, versatile animated characters, and complex sound effects.

The standard American version of the Pac-Man arcade game, licensed and manufactured by the Midway Division of Bally, accepts information from 15 different sources, such as the coin slot switch, one- and two-player game buttons, and most important, a mechanism controlling four switches that indicate whether the joystick has been moved left, right, up, or down.

In any computerized device, a quartz-clock circuit provides a rock-steady beat to which every function is timed. The central-processing chip in a video arcade game operates at three times the clock speed of the corresponding chip in an Apple II microcomputer—hence the greater speed and smoothness of the arcade game's real-time responses.

The images on an arcade game's video screen are generated by two integrated-circuit chips known as character ROMs. These read-only memory chips are permanent repositories for the program instructions defining the boundaries of screen images and their relative positions. Each chip stores 4,096 words of instruction. One chip provides the instructions for displaying the maze and the block-shaped figures that travel through it. The other contains the details needed to redraw these blocks into Pac-Man and his pursuers. The boundaries of any figure on the screen can be defined in simple X, Y coordinates. A figure's color is yet another numerical value listed in the program. To create the illusion of the Pac-Man opening and closing his mouth, four images with varying mouth widths are rapidly alternated.

Moving a figure through the maze is accomplished by an instruction to increment the character coordinates



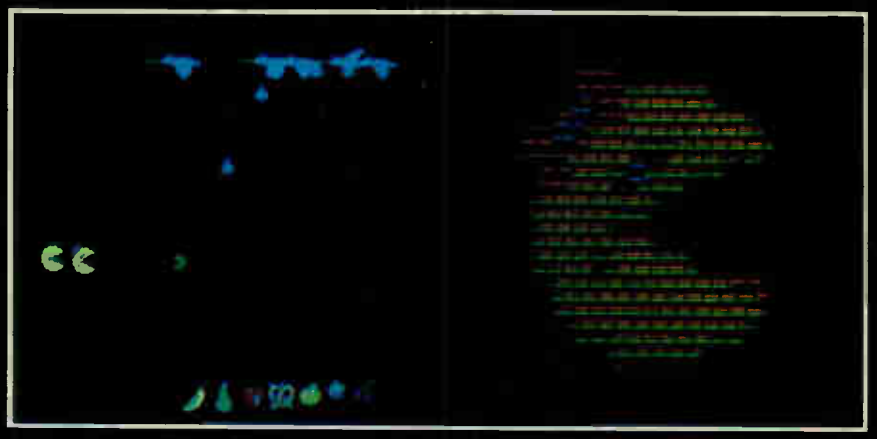
along either the *X* or *Y* axis. When a player pushes the Pac-Man joystick, whichever switch is activated causes the program to jump to an instruction that adds to or subtracts from the *X* coordinate (for right or left movement) or the *Y* coordinate (for up or down). What the system actually receives from the joystick, which it interrogates thousands of times a second, is a combination of electrical pulses that represent the binary digits zero and one. In the arcade game, data is handled in the form of eight-digit binary numbers known as bytes.

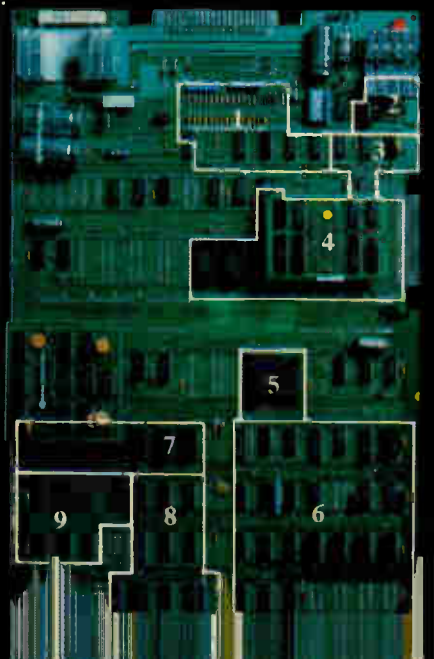
When a byte of information first arrives at the main logic board, it is stored temporarily by a buffer chip while other operations are taking place. When the system can accept a byte, it is fed to random-access memory (RAM) chips. A total of 24,576 bytes can be stored in six RAM chips. Because this is temporary storage, RAM can be referred to as "scratch pad" memory. RAM chips lose the information they've saved if the power goes off or a reset instruction is executed, so the program defining a game's rules and operating routines is stored permanently in ROM chips. When the game runs, the processor copies the program into RAM so that it can be modified by a player's actions.

In the Pac-Man program, a byte from the joystick is translated into a command to modify the position of the Pac-Man on the screen by adding or subtracting a value from its coordinates at regular clocked intervals. The coordinates are continually checked against data that defines the on-screen maze to determine whether a particular position is at an intersection in the maze (allowing a change in direction) or occupied by a glowing dot (slowing down the Pac-Man character while he eats it and adds to his score) or a larger "energizer" dot (giving Pac-Man a chance to chase the monsters for a few seconds).

Other parts, or subroutines, of the Pac-Man arcade program define the particular movements and characteristics of the pursuing monsters. Additional program instructions cause their eyes to shift direction and their borders to become animated. For the first four seconds following the start of the game, the monsters are relatively benign, bouncing up and down within their video cage. Then they are unleashed, each in turn following a predetermined series of moves that changes according to where the Pac-Man character is.

The red, ghostlike monster, called Shadow, is programmed to chase Pac-Man as swiftly as a shadow and is virtually impossible to shake. Speedy, the pink monster, is almost as fast but can be escaped if Pac-Man quickly turns a corner. Bashful, the blue one, is slow and will run away should Pac-Man make a sudden move in its direction. Orange Pokey has been programmed to follow a series of different behaviors





Left: *The guts of a Pac-Man game.* **Above left:** *During one halftime show, a stork delivers a baby to Mr. and Ms. Pac-Man after they fall in love.* **Above right:** *It takes about 250 picture elements to create the Ms. Pac-Man character.* **Right:** *Pac-Man's circuit board. The input circuit handles information from the coin slot, joystick, and other controls (1). One audio circuit amplifies the sounds generated by other chips (2). Clock-circuit chips control the timing of the game (3). Chips for color and game instructions are partially obscured by a sync control, which handles signals from the microprocessor underneath (4). The left chip creates the characters; the right one draws the mazes (5). This group of chips controls the movement of all the objects on the screen (6). The "scratch pad" memory is partly hidden by a sync control (7). These audio chips produce the electronic sounds (8). This circuit plots the location of*

that make his actions the hardest to predict. But although the microprocessor could easily simulate randomness, the game did not resort to that in the program until recently. As a result, by recognizing patterns in the monsters' moves, many Pac-Man devotees have worked out patterns that allow the Pac-Man character to evade the monsters for hours on end (see box, page 29).

To make pattern play more difficult and give arcade owners greater turnover at their machines, randomness has been programmed into the monsters in the latest version of the game, Ms. Pac-Man. Another innovation in this version is the generation of four different mazes as play progresses, instead of one. In either version, playing speed increases as the player does better, as indicated by different fruits displayed on the screen. After screens have been cleared of all their dots by a voracious Pac-Man, both games have program instructions for creating animated half-time shows starring the Pac-Man crew.

When in the course of animated events the Pac-Man is finally overtaken by a monster, the processor recognizes that their coordinates mesh and jumps to a subroutine that resets all variables, clears the screen of monsters, then shows Pac-Man withering away after being caught. Another subroutine checks to see if a player has any Pac-Men left. If yes, the game restarts; if no, the Game Over sign flashes and yet another subroutine puts the video display through a self-demonstrating mode.

When the Pac-Man arcade game is first activated, it plays a distinctive musical theme. This and the *wocka-wocka-wocka* munching sounds are emitted by a standard audio speaker in the game's chassis. Pac-Man's audible death throes when caught by a monster are truly poignant. All the necessary sound information is stored in numerical form on two ROM chips. Another chip serves as an audio amplifier, while six more are called upon to regulate the digital-to-audio conversion.

Arcade games of even greater complexity are already in the testing stages. Features include stickless control mechanisms that register hand or eye movements as input, detailed graphics that rival the quality of live video, voice-recognition and voice-synthesis abilities that allow the game to conduct a conversation with the player, and hardware and software that is sophisticated enough to make strategy rather than hand-eye coordination the key to playing the game. Whatever the abilities of these new games and their successors, it may be years before another game earns the kind of player loyalty that Pac-Man has.

Steve Ditlea is a contributing editor of Popular Computing *magazine.*

Pac-Man at Home

The original Pac-Man arcade game has spawned a thriving subindustry devoted to bringing various Pac-Man incarnations into the home. In addition to Pac-Man dishes, towels, infants' clothing, and even a low-tech board game from Milton Bradley, three versions of the Pac-Man game have been licensed for home use.

Coleco's electromechanical-toy version was deemed so promising for the upcoming sales year that the company's stock registered a gain of 96 percent in a sinking market, becoming the best performer on Wall Street in the first quarter of 1982.

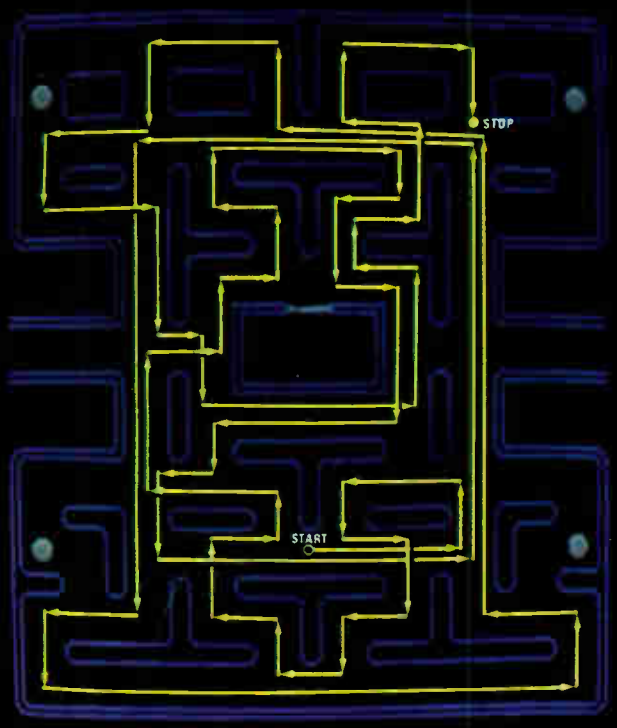
A second, more sophisticated version is Atari's home video cartridge game. Despite its record sales, this much-awaited program has been a disappointment to the true Pac-Man devotee.

The top- and bottom-of-the-line versions of home Pac-Man: Atari's home computer game (left) and Coleco's electromechanical toy model.

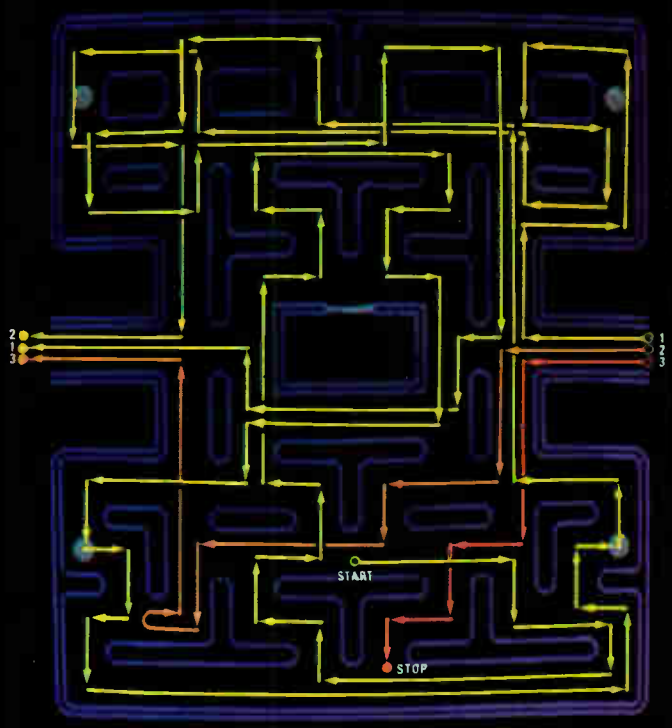
"The Atari home video game just can't compare," explains Bill Heineman, an 18-year-old southern California arcade-game champion turned game programmer and repairer. The game has four chips in its game module and just one chip in the program cartridge. "They had to make a lot of compromises in translating the game from the arcade version," says Heineman. Among the elements lost are high-resolution graphics, individualized monsters (here they are all of one color—pink), the original Pac-Man musical theme, fruit and other bonus items from the arcade game, and even the dots Pac-Man consumes in the arcades (in the home game, they resemble stripes on a highway).

The third version, Atari's home-computer game, however, is more satisfying for Pac-Maniacs, according to *Electronic Games* magazine executive editor Bill Kunkel. "Atari 400 and 800 home computers have graphics and sound capabilities that are very close to arcade-game quality." The Atari computers' secret? Special co-microprocessors devoted solely to creating the video display and built-in four-voice capability for sound. Included on the Pac-Man home-computer magnetic-disk version are ghosts of many colors with eyes that shift when they change direction, smooth movements and high-resolution graphics, and the familiar Pac-Man music and munching sounds.

GET



Bazo's Breaker



Above: *Two strategies for keeping Pac-Man ahead of the monsters. GET's advantage over other patterns is that it doesn't require the player to double back or to consume energy dots and the dots nearby, since these moves inevitably trip up the Pac-Man character. After completing the pattern, though, there's time to gobble up these dots along with plenty of monsters. Bazo's Breaker is fast; at 51 seconds to complete a screen, a player can score more points in less time. Both GET and Bazo's Breaker enable a player to eat all the fruit and keys that appear.*

Pac-Maniacs

"The mark of a good Pac-Man pattern is in its steadiness," says mathematics graduate student Ed Bazo, one of a trio of Davis, California, players credited with having devised some of the most elegant routes through the arcade game's maze.

Together with friends George Huang and Tom Fertado, Bazo composed the GET pattern (for "George, Ed, and Tom") after countless hours on the Pac-Man cocktail table at Fluffy's Donut and Sandwich Shop. This classic pattern, if followed precisely and unhesitatingly, keeps Pac-Man alive indefinitely in a balletic interweaving of monsters and prey. Steadiness is essential. Pausing at a corner, even briefly, can ruin the pattern's timing.

On his own, Ed Bazo created Bazo's Breaker. Unlike the GET pattern, which was designed for the original version of the game, Bazo's Breaker can guarantee almost unlimited play on the newer version from the ninth screen to the great beyond. With crowd-pleasing Pac-Man scores in the 2,000,000-point range, Bazo has been known to play one of his intricate patterns for several hours and then walk away from the machine out of sheer weariness.

At the Pac-Man cocktail table at Fluffy's Donut and Sandwich shop, Ed Bazo, George Huang, and Tom Fertado (from left to right) figured out a way for the Pac-Man character to elude all four monsters forever.

"Ed's style tends to be conservative, while George is as aggressive as you can get," says Fertado. "George likes to make dangerous moves that can get you more points. I prefer a smoother strategy that may not score you points as fast."

None of the self-styled GET brothers has switched his allegiance to another arcade game.

"It may be me or it may be the new games," says Ed Bazo, "but I can't see anything around today taking the place of Pac-Man."

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6:15

WAKE-UP 2. Then it comes back on to wake up your better half to a Beethoven symphony at 7:53. And on the Great Awakening it's all done with push-button ease.

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15

RADIO FM. You can also program up to six of your favorite stations into the Computer Radio's memory. And recall any one of them with the touch of a finger.

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1410

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Vacuuming the Ocean Floor

by William J. Cromie

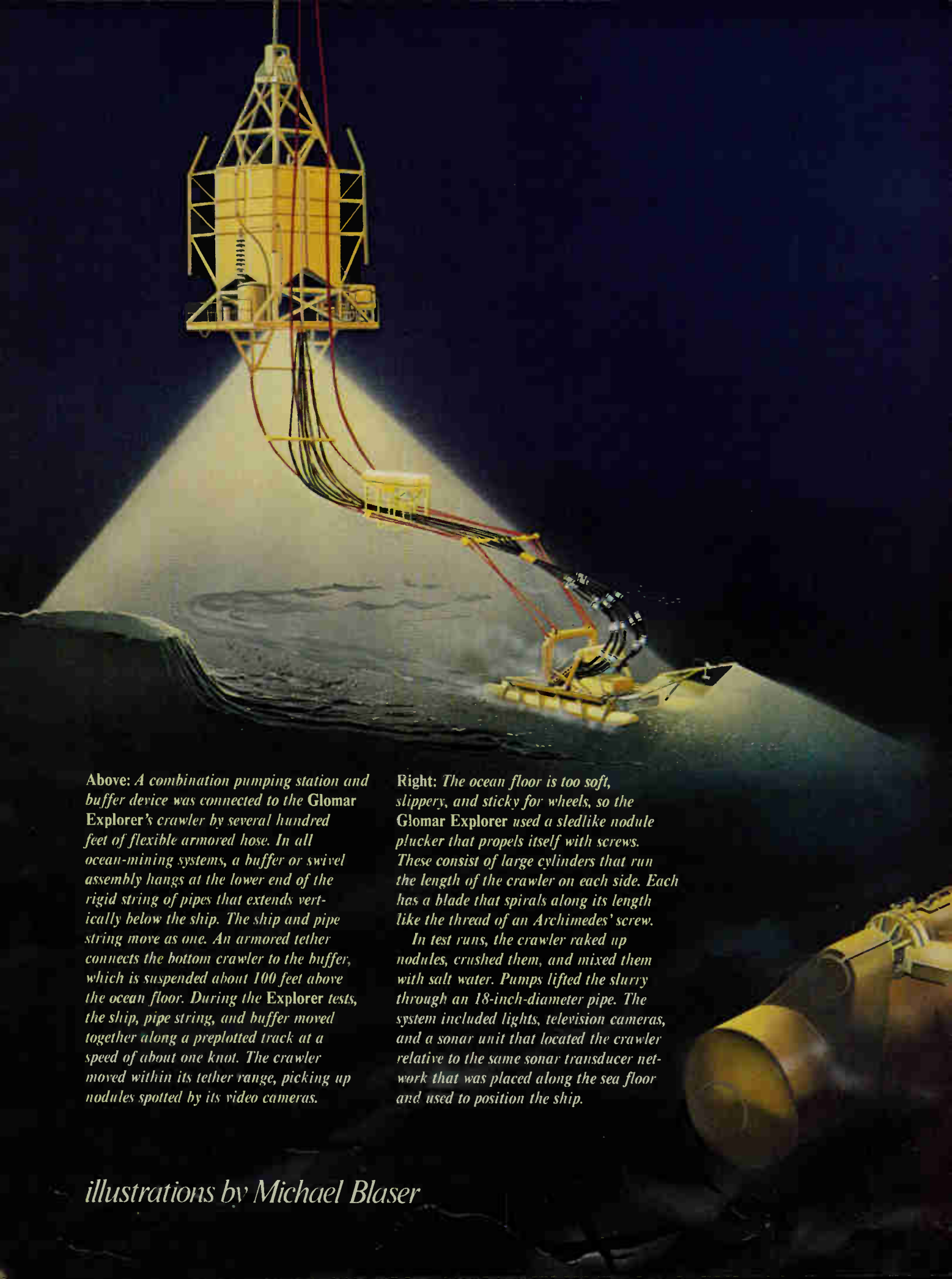
SEDCO 445 rose and fell with the ocean swell 800 miles southeast of Honolulu. A cross-legged, gimballed derrick towered above the deck. Below the keel, 17,000 feet of pipe curved gently to the bottom of the Pacific Ocean. A vacuum cleaner on the end of the pipe sucked up black lumps from the cold ooze like a voracious mechanical elephant picking its way through acres of spilled peanuts. A series of pumps on the pipe string moved the crushed lumps upward in a saltwater slurry. At 6:26 A.M. on March 26, 1978, a stream of wet ore began to splash into the hold of the ship. It was a technological milestone and good reason for the crew to whoop and cheer. They had produced the first continuous stream of metal ore from three miles beneath the ocean surface. It was the beginning of a new industry: deep-ocean mining.

Nine months later, another derrick ship, built to surreptitiously recover a sunken Soviet nuclear submarine, headed for the same mother lode. On the way, the ship—the *Glomar Explorer*—passed a converted ore carrier optimis-

continued on page 36

OCEAN MINERALS CO.

A "moonpool" cut out of the middle of the Glomar Explorer *is flooded to equalize water pressure on the huge doors on the ship's bottom, allowing the crew to open them. A crawler is then lowered to the sea floor by the derrick straddling the moonpool.*

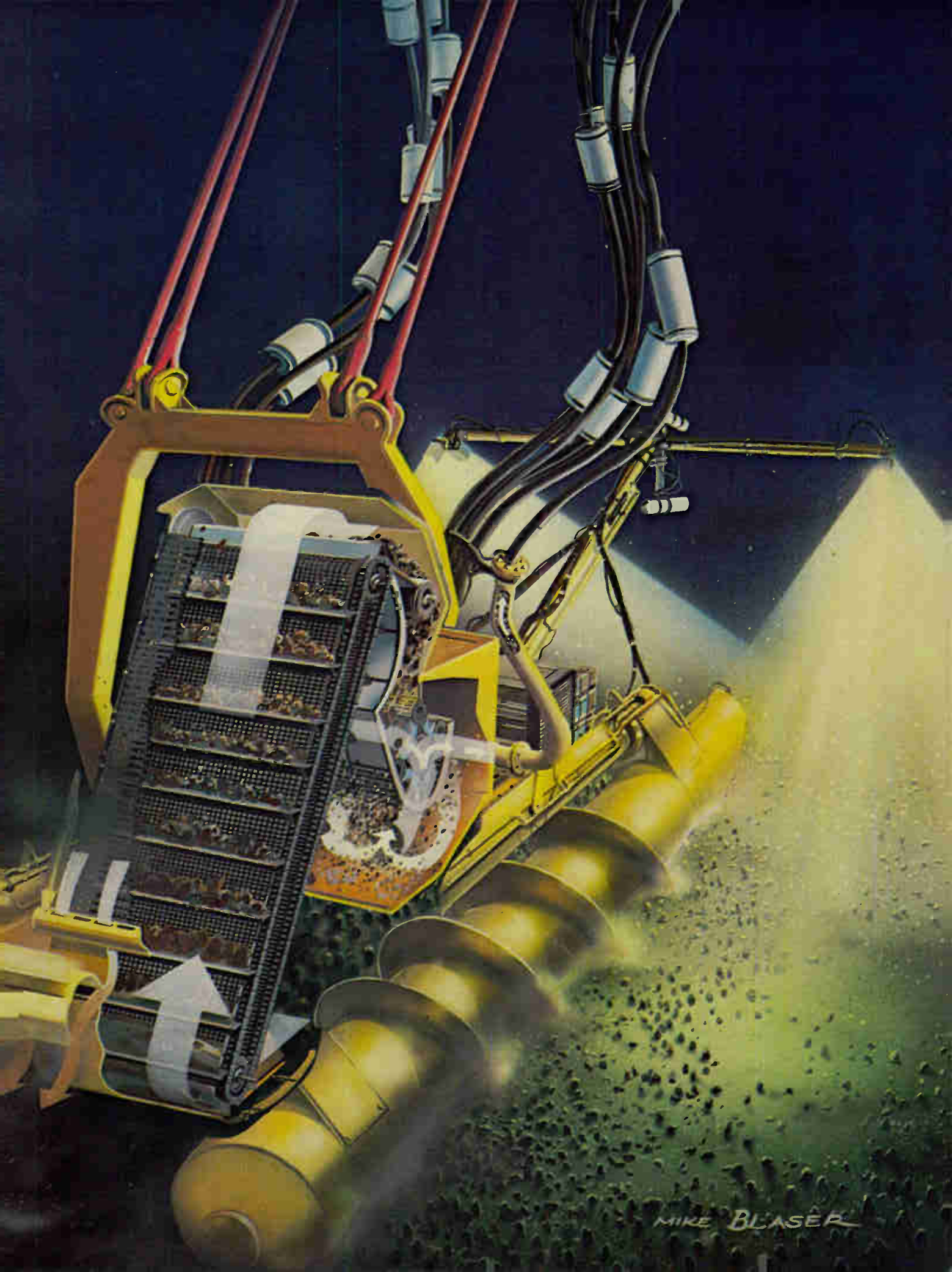


Above: *A combination pumping station and buffer device was connected to the* **Glomar Explorer**'*s crawler by several hundred feet of flexible armored hose. In all ocean-mining systems, a buffer or swivel assembly hangs at the lower end of the rigid string of pipes that extends vertically below the ship. The ship and pipe string move as one. An armored tether connects the bottom crawler to the buffer, which is suspended about 100 feet above the ocean floor. During the* **Explorer** *tests, the ship, pipe string, and buffer moved together along a preplotted track at a speed of about one knot. The crawler moved within its tether range, picking up nodules spotted by its video cameras.*

Right: *The ocean floor is too soft, slippery, and sticky for wheels, so the* **Glomar Explorer** *used a sledlike nodule plucker that propels itself with screws. These consist of large cylinders that run the length of the crawler on each side. Each has a blade that spirals along its length like the thread of an Archimedes' screw.*

In test runs, the crawler raked up nodules, crushed them, and mixed them with salt water. Pumps lifted the slurry through an 18-inch-diameter pipe. The system included lights, television cameras, and a sonar unit that located the crawler relative to the same sonar transducer network that was placed along the sea floor and used to position the ship.

illustrations by Michael Blaser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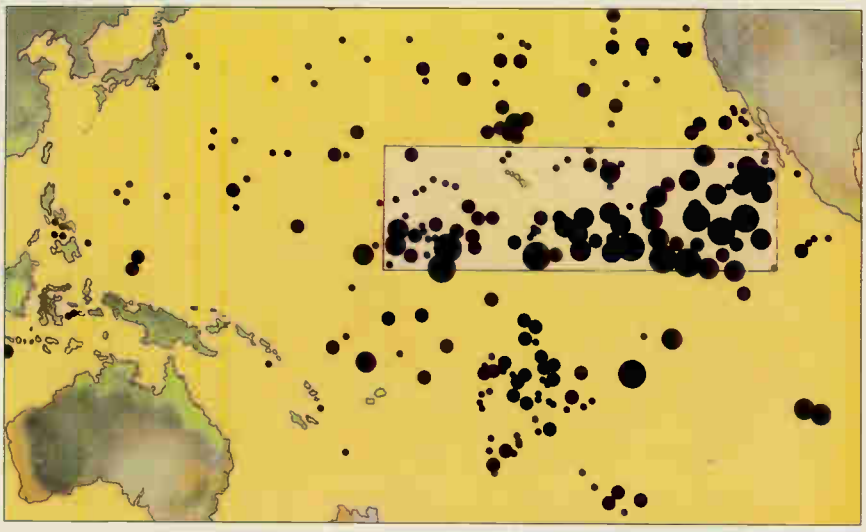

Black dots represent where metal deposits have been located on the floor of the Pacific Ocean; the largest concentration is near the islands of Hawaii. On this map the four sizes of dots indicate the relative amounts of nickel the deposits contain, ranging from less than 0.5% to 2%.

tically named *Deepsea Miner II*. The crews exchanged greetings, and the roughnecks aboard the *Miner* went back to wrestling 15,000 feet of pipe weighing about 750,000 pounds. Following four tests conducted 1,100 miles southwest of San Diego, the operators of the *Miner* announced that their work successfully modeled a deep-ocean commercial mining operation and proved that valuable metals could be recovered from ore deposits lying on the seabed. "There no longer is any question that deepsea mining is, in the full engineering sense of the word, technically doable," commented Raymond Kaufman, vice-president of Deepsea Ventures, owner of the *Miner*.

One of his colleagues described the objects of all this attention as looking like "little potatoes overcooked on a charcoal grill." The porous black or brownish lumps litter the floors of all oceans, a fact discovered by British oceanographers on a research cruise aboard H.M.S. *Challenger* back in the 1870s. Called nodules, they come in all varieties of shape. Although nodules are normally less than three inches across, prospectors have found boulder-size specimens weighing more than 500 pounds. In some places, nodules are so plentiful they resemble a cobblestone pavement. The ore in them varies from location to location, but deposits worked by the *Miner* contain about 30 percent manganese, 1.25 percent nickel, 1 percent copper, and 0.25 percent cobalt. Numbers like these get mining engineers very excited.

Many mineral deposits being worked on land are not as rich. During the 1970s oceanographers mapped an area of 1.6 million square miles in the North Pacific where deep-ocean mining could be profitable. The National Science Foundation estimates the value of ocean nodules in this area at $10 million per square mile. An industry spokesman is more conservative, citing a range of $2 million to $4 million, or $150 to $300 per ton of nodules. Even at the lowest estimate, this figures out to more than $3 trillion worth of ore in one part of one ocean alone. The richest deposits discovered lie between the Hawaiian Islands and the west coast of the United States and Mexico.

The biggest mystery about the nodules involves their origins. The metals probably come from river input and the exhalations of volcanic rifts in the ocean floor. Researchers know that nodules rich in copper and nickel occur under locations where microscopic plants and animals thrive. "These tiny, floating organisms concentrate metals in their bodies, then transport them to the sea floor when they die," explains Oregon State University marine geologist G. Ross Heath. "Under biologically productive areas, water in the bottom sediments contains ten to twenty-five percent as much manganese as water in nonproductive areas." Somehow this metal precipitates out of the water and coats seabed debris such as sharks' teeth. However, the details of how nodules grow, and especially how they keep from being buried by the rain of material from above, remain unknown. Solving the mystery involves more than an academic exercise. "Once we determine what factors control their formation and growth," notes Heath, "we should be able to predict more precisely where the nodules can be found."

Once found, they must be gathered, of course, and lifted several miles straight up. In most of the mining systems tested to date, the mining ship itself has pulled a device that moves along the ocean floor racking, sucking, or picking up nodules. The system used with the 600-foot-long, 45,000-ton *Glomar Explorer*, however, used a self-propelled bottom crawler as big as a house (30 feet wide, 45 feet long, 15 feet high) and weighing 100 tons. The *Explorer* carried it to the mining site 1,500 miles southwest of Los Angeles in a well, or "moonpool," cut out of the middle of the ship. The crewmen then flooded the moonpool, opened huge horizontal doors on the *Explorer*'s bottom, and lowered the crawler by the derrick straddling the well.

The *Explorer* had to rely on a set of auxiliary propellers at the bow and the stern to keep the hull in position over the ocean bottom. Signals from a network of sonar transducers positioned on the seabed went into a shipboard computer along with information about winds, waves, and currents. The computer determined what forces were needed to stay in a given spot or to move from one point to another, and it applied these forces via signals to the propellers. As these thrusters nudged

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DEEPSEA VENTURES

DEEPSEA VENTURES

Above: *Aboard the* Deepsea Miner II *(top right), the crew can coordinate the mining operation by remote control and view the whole procedure on a screen.*

the ship back and forth and from side to side, a heavy-lift system incorporating gimbals and a heave-compensating mechanism held the underwater equipment and countered the up-and-down and rolling motion produced by waves.

Stretching nearly three miles straight down below the ship's hull was a rigid assembly of pipe sections screwed end to end. At the pipe string's lower end, just above the sea floor, was a large swivel assembly. Once lowered to the end of the pipe string, the bottom crawler remained tied to this buffer by means of several hundred feet of heavy, flexible hose. As the robot crawler moved, it scooped up nodules, which were pumped to the surface in a salt-water slurry. On the surface, meanwhile, the ship slowly sailed a preset course, pulling its seven-million-pound pipe string along with it.

This system cost $100 million to develop, according to Conrad G. Welling, senior vice-president of Ocean Minerals Company (OMCO), the international consortium that operated the *Explorer*. Ocean Mining Associates, the four-corporation international group that bankrolled the *Deepsea Miner* test, says it spent $75 million. The operators of *SEDCO 445*, a four-corporation combine, claim they invested in excess of $60 million. Three other consortia expended a total of about $15 million. This is only the beginning; future pilot systems will dwarf the experimental

DEEPSEA VENTURES

The crew of a survey ship hauls up a wire dredge basket filled with nodule samples to record their location and metal content for later ocean-mining missions.

systems in size and cost.

"We must now refine the technology and scale up the basic equipment to obtain reliability and production data," Welling remarks. "The bottom crawler will be approximately one hundred feet wide instead of thirty. Its mother ship will be supertanker size—one thousand feet or longer. We'll require ore carriers about eight hundred feet long to transport the slurry to a land-based processing plant and to carry fuel and supplies to the mine site. Such a system means an investment of a billion dollars or more."

Ocean miners may talk in billions and millions, but it will remain largely talk until the legal-political climate changes. For eight years the United Nations Conference on the Law of the Sea attempted to hammer out a treaty that would, among other things, govern mining in parts of the deep ocean beyond national jurisdictions. Finally, last April, the delegates voted 130 to 4 to adopt a much-debated version. The United States was one of the four nations that voted against it.

"The United States *had* to vote no," declares Welling. The four American-dominated mining consortia, he says, "couldn't attract investment capital under the provisions of the treaty." These require private consortia to develop two claims for each one they intend to mine themselves. A U.N.-chartered group, the International Mining Enterprise, would have the right to select one of the sites to exploit for the benefit of underdeveloped countries. The Enterprise lacks the technology to work such claims, so the treaty calls for the mining interests from industrial nations to sell this at "fair and reasonable" terms.

The Enterprise would pay no taxes, while private ventures would be taxed by their governments and would pay royalties to a U.N. seabed authority. The latter would control mining operations in international waters. Since it would be operated on a one-nation, one-vote basis, the authority would be controlled by Third World countries that believe the riches of the ocean floor belong as much to them as to the industrial nations.

The treaty is scheduled to be signed in Caracas in December. If the United States and other nations who dominate the technology do not sign it, the treaty would be ineffective. Meanwhile, the United States and other Western nations have passed unilateral legislation under which mining permits can be granted. The result could be international legal squabbles, perhaps even armed conflict over disputed sites.

In the meantime, the *Glomar Explorer* is mothballed with the navy's reserve fleet. *SEDCO 445* has gone back to the work of drilling for oil. *Deepsea Miner* is in "semiactive layup" in a Portland, Oregon, shipyard, according to Jeff Amsbaugh, president of Ocean Mining Associates. Welling expressed the feeling of all the mining interests when he said, "I'm not sure where we go from here, but one thing is clear: We won't spend large sums on hardware or technology until things become more settled."

William J. Cromie, executive director of the Council for the Advancement of Science Writing, is the author of Exploring Secrets of the Sea.

Pedal Pushing

STORY DESIGNED BY BRUCE A. McINTOSH

Boneshakers, penny-farthings, safeties, and recumbents—the bicycle continues to change. by David Holzman

The best day of my bicycle trip across the country was the day I crossed the continental divide at Logan Pass in Glacier National Park. It was the climb, not the long coast downhill, that made that day so exhilarating. At the top, I felt I had earned the incredible views through my own efforts.

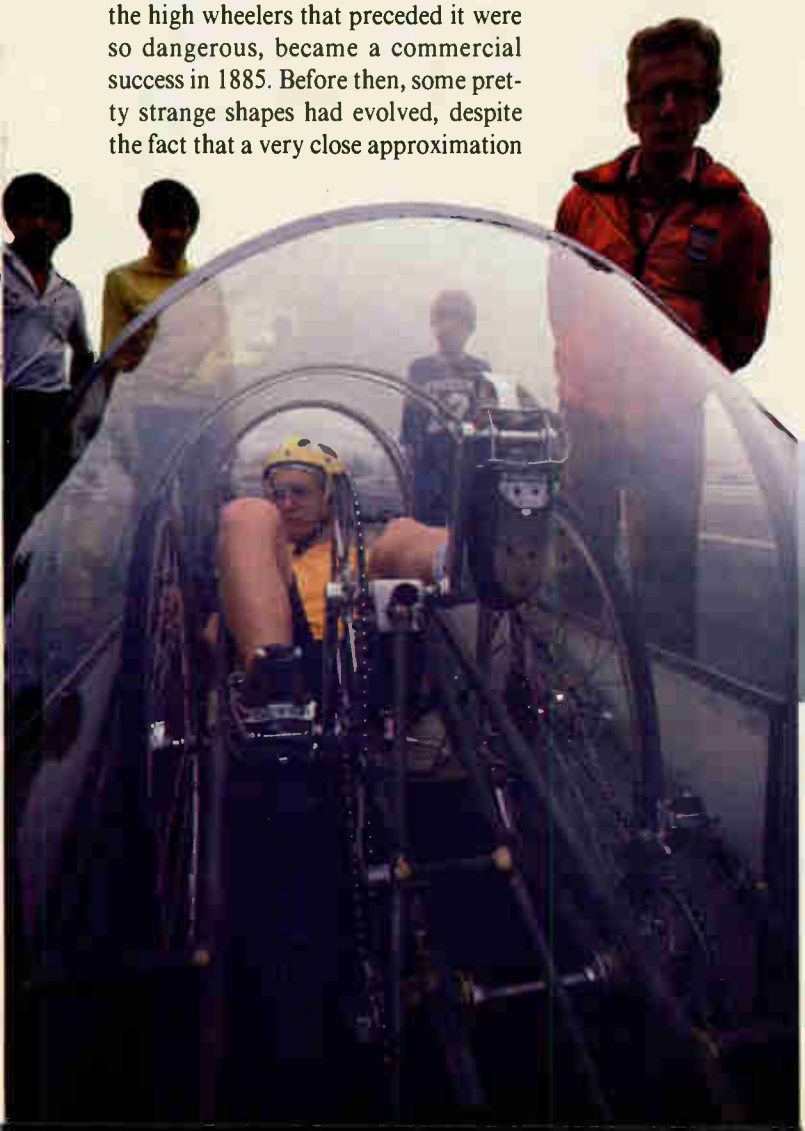
I do not mean to brag about my leg muscles. My 29-pound, bottom of the line, red Peugeot 10-speed made the climb seem effortless. The bicycle is like the wing of a bird—minimum weight, maximum strength. It is hard to imagine how the basic configuration of the bicycle could be improved. In fact, this configuration has not changed in almost 100 years.

The safety bicycle, so called because the high wheelers that preceded it were so dangerous, became a commercial success in 1885. Before then, some pretty strange shapes had evolved, despite the fact that a very close approximation to a safety bicycle had been built in 1839. Still earlier, in the late teens, Draisiennes (named for inventor Baron Karl von Drais) had been a craze among the well-to-do. These two-wheeled, steerable bicycles, which died out in the 1820s, were propelled with one's feet, like the Flintstones' cars.

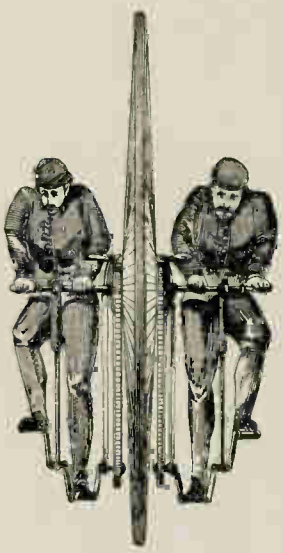
The concept of the bicycle remained buried for the next 45 years, at least partly because of the development of the railroad and the coincident decline of roads during this period. Many tinkerers who were interested in human-powered transport built tricycles and quadricycles. These velocipedes were heavy and slow, yet graceful considering the limitations of technology. They had a small but devoted following. One Henry Hill Hodgson covered more than 60 miles a day in his Sawyer, a quadricycle he bought in the 1850s. H. F. Wilcox wrote in 1869 that the Sawyer had "arrived at as complete a state as can be attained."

The rapid evolution of the bicycle during the late 19th century was the result of combining technologies rather than making a breakthrough. In 1861 someone brought a broken Draisienne to the Paris workshop of Pierre Michaux. Pierre and his son Ernest, so one story goes, put pedals and cranks on the front wheel. By 1868 they had a factory with 300 employees turning out five "boneshakers" a day.

The boneshakers came and went quickly, in the historical sense. As the name implies, the ride was painful on the roads of the day. Moreover, the boneshakers were slow: Their frames were solid metal, and they weighed some 60 to 90 pounds. Their top speed



Opposite page, clockwise from top: *The Pedestrian Hobby Horse, or Draisienne (1817), was an early, human-powered cycle with no pedals; the British called the ordinary a penny-farthing, the farthing (worth one-fourth of a penny) referring to the small rear wheel; a turn-of-the-century poster advertises a bicycle school; adult tricycles, like this 1890 Peugeot, were not uncommon in the 19th century.* Left: *Recumbent bikes with the rider in a prone or supine position may be the next step but are designed today primarily for racing.* Above: *A dropped handle multispeed with a derailleur is today's most common bicycle.*



Left: *Baron Karl von Drais astounded paying crowds at Luxembourg Gardens in 1818 with the improved hobby horse that bears his name.* Below: *Willard Sawyer sold his quadricycles to both royalty and the general public during the 1860s.* Right: *Although providing excellent distribution of wheel load, monocycles (here a "sociable" model) were often unstable and too big a challenge for all but the most daring riders.*

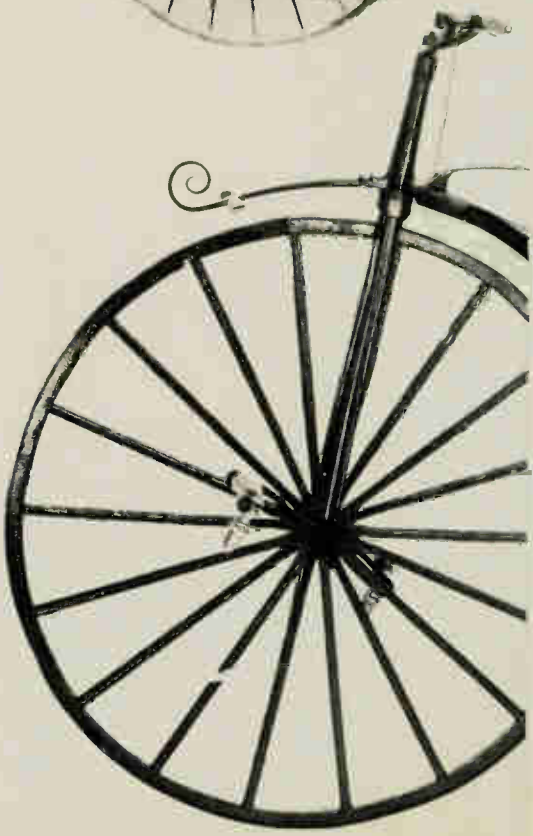
was limited by the size of the front wheel. One turn of the pedals produced one turn of the front wheel—about the distance covered in a low gear on today's 10-speeds.

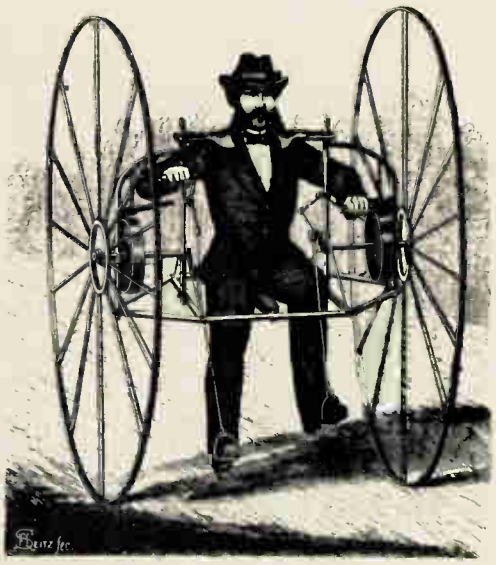
Fortunately, through pure happenstance, the Coventry Sewing Machine Company obtained one of the Michaux boneshakers. James Starley, a mechanical genius who would soon be known as the father of the British bicycle industry, turned his considerable talents and his company to improving the boneshaker. He and his associate, William Hillman, patented the prototypical high wheeler, the Ariel, in 1870.

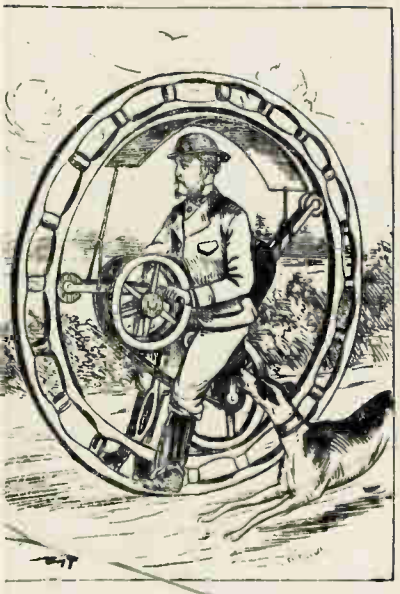
The Ariel was lighter, smoother, and faster than the boneshakers, with a top speed close to 14 miles per hour. The Ariel gained speed foremost from its huge, 50-inch-diameter front wheel, which could take the Ariel farther with each revolution of the cranks. But more subtle factors contributed to the speed. The large wheel smoothed the ride, probably cutting energy losses from vibration almost in half. Hollow tubing and a vestigial rear wheel—14 inches in diameter—lightened the bicycle still more, to about 50 pounds.

The ordinaries, as the high wheelers were called in deference to the many bizarre variations that coexisted briefly, used several new technologies. Tension spokes probably made the high wheel possible, because a large wheel with wooden spokes would have been unbearably heavy. The early radial spoking pattern allowed the hub to twist slightly relative to the rim. In 1874 Starley patented the tangent spoked wheel that bicycles still use, which held the wheel rigid with spokes inserted in several directions tangent to the hub.

Boneshakers and the first ordinaries used "plain" wheel bearings, the system that cheap children's tricycles still employ, where the axle simply rubs against the holes in the front fork that holds it in place. Bicycle manufacturers quickly developed roller (cylindrical) bearings, ball bearings, and the adjustable ball bearings that bicycles still use, which allow changes in the fit as the bearings wear down. By 1879 ball bear-







Top left: *A brave heart and young bones were extremely useful for riders of "boneshakers."* Top right: *Some velocipedes were hand-pedaled, like this Improved Bicycle patented by John J. White in 1869.* Above left: *Connecticut inventor R. C. Hemming produced this amazing monocycle called The Flying Yankee.* Above: *Despite male ridicule, women also joined the velocipede craze. Many wore sedate dress on tricycles, quadricycles, or side-saddle bikes; others shocked society by adopting short skirts or bloomers.* Left: *The boneshaker was created in 1861 when Ernest and Pierre Michaux put a crank axle and pedals on a Draisienne.*

ings were widespread on ordinaries.

In his book, *Collecting and Restoring Antique Bicycles*, G. Donald Adams praises the ordinary. He claims the later ones could reach a top speed of 20 miles per hour. "The smoothness and responsiveness that result from pedaling a wheel that is driven directly with no mechanical loss from a chain . . . is exhilarating . . . . The elevation from which one views his surroundings is stimulating."

But ordinaries were hard to mount. Moreover, the concept had a tragic flaw. In order to get the fullest benefit of the smooth ride from the large wheel, as well as the best leverage on the pedals, the rider sat almost directly above the front axle. A little stone under the front wheel could topple the rider forward. Consequently, the market for ordinaries was limited to the acrobatic, the brave, and the foolhardy, who in England numbered some 200,000 in the early 1880s.

The search for a safer alternative gave rise to a number of peculiar cycles, some of which used the chain and sprockets that would eventually make it possible to reduce the size of the wheel. The Kangaroo had the outline of an ordinary, but the rider sat well behind the front axle and the front wheel was smaller than the ordinary. In order to compensate for the reduction in speed this would have otherwise entailed, the front wheel was geared up

with pedals attached to an extension of the front fork that turned the axle via a chain and sprockets.

The Star, an American bicycle first produced in the spring of 1881, tried to solve the safety problem by placing the large driving wheel in back, with the little wheel in front. Headers were no longer a problem, but the bicycle sometimes fell backward.

Yet another approach was the Lawson Bicyclette, an 1879 English machine. It was not a success, but it may have been the first commercial bicycle to use chain-and-sprocket gearing to the rear wheel. It retained the configuration of an ordinary.

All at once, between 1884 and 1885, several commercial safety bicycles were introduced in Britain, and within two years the new form crossed the ocean to America. In an article in *Scientific American* (March 1973), S. S. Wilson suggests that the invention of the modern "bush-and-roller" chain in 1880 was a prerequisite to the introduction of the commercial safety bicycle. The modern chain greatly reduced friction and wear.

The safeties caught on quickly yet failed for several years to send the ordinaries the way of the dinosaurs. Some historians suggest that pneumatic tires, invented in 1888, made the safety the clear alternative to the ordinary. "Have you ridden one of the hard-tire safeties of '85–'86?" demands George Garrettson, a Pennsylvania member of The Wheelmen, a national organization that collects and restores antique bicycles.

Thomas Stevens, the Around the World Bicycler, on the Expert Columbia.
BICYCLING WORLD AND L. A. W. BULLETIN, PLATE No. 2.

Left: *An 1888 issue of* Bicycling World *commemorated Thomas Stevens, whose Expert Columbia took him across America in 1884 and around the world by 1887.* Top: *The Acatene chainless safety of the 1890s was as sturdy as the operatic woman advertising it.* Middle: *By using a crank axle with chains and sprockets, the wheel size of the 1885 Kangaroo could be reduced.* Bottom: *Lawson's safety Bicyclette of 1879 pointed the way to modern bike design.*

"It's cruel. It fights the bottom and the top of every bump, pounding your spine.

"There was a good five years of commercial coexistence between the safety bicycle and the ordinary," Garrettson continues. "Then came the pneumatic tire, and boom, the high wheel was dead within eighteen months."

G. Donald Adams suggests that manufacturers were slow to introduce the safety because men didn't want women to ride bicycles. One manufacturer called its low-wheeled safety a "boy's" bicycle even though it was designed for women.

The ordinary was a bastion of male athletes. "I do know that there was a certain sense of adventure and sport associated with the high wheel," says Adams. He quotes a fellow who stuck with the ordinary long after the safeties were introduced: "Who would want to ride one of those? You'd be lower than a man on a horse."

But even the macho image had to give way when the ordinaries were defeated at the races. Step-up gearing, by which one turn of the crank gives more than one turn of the wheel, gave the safety such an edge that the ordinary never had a chance. A 60-inch wheel can travel 15.7 feet in one spin of the cranks; in tenth gear a typical 10-speed travels more than 26 feet.

Although some rather strange frames were built on early safeties, the diamond frame soon became the standard of the industry. The logic of this frame is simple. The triangle is the only rigid geometrical structure, and the diamond frame incorporates a triangle in the rear part of the frame, directly beneath the cyclist, for bracing. The fact that the front part of the frame has four sides is due to the need to accommodate torque on the frame from forces in the front wheel.

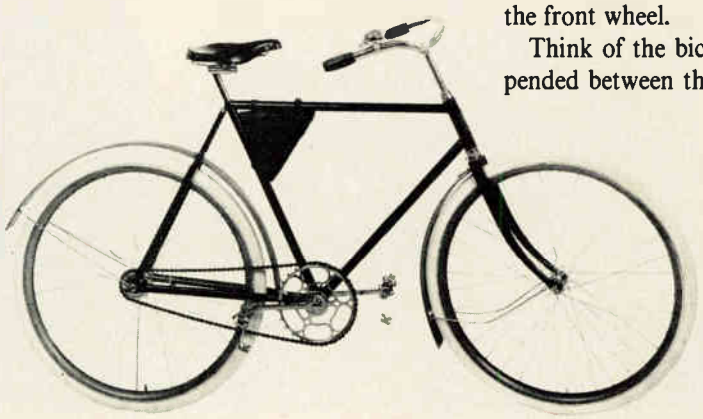
Think of the bicycle as a beam suspended between the two wheels, holding up the rider. Metal is strongest in tension or compression, weaker under bending forces. Normally such a beam would be subject to bending forces, but each bicycle tube is connected to others only at its ends so that a force that would otherwise bend one tube is taken in tension or compression by another.

Once the safety bicycle was in place, development of the remaining components was swift. Three-speed hubs and freewheels were available by the turn of the century, and the derailleur, a latecomer, was patented in 1909.

The major changes in bicycles during this century have been in materials and refinements of components. Why has the basic design remained the same for almost 100 years?

"The answer lies in the sheer humanity of the machine," S. S. Wilson stated in *Scientific American*. "The bicycle has evolved so that it is the optimum design ergonomically. It uses the right muscles (those of the thighs, the most powerful in the body) in the right motion (a smooth rotary action of the feet) at the right speed (60 to 80 revolutions per minute)."

In addition, the bicycle has all but eliminated friction from the bearings



Above: *Peugeot's 1910 safety has the same basic design as today's road bike.* Below: *The American Star had a small wheel in front to prevent falling on one's head.* Upper right: *A fairing reduces drag, here on a tandem racer.* Lower right: *Fully-faired bikes can break the 55-mph limit.*

and the road. The bicycle is so efficient that at 10 miles per hour, the cyclist's energy use is equivalent to 1,000 miles per gallon of gas.

But Chester Kyle, who bicycles to his job as professor of mechanical engineering at California State University, Long Beach, wondered how the modern velocipedes could be improved. In 1973 he encouraged students who took his special-projects course to study the bicycle. Two students decided to compare the rolling resistance of "sew-up" and "clincher" bicycle tires. In the process they discovered that wind drag was far more important than tire drag.

So Kyle studied bicycle aerodynamics, and he and Jack Lambie, a consulting aerodynamicist, founded the International Human Powered Vehicle Association and held the first annual race in 1975. The results have been phenomenal. The first year, the top speed was 44.69 miles per hour, but in 1979 three vehicles broke the national 55-mph speed limit and received ceremonial speeding tickets from the California Highway Patrol. The vehicles that can reach these speeds, called recumbents, are slung low to the ground, with the riders on their backs or stomachs, sometimes partially seated. But the real key to these high speeds is the fairing, an aerodynamic shell that encloses cycle and rider. At 25 miles per hour 90 percent of a cyclist's energy goes to cutting through the atmosphere; a full fairing decreases wind resistance a full 80 percent.

The fairing cuts through the air, but it can also act like a sail in crosswinds. A fully faired two-wheeler would risk being blown across the highway. Three wheels render it stable.

While these three-wheeled recumbents are competing in annual races, a few small companies have started marketing commercial recumbents with two wheels and no fairing. The rider is seated as if in a lawn chair, with feet on pedals that are out in front. These two-wheelers reduce wind drag by 25 percent, because only 65 percent as much frontal area is presented to the wind as is presented on a conventional bicycle.

The recumbent has several other advantages over conventional bicycles. The laid-back riding position subjects the rider to none of the pains in the hands and rear end that cyclists commonly complain about. It may allow the cyclist fuller lung capacity, unlike the hunched-over position of a 10-speed.

Since a cyclist can push against the seat back and use the full force of the leg muscles, the recumbent also offers more leverage for hill climbing. Some have criticized the recumbent's hill-climbing ability, but as Chester Kyle says, "I don't think most of the good riders have had enough experience on them to make a good judgment."

David Gordon Wilson, professor of mechanical engineering at the Massachusetts Institute of Technology and codesigner of the Avatar 2000 recumbent, thinks that some recumbents "greatly decrease the chance of fractured skulls and spines," since the cy-

Top: *At the 1981 International Human Powered Speed Championships, Olympian Eric Heiden prepares for time trials in a recumbent designed by David Wiener.* Right: *Heiden rides the same bike, without fairing, in the road race.* Below: *The Avatar 2000 was the first semirecumbent produced for the general public.*

clist would crash feetfirst instead of headfirst and would fall less distance to the ground.

Not everyone agrees the recumbent is safer. In the fifties Captain Dan Henry, one of the world's most famous bicycle aficionados and modern-day tinkerers, built a recumbent that he still rides. He uses his conventional bicycle more often, however, because he fears the low-profiled bicycle is too inconspicuous in traffic.

The nonfaired recumbent's fate as a competitor to the safety bicycle will depend on whether it is found to be safe by comparison. The fully faired recumbent's technological refinements have turned it into a specialty vehicle. Its width prevents it from slipping through city traffic like a bicycle, and slow city speeds prevent it from taking full advantage of its aerodynamics.

The resurgence of interest in tinkering with the basic shape of the bicycle has begun to push the state of the art of bicycle components. Manufacturers are now turning out streamlined tubing, brakes, and derailleurs and burying cables inside the tubing—measures that can cut wind drag by 5 to 10 percent. And you can now buy a fairing for a conventional bicycle that is mounted on the handlebars. It reduces wind drag by 20 percent, according to the manufacturer.

Manufacturers have never been so sensitive to the problem of air drag. Yet, ask any cyclist what the most unpleasant riding conditions are. The hardest day of my bicycle trip across the country was a day of 25- to 30-mph headwinds in the Great Plains. It was hard even to pedal downhill in low gear.

David Holzman is co-columnist for a weekly science column in the Baltimore Sun *magazine.*

CREDITS FOR PHOTOS AND ILLUSTRATIONS

PAGE 38: COLOR REPRODUCTIONS FROM THE COLLECTION OF BENJAMIN OLKEN; LOWER LEFT, CYCLES PEUGEOT U.S.A.; RIGHT, BETTMANN ARCHIVE. PAGE 39: LEFT, RANDA BISHOP; RIGHT, SHIMANO AMERICAN CORPORATION. PAGE 40: TOP LEFT, BETTMANN ARCHIVE; TOP CENTER AND RIGHT, *KING OF THE ROAD*, BY ANDREW RITCHIE (USED WITH PERMISSION OF TEN SPEED PRESS, BOX 7123, BERKELEY, CALIF. 94707); LOWER RIGHT, CYCLES PEUGEOT U.S.A. PAGE 41: LEFT CENTER, *KING OF THE ROAD*; ALL OTHERS, BETTMANN ARCHIVE. PAGE 42: CLOCKWISE FROM LOWER LEFT, HARVARD UNIVERSITY LIBRARIES; BENJAMIN OLKEN; *BICYCLES AND TRICYCLES*, BY ARCHIBALD SHARP (1896); NEW YORK PUBLIC LIBRARY. PAGE 43: CLOCKWISE FROM LOWER LEFT, BENJAMIN OLKEN; CYCLES PEUGEOT U.S.A.; RANDA BISHOP (TWO). PAGE 45: TOP TWO, RANDA BISHOP; BOTTOM, DAVID GORDON WILSON (FOMAC, INC.).

Dr. Porsche invites you to test drive the newest Porsche.

My family, beginning with my father, has been designing and building cars for over 80 years.

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Trial By Fire

A portrait of Underwriters Laboratories. by J. Tevere MacFadyen

In one corner of a room in a vast industrial building near Chicago, an ordinary household refrigerator endures extraordinary abuse. Its top is clamped to a steel frame bolted into the floor beside it. Its bottom, where the vegetable drawers would be, has been filled with sandbags to moor it in place. A tubular steel arm reaches across toward the refrigerator's handle. The arm, an elongated piston fitted at its end with a carpet-covered pad, is attached to the door handle by a short length of frayed, braided line. Every few seconds the piston retracts, yanking the door open, only to slam it shut again with an abrupt jab from its upholstered palm. The hushed hiss of hydraulics, the soft inhalation of the opening door, and the muffled thump of its closing produce a strangely pleasant rhythm.

The refrigerator suffers alone and at great length. Before the hydraulic arm rests, it will have opened and closed the refrigerator door 300,000 times, the equivalent of 20 openings every day for more than 40 years. During that period the door handle will separate slightly from its mountings. The door's hinges will loosen, and the molded-plastic shelves inside the door will be crazed with cracks and fissures. But none of this matters. What matters is that when that tired door slams shut for the three-hundred-thousandth time, it can still be opened from within by the application of fewer than 15 foot-pounds of force, an amount that might conceivably be exerted by a terrified four-year-old inadvertently trapped inside the refrigerator.

If the door pops open easily then, the refrigerator will have passed a child-entrapment test devised and administered by the safety engineers at Underwriters Laboratories. If it survives this and countless other tests, it will earn for its manufacturer the right to affix to the underbodies of such refrigerators a small, round seal bearing the initials UL encircled by the phrases "An Independent Laboratory" and "Testing For Public Safety." Labels like this are displayed on products included in generic categories from "Acetylene Generators, Low Pressure, Stationary" to "Skillets and Frying-Type Appliances, Household Electric." To receive such a label is to gain UL listing, and for every product listed, a set of standards has been developed, as well as a battery of tests designed, to insure that the product in question lives up to those standards. Underwriters Laboratories is the largest independent testing organization in the world, with testing labs in four states and a staff of thousands. It is an empire balanced on a tiny blue label.

The capital of the kingdom is Northbrook, Illinois, site of UL's corporate headquarters and largest laboratory. A bronze bas-relief plaque displayed in the headquarters building commemorates William Henry Merrill, who founded Underwriters Labs in 1894. At the dawn of the electric era, Merrill laid down a disarmingly simple operating phi-

ROBERT LIGHTFOOT

After 30 minutes of torching, a safe fails this burglary test if the door can be opened or if a two-inch hole appears.


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losophy that has weathered the subsequent technological fire storm essentially unchanged. He was less interested in how well things worked than in how well they didn't work and what happened when they failed. Merrill's inversion still rules. "What we basically do," explains a technician testing hand-held power tools, "is run them till they die, to make sure they die safely."

Safety is UL's solitary concern. Contrary to a prevalent popular assumption, the appearance of the UL mark on a product in no way affirms its inherent worth. Underwriters Laboratories, unlike Consumers Union, for instance, does not assess the relative quality of various competing brands. Except where safety is inseparable from performance—as would be the case with fuses or circuit breakers—performance per se is not evaluated. "To receive a UL listing, a vacuum cleaner doesn't have to be able to pick up dust and dirt," allows staff engineer Bob Harris. "It just has to be able to operate safely until it burns out and then burn out without creating a hazard."

The room where vacuum cleaners are left to die is a small, glass-fronted alcove adjoining the primary test lab of UL's Electrical Department. One wall is lined with industrial shelving, with squat, canister-type vacuum cleaners lined up cheek to jowl on each shelf. Facing them, on two carpeted platforms, upright machines go through their paces. The machines are fixed in place, but the platforms beneath them shuttle back and forth to mimic the sweeping of an endless carpet. The carpet in question has worn down to a nubbin, but the sweepers sweep on. The room contains perhaps four dozen vacuum cleaners, every one operating, and even with the door tightly sealed, their combined din is audible halfway across the lab, where a technician watches the digital thermometer monitoring the temperature inside a microwave oven's wiring compartment.

If an outsider is to spend much time at Underwriters Labs, it helps to have a sense of the absurd. "We analyze things to death here," one engineer told me. "That's what we're good at." UL's labs are strewn with evidence of that peculiar talent. The pristine, yellow-tagged "manufacturer's new work samples" are the exception; destruction is the rule. A partially disemboweled pinball machine grazes among crippled household ovens and ranges. A vending machine meant to dispense coffee and hot chocolate lacks its front and much of its innards. A word processor, its keyboard cover removed and a web of test leads clipped into its privates, appears to have been left for dead behind signs that read Danger: High Voltage and Do Not Disturb: Test In Progress.

An appliance doesn't have to work well to pass UL's muster. It just has to run safely and die peacefully.

ROBERT LIGHTFOOT

Left: *A sample of appliances tested in the electrical lab.* Above: *Sprinklers spray a burning crib of wood for half an hour; if the wood retains 80% of its weight and the ceiling temperature doesn't rise more than 530°F, they pass this test for controlling a fire.*

Off to the side, a fluorescent green machine identified as a "toggle switch life test actuator" jitters incessantly at a row of switches until they break off at the stem. An elaborate steel-pipe contraption beside it, bristling with clamps and bound with yards of gaffer's tape, permits technicians to jam the blades of circular saws spinning at 7,000 rpm. There are waffle irons and power-assisted hospital beds, toasters and hair dryers, a restaurant's infrared warming table, compressors and automatic garage-door openers. Everything in the place has been ill used and tormented. It looks like the fantasy workshop of a child who dissects clocks and radios.

"On a new microwave oven design, we'll use up maybe eight or ten ovens in testing," reveals a genial engineer named Bob Horvath. "We even surprise ourselves sometimes when we beat things to death and can't get them to crack."

"You don't learn any of this in engineering school," Horvath says. "You find that out real fast when you start here." If the practice of Horvath's profession seems often to verge on madness, the principle informing it is resolutely sober. "As a design and development engineer, you're so concerned with just making the product work that you may overlook the safety aspect." UL acts as a backup. In a sense UL owes its existence to industry's desire to defer a portion of its responsibilities. UL offers third-party certification of a product's safety.

"I have to believe that most of our clients use our services more to lessen their liability than for marketing purposes," Bob Harris says. As an engineer with the company's Follow-Up Services Department, Harris is especially sensitive to the unusual relationship UL must preserve with its clients. Manufacturers who pay dearly to have their products tested in the first place must also sign up for continued surveillance in order to qualify for listing. Field inspectors may make unannounced visits

ROBERT LIGHTFOOT

Aging fast. *After four days to six months in an oven heated up to 250°C, wire insulators (right) undergo tests for flexibility, elongation, and tensile strength.* Below: *48 vacuum cleaners run day and night, alternating eight minutes on with two minutes off, until they burn out. UL monitors electric-current leakage that can cause shocks as the machines age.*

ROBERT LIGHTFOOT

to factories. They'll pull products off the assembly line and take them apart to be checked against the UL engineer's report. When an inspector is less than satisfied, the manufacturer may be asked to halt production, if he wants to stay in UL's good graces. This can leave the manufacturer in the maddening position of having paid for the privilege of having his own plant shut down.

The company's engineers are hardly unaware of their importance. They know, for instance, that many manufacturers protect their flanks legally by demanding only UL-listed components. Still, the engineers tend to downplay their influence on product development and marketplace competition. They point out that UL standards govern only the safety of technologies and not their application or compatibility. At that, Harris contends, "Our standards are minimum standards, not maximum. UL is not in the business of making products as safe as possible. There are a lot of products we know we could make safer. We're in the business of making sure that a product meets a certain acceptable degree of risk."

Nevertheless, being in the business of determining what constitutes that acceptable degree of risk naturally confers considerable authority. Nowhere is this more apparent than in the emerging energy generation and conservation technologies. On contract to the Department of Energy, by way of various research facilities, UL has lately been in search of basic standards for residential photovoltaic power systems. It's a safe bet that the UL standards when released will exert formidable sway within the industry, just as UL listing of flat-plate solar collectors has already helped to winnow out that crowded field. Which raises a troubling question: To what extent might the publication of product standards have the effect, however unintentional, of blocking innovative but perfectly safe products that don't happen to conform to those specific standards?

ARTHUR SHAY

"We just test 'em," one engineer protests in response, and in the end, of course, it's the tests themselves—the heating and cooling and stretching and crushing—that are the heart of the whole endeavor. The technology of testing has come a long way since William Henry Merrill. UL's Casualty and

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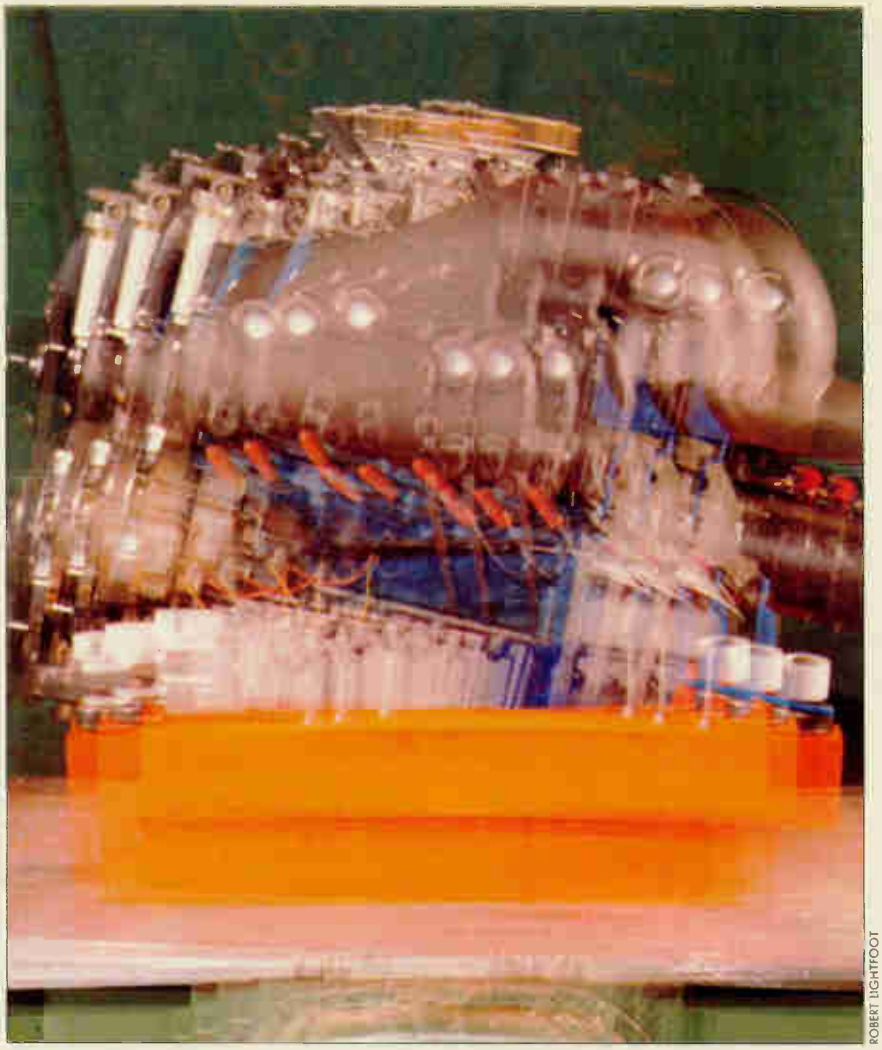
Shake, rattle 'n' roll. Right: *12 hours on a shake table simulate the effects of pounding waves and a marine engine's own vibration. UL checks for loosened or damaged parts that could create hazards.* Below: *To qualify for a UL rating, 9 out of 10 plates of an indoor, bullet-resistant glazing material must withstand the impact of a five-pound ball dropped on it five times from 10 feet above the pane.*



ROBERT LIGHTFOOT

Chemical Hazards Department employs an atomic absorption spectrophotometer to investigate the composition of paints and coatings. They evaluate the heat tolerance of wiring in ultra-high-temperature ovens and its resistance to cold in subzero freezers. They have available something known as a Weatherometer, whose thermostats and sprinklers and ultraviolet lamps may be programmed to reproduce unimaginably hostile climates. In the basement there's a reverb room, or "acoustic noise measurement facility," where products are measured for compliance with noise regulations. In this eerily quiet, hospital-green chamber, a burnished-aluminum, dish-shaped, rotating diffuser hovers overhead, scattering sound waves downward to two microphones, which feed into an electronic console. UL's labs, as a rule, are littered with digital-readout instruments, computer terminals, and highly specific test equipment.

All this impressive technical firepower may wind up trained on something relatively mundane. In a wing of the Fire Protection Department, a building pervaded by a faint but unmistakable charcoal-broiled aroma, I encountered a couple of technicians on the job, lounging in battered office chairs with their feet up before a blazing fire. Two

ARTHUR SHAY

fires, actually, burning in fake Colonial-style woodstoves designed for insertion into fireplaces. Each woodstove insert was housed in its own imitation hearth. Thermocouples studded the woodstoves, their plywood enclosures, the floor in front of them, and even a pair of simulated mantels fashioned from two-by-eights laid on shelf brackets above them. A thick tangle of wires fed into a data processor between them. Every seven minutes a buzzer would sound, and the technicians would rise from their seats to feed the flames with perfectly standardized blocks of Douglas fir. Then the computer would disgorge a long printout, and the technicians would settle into their chairs again. To most people, the scene would appear absurd. To the earnest engineers of Underwriters Laboratories, it's all part of the business of running things till they die.

J. Tevere MacFadyen is a New York–based free-lance writer.

What makes this radar detector so desirable that people used to willingly wait months for it?

Anyone who has used a conventional passive radar detector knows that they don't work over hills, around corners, or from behind. The ESCORT® radar warning receiver does. Its uncanny sensitivity enables it to pick up radar traps 3 to 5 times farther than common detectors. It detects the thinly scattered residue of a radar beam like the glow of headlights on a dark, foggy road. You don't need to be in the direct beam. Conventional detectors do. Plus, ESCORT's extraordinary range doesn't come at the expense of more false alarms. In fact, ESCORT has fewer types and sources of false alarms than do the lower technology units. Here's how we do it.

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ESCORT's secret weapon is its superheterodyne receiving circuitry. The technique was discovered by Signal Corps Capt. Edwin H. Armstrong in the military's quest for more sensitive receiving equipment. ESCORT's Varactor-Tuned Gunn Oscillator singles out X and K band (10.525 and 24.150GHz) radar frequencies for close, careful, and timely examination. Only ESCORT uses this costly, exacting component. But now the dilemma.

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For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true backspace, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

All of which should come as no surprise, especially when you look at the family tree. After all, Epson *invented* digital printers almost seventeen years ago for the 1964 Tokyo Olympics. We were the first to make printers as reliable as the family stereo. And we introduced the computer world to correspondence quality printing and disposable print heads. And now we've given birth to the finest printers for small computers on the market.

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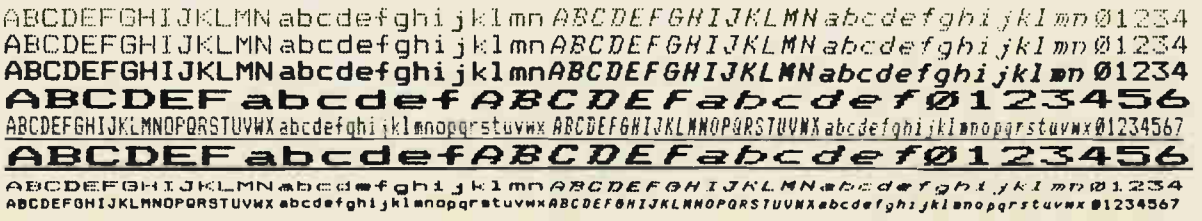
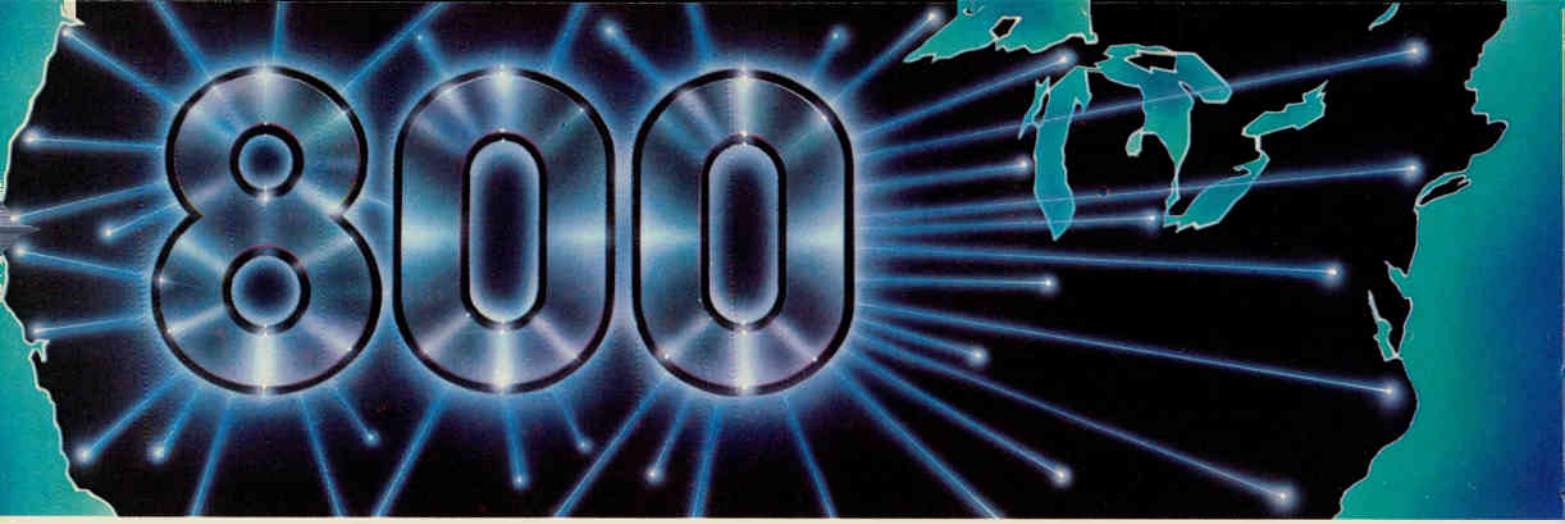
Bidirectional printing	X	X	X	X	X	X
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	X	X	X	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	X	X	X	X
Selectable paper feed			X		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		X	X	X
Programmable form length	X	X	X	X	X	X
Programmable horizontal tabs	X	X	X	X	X	X
Skip over perforation			X	X	X	X
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	X	X	X	X	X	X
Italics character font		X		X	X	X
Special international symbols				X	X	X
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	X	X	X	X	X	X
Subscript/Superscript print mode				X	X	X
Underline mode				X	X	X
10 CPI	X	X	X	X	X	X
5 CPI	X	X	X	X	X	X
17.16 CPI	X	X	X	X	X	X
8.58 CPI	X	X	X	X	X	X
DOT GRAPHICS MODE						
Line drawing graphics				X	X	X
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	X
CONTROL FUNCTIONS						
Software printer reset		X		X	X	X
Adjustable right margin			X	X	X	X
True back space		X		X	X	X
INTERFACES						
Standard — Centronics-style 8-bit parallel	X	X	X	X	X	X
Optional — RS-232C current loop w/2K buffer	X	X	X	X	X	X
RS-232C x-on/x-off w/2K buffer	X	X	X	X	X	X
IEEE-488	X	X	X	X	X	X

*Tandy TRS-80 block graphics only available with GRAFTRAX 80.





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The knowledge business

Henry Kloss (the K in KLH) is not famous as a successful businessman. With his projection TV starting to take off, he doesn't particularly care.
by Richard Wolkomir.
photography by Herb Snitzer

The Wizard's Revenge

Kermit the Frog is astonishing, the size of a tyrannosaur. The green face is five feet high. More Muppets flash on the huge television screen. They are enormous, hypnotic in this shuttered room in a factory in Cambridge, Massachusetts.

"That whole idea of the flaky, baggy-clothed inventor—one is finally reconciled to that," says a mellow baritone voice from the dimness below the screen. "A bit annoyed, though."

Like the Wizard of Oz revealing the Emerald City's jumbo talking head to be so much technological flimflam, Henry Kloss (pronounced KLŌS), father of the projection-television industry, rises from the set's controls, where he has been trying to find the sound. He is not tall, built something like Smokey

the Bear, and bald above the treeline. But his human presence instantly converts the giants on the screen behind him to electronic phantasmagoria.

"When projection TV first appeared, people thought it was an evil monster, Big Brother in the living room," Kloss says, not even glancing at the colossal Muppets, his blue eyes distracted.

The set, he says, runs continuously for tests, and someone has disconnected the sound. But his mind is on a question his visitor asked earlier, about his reputation as the eccentric wizard of the home-entertainment industry. It is a subject he has pondered often. It makes him grit his teeth, which he does when irritated. Why are they saying these things about Henry Kloss?

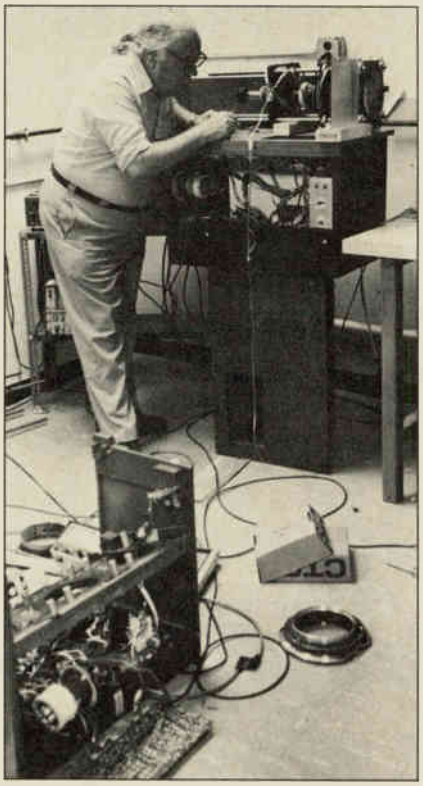
They say, for instance, that he was a creator of the high-fidelity industry. That is OK. After all, he was a founder of Acoustic Research, which marketed the first compact hi-fi speaker for the home. He was the K of KLH, which introduced reel-to-reel tape decks with Dolby noise reduction. And he founded Advent, the company that built some of the best-selling speakers in the industry's history.

And they say that Henry Kloss is the father of large-screen projection television, which also is OK. After all, it was to market such a television that he founded Advent. And he is the founder of Kloss Video and the inventor of the Novatron tube for projecting blown-up video images onto a screen.

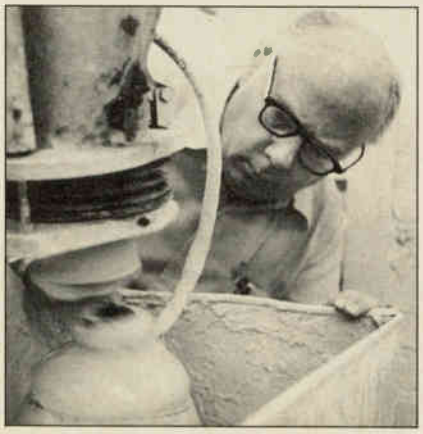
They—people in the home-entertainment industry, in the press—also say that Henry Kloss may be a crackerjack inventor, but he is no businessman. And that definitely is not OK. "One is not a *tinkerer*!" he fumes, his teeth clenched.

They rub it in. Not only, they say, is this founder of famous companies no businessman, but he is an eccentric who wears his gray hair long and braided in back. Which happens to be true. And they say he drives an aging Checker instead of the Cadillac befitting a corporate tycoon. Which also happens to be true. And they say he avoids the pronoun *I*, usually referring to himself as *one*. Which is, in fact, how he talks.

He objects to some parts of his image. "One is not a tinkerer!"



Above: *Kloss refines a new tube for high-resolution TV at one of the small workshops scattered around his factory. A NovaBeam Model Two in the last stages of engineering sits in the foreground.* Below: *Lenses for Novatron tubes are polished by machine.*



And they say he wears only tan chinos (individualized by stains) and blue shirts (also stained) with buttons popping open. And it does happen that today, showing a visitor through the plant, he is wearing tan chinos (a grease stain on the left calf) and a blue button-down-collar shirt (stains on the left shoulder) with buttons popping open.

But what really nags is Advent, because the company—despite its products' popularity—went broke. Was it because Henry Kloss was no businessman? So said the banks. Or was it because he was way out there on the marketing frontier, shepherding in a big new technology, and they cut his supply lines? Kloss prefers the latter view.

So how did a technically minded fellow from Tyrone, Pennsylvania, get into these corporate adventures in the first place? According to Kloss, it was sort of by accident.

After high school, Henry did construction work for a year, earning enough to enroll at the Massachusetts Institute of Technology.

"Had always been interested in mechanical things and just wanted to go to engineering school, headed in no particular direction," Kloss says.

Mostly he studied physics. But insufficient money forced him to drop out to work, mostly for housing contractors. He also had his own one-man business, handcrafting speaker cabinets. "One then learned how miserable the loudspeakers were, got some interest in the field," he says.

War was raging in Korea, and Kloss was drafted. Teaching electronics to GIs at Fort Monmouth, New Jersey, just a short train ride from Manhattan, proved a blessing; in the evenings he took courses at Columbia and New York University. And he became an enthusiastic theatergoer.

One evening an NYU instructor told the 22-year-old Kloss about his idea for a revolutionary new loudspeaker: Make the speaker box an integral part of the speaker's acoustical structure, not just a container. Start with a small, loosely suspended cone, one whose natural resonant frequency would normally be too low. Then use the air trapped in the

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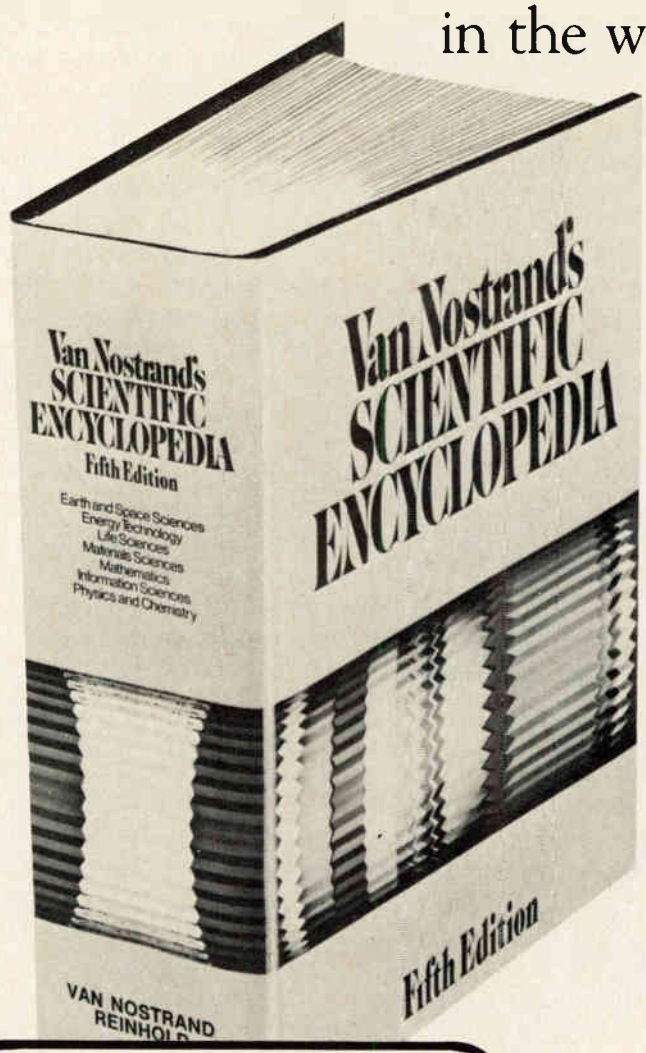

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He waves at his desk apologetically. "They say this doesn't present a good image," he mumbles as if he doesn't see the point.

In contrast to the starkly clean manufacturing plant, Kloss's office is so cluttered the telephone is balanced on a stack of papers.

cabinet as part of the suspension system, raising the cone's resonant frequency in the process. The system should produce bass notes with quality as good as that expected of a larger conventional system.

"It was obvious—higher quality, much more compact," says Kloss. He immediately told the instructor, Ed Villchur, that they should build it. Villchur wanted one of the major companies to bring it out. But they turned him down cold. And so in 1954, out of the army and back in Cambridge, Henry Kloss, together with Ed Villchur and two friends who had $5,000, started Acoustic Research. Experimenting with Villchur's idea, Kloss worked out a fixed proportion at low frequencies between the cabinet's volume and the loudspeaker's efficiency—a relationship that is a crucial factor in modern speaker design.

In 1958 Kloss and two of the partners split from Acoustic Research to found KLH, aiming to refine the acoustic-suspension loudspeaker. They produced the first portable stereo with components-quality sound, the KLH Model Eleven. Then the partners sold their successful company to the Singer Company. Kloss stayed on, but he was increasingly dissatisfied. He felt there was little left to do in audio.

In 1967 Kloss left KLH to found Advent Corporation. He had decided that television needed a shot of technological vitamins. Why not see it big? Why not have a theater in your living room? Henry Kloss loved theater, after all. Advent would make it happen.

Kloss funded his projection TV research by putting Advent in the audio business. The company produced high-quality, shelf-size speakers. And noticing that the time seemed right for hi-fi tape cassettes for home stereo play, Kloss designed the first cassette tape deck with Dolby noise-reduction circuitry. Then he pioneered the production of a new Du Pont invention, chromium dioxide tape that produced exceptionally good sound in the high-frequency range. By 1975 Advent's sales had topped $16 million a year.

Meanwhile, Kloss was working hard on projection television, using an approach that had always worked well for him: noticing the need for a new product, ascertaining that the technology needed was already available, and adapting the technology to his own purposes. The idea for large-screen TV had surfaced in 1933. To Kloss, the fact that nothing had been done with it did not mean that nothing could be done. He had seen the audio industry pass up the chance to make excellent new equipment, shunning Ed Villchur's idea; he suspected that television's possibilities had not been exhausted either.

What most attracted him was projection television's efficiency. Like ordinary TV, it sweeps a patch of phosphor with a beam of electrons, making it glow to create an image. But the more area the beam sweeps, the more electricity it draws. And projection TV's phosphor patch, although intensely bright, is tiny. That means projection TV would produce more light with less power. And a key motivation for Henry Kloss is making efficient use of materials and processes. "Hate waste in any form," he says.

The only technology Kloss lacked was a reflective screen that would concentrate light, bouncing it back to viewers in a horizontal swath. From the ceiling or floor, such a screen would look dark, but who watches television from there? Designing the screen, however, proved baffling.

Reading *The Wall Street Journal* one

Ringling Museums' Medieval Fair, Sarasota, Florida. Shot with an 80-200 mm zoom lens at f/5.6 at 1/125 sec

The more you care about color, the more you need Kodacolor II film.

America's Storyteller

day, Kloss snapped to attention. An article mentioned that a Kodak engineer, noticing aluminum foil's reflective peculiarities in his kitchen one day, had decided that the material, modified, would make a good screen. It was just what Kloss needed. "Fortunately," he says, "one lucked out."

To project the image onto the screen, he used an optical mirror like those often used in telescopes. And for efficiency, he put the mirror inside the video tube itself. It worked beautifully. But the tube had more than 35 steel parts inside, each requiring careful alignment, and that made manufacturing complicated.

Advent went ahead with production, and before long the company's ledgers were bleeding red ink. Behind the loss was Kloss's conviction that he had to rush his TV design into mass production, ahead of phantom competitors he believed were nipping at his heels. He spent millions training workers for large-scale production of the TV sets. And planning for mass marketing, he lowered the sets' prices—too low to turn a profit at Advent's small production level. Income from the company's audio sales was insufficient to cover the expenses of the video division. In the second half of the 1974–75 fiscal year, Advent recorded a $3 million loss.

Kloss believed the problem was just a temporary blip. But the bankers threw a tantrum, demanding the company hire a business expert. Enter Peter Sprague, a wealthy young man who specialized in turning around ailing companies. Sprague described Kloss as "an ingenious Yankee tinkerer"—but obviously no big businessman. Finally, in October 1976, forced out of the decision making by the newcomers, Advent's founder left the company.

Back in the basement of his Cambridge home, Kloss set up a laboratory, complete with glassworking equipment and a "clean room." He worked there incessantly, alone, a ticked-off wizard out to make a point. Projection TV, he was going to prove, could be manufactured efficiently and economically. All he needed to do was design a video tube that would be simple inside, a tube without all the adjustable metal fittings of his original design.

Soon after Advent introduced the projection TV that Kloss designed, its ledgers were bleeding red ink.

One year later, Kloss emerged from his basement workshop with the Novatron tube. His solution was elegant. He made the projection mirror an integral part of the tube, its back. A glass cylinder connects the mirror to the tube's faceplate, and Kloss put a phosphor patch on the faceplate's inner surface. An electron beam shoots through the mirror at the back of the tube, traverses the evacuated cylinder, and paints an image on the phosphor patch. The image is reflected by the mirror through the faceplate to the screen, immensely enlarged.

Advantages? Few parts. And the matching curves of the mirror and faceplate make them easy to align, a manufacturer's dream.

The factory at Kloss Video that Kloss has equipped to produce his televisions is as unorthodox as the man himself. The main entrance of this strong young company, on a moderately seedy industrial sidestreet, is a door in a wall. Inside is a drab yellow warren of windowless cubicles, inhabited by earnest-looking men and women, mostly wearing blue jeans. Wires snake along the walls and ceilings. Boxes clutter hallways and offices. And everywhere Novatron tubes stand on their faceplates with electron guns sticking up, like cupcakes with a single candle.

Padding through all this in Wallabees, blinking distractedly, is the boss. He avoids his own cubicle, which is so heaped and piled and stacked (the telephone is balanced atop a leaning tower of paper) that he no longer uses it. He waves at all this apologetically, explaining that the company has grown, is in transition, soon to be remodeled. "They say this doesn't present a good image," he mumbles, as if he doesn't really see the point.

But the manufacturing plant, which Kloss designed himself, is pure NASA. Here all is dairy white. Phalanxes of whirring automatons precisely grind out faceplates and mirrors. Assembled tubes ride a conveyor through a kiln, which automatically fuses them into finished Novatrons.

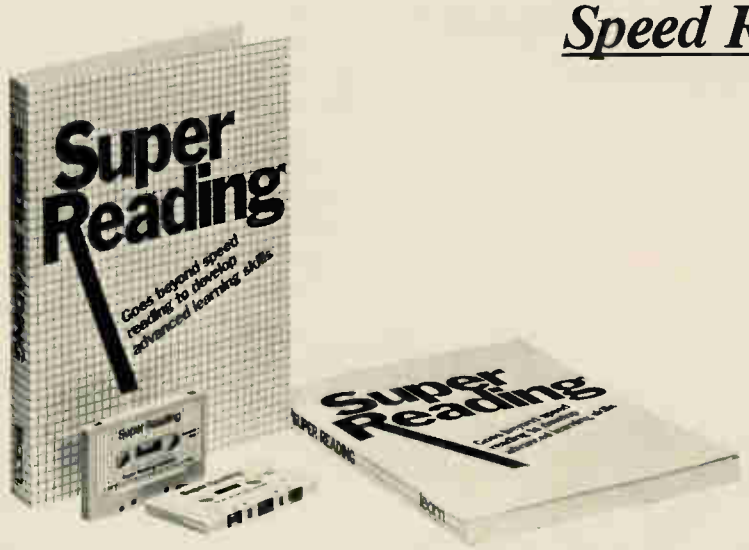
Henry Kloss is like his factory, contradictory, as if Wernher von Braun, Lee Iacocca, and one of Tolkien's hobbits had all crawled into the same body. For instance, this founder of corporations and father of industries claims to be a very lazy guy. "The companies weren't started because one had to have a place to put energy," he says. "You had to summon up some energy because that job was to be done, it ought to be done, it should be done."

What aspect of his work does he like best? "Don't enjoy any of it," he insists. "The most fun is just seeing it all going well and knowing there's nothing particular to worry about now."

Money, pleasant as it is, has never been his motivation. (The first major indulgence the income from his businesses has produced for him and his wife, Jacque, a Radcliffe astronomy graduate, is a 160-acre plot on Martha's Vineyard, where he plans to build a home. For now, the Klosses spend vacations there in a large tent.) What has driven him, he says, is not money but the urge to create new technologies so right for the times that other companies must follow suit, verifying the importance of the designs. For instance, when Kloss Video came along and he needed a high-quality small speaker for his sets, they were available. Why? "Because I taught the world to make them," he says, for once uttering the taboo personal pronoun.

But it is the business issue that most stirs up contradictions. The charge that Henry Kloss is no businessman still makes his teeth clench. Yet he has considerable disdain for the whole process: "What the hell is this idea that there's

Speed Reading Breakthrough



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"I'll make the products, I'll take the money, and I'll go down as a flaky, baggy-clothed inventor."

The concave screen on this projection TV required the viewer to sit at least eight feet away to see a sharp image. The most recent version projects the picture on a flat, white wall only four feet away.

some magical thing called business?" he grumbles. Accounting is important, he acknowledges. But he points out that you can buy that skill by the hour. Otherwise, it's just decisions. Fire this guy? Rent this space? Kloss says, "The fundamental question is, do you make this product or not?"

Meanwhile, hidden in Kloss Video's innards is a small workshop, an out-of-the-way corner with a bench. It is the private laboratory of the company's chief executive officer. It is here that, as he puts it, "many hours are spent." He is refining the Novatron design, playing with the phosphor layer, adjusting the accuracy of the optics, rejigging the electron gun. Tinkering.

An odd activity for a corporation chief, some might contend. He insists that his taking on this work is simply efficient. And who knows what might pop out of this workshop?

Contradiction can indeed pay off. In an industry producing mostly one-piece sets, he sticks to a separate projector and screen. With most screens shrinking to fit small rooms, he keeps his large—"They're sort of missing the fruity import of the whole thing," he muses. "The whole thing is size." And while most of the industry is in a brightness race (a race in which Kloss is thus far the winner), he has just brought out a new, screenless model, the NovaBeam Model Two, that projects onto any wall. It requires a slightly dimmed room, like a theater. But its cost is a relatively low $2,200.

Why, then, is he so disgruntled with his reputation as an eccentric inventor? It makes the company seem a one-man show, he says, and a parochial one at that. In fact, he points out, the day-to-day operations are in the hands of highly skilled professionals who do not wear their hair in braids.

His own contribution? "Probably wanting to give away as much work as I can," he says.

But the wizard has his revenge. On a Kloss Video loading dock stand boxes of used Advent equipment, bought when the company recently dissolved. The business aces who took Advent over proved there is no special magic in an M.B.A. Meanwhile, Kloss Video has begun to turn a handsome profit.

Kloss is delighted by a recent article citing Polaroid's founder as "no businessman." "It's a consolation to see they say it about him too," he says. "So, finally, I give that one up—I'll make the products, I'll take the money, and I'll go down as a flaky, baggy-clothed inventor."

The future? Kloss says he operates simply by keeping alert, by always thinking, "What is important *now*?"

"And the answer," he says, "is probably cleaning up my office."

Richard Wolkomir is a free-lance writer and frequent magazine contributor who lives outside of Montpelier, Vermont.

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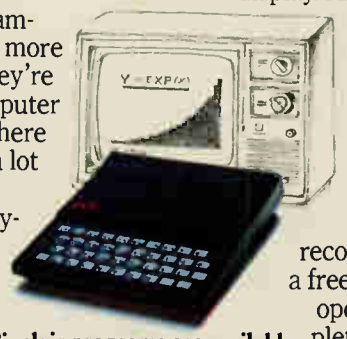

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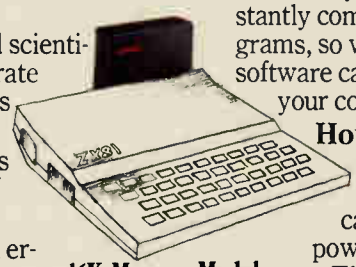

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Superrecords

High-priced LPs are the product of new technologies and some old-fashioned TLC. by Robert D. Long. photography by Peter Hudson

Especially to those with trained ears, the sound quality of the general run of records leaves a lot to be desired. Such was the opinion of musician Lincoln Mayorga when he set out, 14 years ago, to produce a superior type of record—a superrecord. Mayorga (now perhaps best known as one of the soundtrack pianists for the film *The Competition*) and engineer Doug Sax felt that the major faults in existing LP records were contributed by the tape recorder, the inescapable common denominator of all recording at the time. But getting rid of the recorder was not easy. Signals from the microphones would have to be fed through a mixing console to one or more disc lathes on which master lacquers were cut as the music was played. Any flub by anyone—musician, mixer, or lathe operator—ruined the entire side. No "we'll fix it in the mix" or "we'll patch in the second horn part from Take 3." Whatever happened in the studio while the lathes ran went onto the master—to be used or scrapped.

Mayorga and Sax considered the results spectacular, however, and when their records were marketed—under the Sheffield Lab label—so did many audiophiles. That raised another problem that conventional LPs don't share. If a master is damaged or wears out, a new one can always be cut from the master tape—if there is one. But although Sheffield has always made back-up tapes of "direct-to-disc" recordings, recutting the master from this would compromise the concept. Press runs thus were limited by the number of good stampers that could be made from the lacquers cut during the session. Even running four lathes, Sheffield realizes fewer than 500,000 pressings of any one recording, no matter how big a hit it turns out to be. That failures can't be compensated for by running the successful releases into the millions adds to the cost of the discs.

Above: *Quality-control check of a mother disc is crucial in making a superrecord. Here the grooves are being microscopically examined as the disc is played. Rack holding other mothers is seen in foreground.* Right: *Stages in the manufacture of a record, top to bottom: lacquer master, master mold ("father"), mother, stamper, the final disc, and raw vinyl from which the final disc is pressed.*

Extra care applied to the cutting of the lacquer master does not a superrecord make; high standards of plating and pressing are necessary too, even at the cost of slowed production. Accordingly, superrecords use longer press cycles, thicker vinyl, and the best possible vinyl formulations.

To permit accurate recovery of the ultrasonic signals used in the now-discontinued Quadradiscs, Victor Company of Japan (known here as JVC) had experimented with special mastering techniques and vinyl formulations, and the company's advanced technology has proved important to superdiscs. But the biggest name in superdisc pressing surely has been Teldec of West Germany, known for its high-quality vinyl and pressing technique. It has turned out superb products for small independents and for premium lines from the majors. Some producers say they can now get equal quality (if not quantity) from specialist plants in this country using Teldec vinyl, but the bulk of the pressing still is done outside the United States.

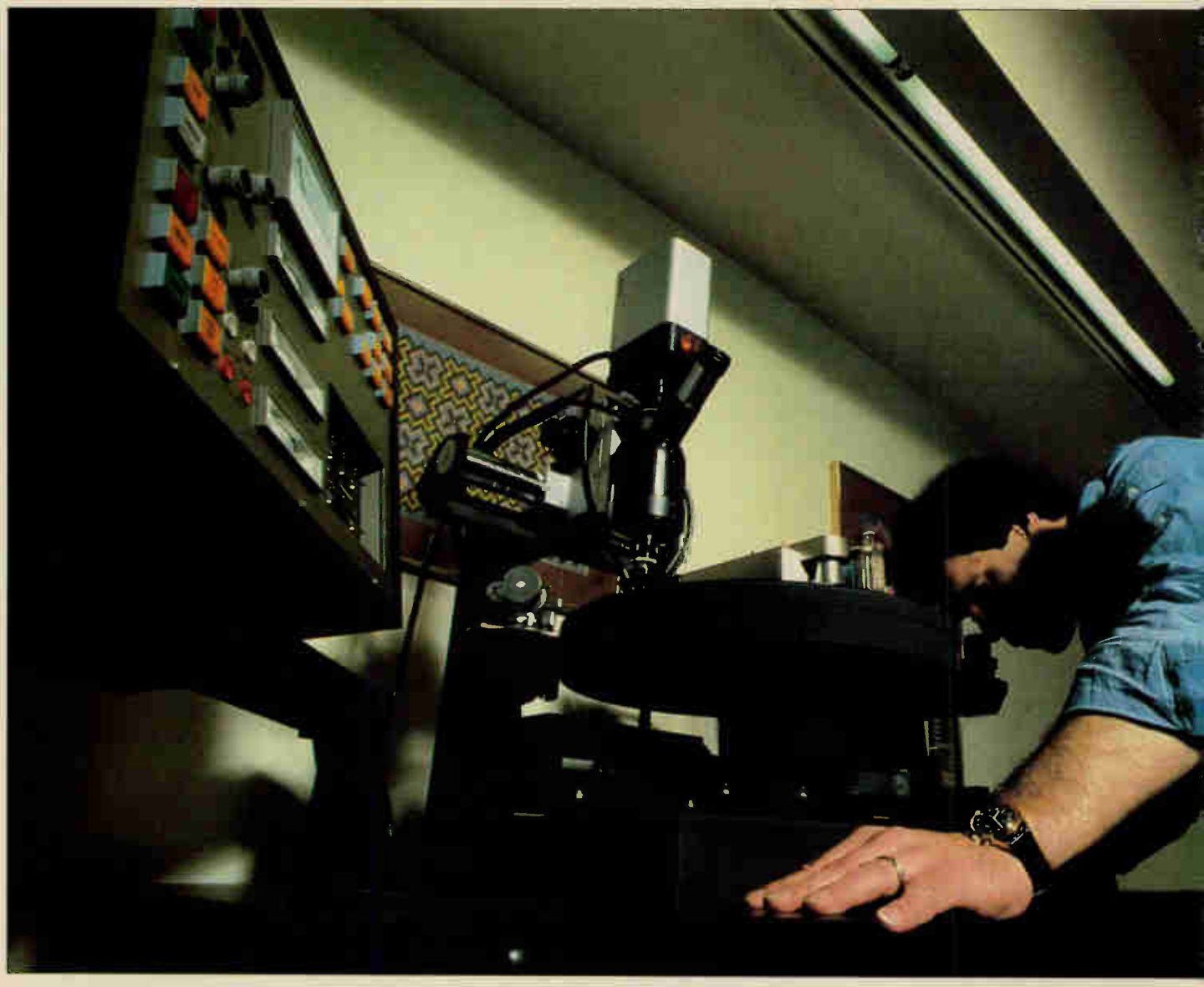
JVC's ultimate contribution to superrecord technology, as it turned out, was one that Sheffield couldn't use in its direct-cut discs: half-speed mastering. JVC originally tried slow mastering speeds as a way of avoiding attenuation of its ultrasonic signals due to the limited ability of the cutting system to handle high frequencies. If the lathe speed is reduced by half, the speed of the master tape must be too. This cuts the signal frequencies in half and the power requirements of the cutter by a factor of four. The slow lathe speed also helps create an exceptionally precise groove contour. For this reason, half-speed mastering has become a staple superrecord technique where tape—rather than a live studio feed—is the signal source. Mobile Fidelity, in particular, has applied it to important recordings that already had been issued by major companies in conventional form. RCA has followed suit by creating the Red Seal .5 Series (a direct reference to the cutting speed) of reissues from its own vaults.

Then there is the question of the lacquer blanks used in cutting the masters.

continued on page 76

STORY DESIGNED BY PETER HUDSON. LOCATIONS COURTESY OF EURODISK PLATING CO. LTD., N.Y.C. & STERLING SOUND STUDIOS, N.Y.C.


Red Seal
DIGITAL
RCA



Pressing records; times have hardly changed.

Technological change in the phonograph industry has seldom been radical. Highly touted "revolutions" such as electrical recording and the long-playing disc have touched only limited (though highly visible—or audible) elements of the technology. Today's records trace their ancestry to disc records mass-produced early in this century.

Every phonograph record starts with a master blank. The blank must accept a cut from a specially shaped stylus with microscopic fidelity. Tearing, fracturing, or other deformation of the cut produces distortion or noise in the playback sound. In the early days, blanks were made of wax, a material that accepted a cut very accurately but, partly because of its need for refrigeration, was hard to handle. By the 1950s a state-of-the-art blank consisted of a substrate (invariably aluminum today) coated with a special acetate lacquer.

Once the master has been cut—usually from a tape recording—and the cutting engineer is satisfied that nothing is amiss, it is plated in much the same way masters have been treated for 80 years. A layer of conductive metal is deposited on the lacquer master. Then this microscopic layer is built up by electroplating to create a solid metal mold. The resulting mold could be used to press records, but its lack of durability would limit quantity. Therefore, the initial mold, called a master or a master mold, is subjected to two more plating operations. First, it is plated just the way the original lacquer blank was. The grooves cut by the stylus into the blank were molded as ridges, or a "negative." The second plating reverses the shape, once again, to produce grooves. This mold of the original mold is known as a mother and can be played just like a record. Normally, several mothers are produced from a single master mold, and each can be plated repeatedly to create several third-generation metal parts that, like the master mold, have ridges instead of grooves. These final platings are known as stampers and are used to mold the records.

Recently, Teldec of West Germany has introduced direct metal mastering (DMM), a process in which the metal mother is made by cutting rather than

Repeated meltings destroy the resiliency of the vinyl used to make records, so "virgin" vinyl is preferred for making quality discs.

Far left: *A technician leans over a cutting lathe to check the grooves with a microscope as a master is cut.* Top: *The master mold is prepared for plating to produce the mother.* Left: *The newly made mother is separated from the master mold after plating.* Above: *The mother disc is washed with a special goat-hair brush before the next plating step. Similar cleaning precedes all stages that require plating.*

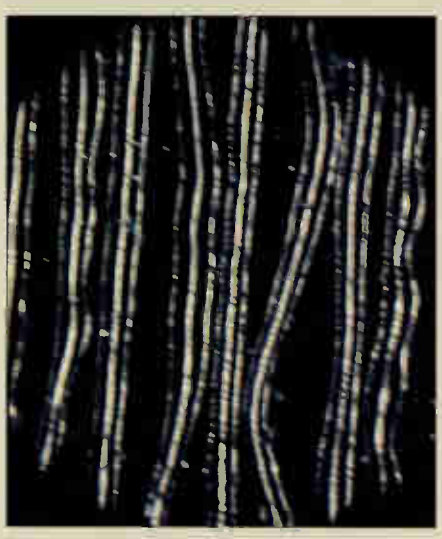
plating and the lacquer stage is eliminated. Details of the technique are not yet available, but it starts with blanks consisting of a layer of copper deposited on a stainless-steel substrate and uses ultrasonic waves in the cutting process. The advantages claimed for DMM include stampers entirely free of ticks and pops. Unlike lacquer the material does not allow echoes of loud passages to affect adjacent grooves. DMM, however, is not yet used in the United States.

Vinyl (or polyvinyl chloride), now ubiquitous in phonograph discs, had been used prior to 1940, but it was not until after the war that compounding and pressing techniques succeeded in making it satisfactory in groove accuracy and wear properties. Proprietary additives, whose identities and proportions are jealously guarded, are involved in the transformation. There is no dispute, however, that some vinyl compounds—at least, in the hands of some pressing plants—are able to produce records with less audible noise and distortion than others.

There also is no argument about the critical importance of the pressing operation itself. Though injection-molded polystyrene has been widely used to form 45-rpm singles and even LPs, and some high-quality discs have been made with vinyl powder, the preferred raw material for quality LPs these days is vinyl "biscuits." A biscuit is a premeasured quantity of vinyl powder that has been warmed just enough to hold it together. Repeated meltings destroy the resiliency of the vinyl; hence there is an emphasis on "virgin" vinyl for quality disc making. The biscuit—usually, along with the labels, aligned by a stud that forms the center hole—is placed in a press that resembles an oversize waffle iron, with the two stampers for top and bottom plates. Steam enters behind the stampers to heat and soften the vinyl; cold water then flushes through the same course to cool the press and at least partially solidify the vinyl.

At this point the record must be removed from the press, the flash (vinyl that has squeezed out and still adheres to the edge of the record) removed, and the disc packaged or otherwise preserved from ambient dust. These last steps cannot be performed with the vinyl warm enough to be malleable or permanent deformation can result.

—Robert D. Long



Above: *Press on which vinyl "bisquit" (top right) is formed into a finished record. Vinyl is squeezed between steam-heated stampers—one per side—by literally tons of force. Stampers are chilled to remove the record. Length of the pressing cycle—from about 14 to 27 seconds—is crucial to quality.* Left: *Microscope photo of the grooves of a record showing how pitch (the distance between grooves) varies with modulation. Adjustment is automatic when a disc is cut from a tape but manual in direct cutting.*

Sound—or Music?

How is it that companies can get away with selling records so poorly made that they spawn competing superrecords whose major feature is improved quality control? The answer, according to Stephen F. Temmer, president of Gotham Audio Corporation in New York, lies in the habits of the record-buying public. "What most people don't understand," says Temmer, "is that the product is music, not records." When a new release by a major artist appears, music lovers buy it, even when the ticks, pops, and surface noises are severe. Most listeners get involved in the music and don't notice the faults. A profit-oriented company is therefore going to concentrate on quantity at the expense of quality. Good sound, on the other hand, is sold by companies that don't have major artists under contract.

But things are beginning to change a little, and first-rank artists are becoming available on carefully made records. For example, Eugene Ormandy and the Philadelphia Orchestra are available on Telarc and Delos labels, Seiji Ozawa and the Boston Symphony Orchestra on Hyperion and Telarc, Morton Gould on Varèse Sarabande and Chalfont, and Diahann Carroll with the Duke Ellington Orchestra on Orinda. In the domain of rock music, the J. Geils Band, Police, and Loggins and Messina can be heard on dbx-encoded discs, and there are Mobile Fidelity rereleases of attractions like the Beatles and Gordon Lightfoot. Finally, since today's lower-ranked artist is often tomorrow's star, superrecords preserve what sometimes prove to be in retrospect important performances.

—Harold A. Rodgers

For best results, the blank's aluminum substrate must be perfectly flat and must be coated with a uniform and sufficiently thick film of lacquer. More important, the lacquer must have precisely the right consistency to deliver a cut of minimum noise and distortion. A certain amount of black magic is invoked here by the manufacturers of the blanks, who are secretive about lacquer formulations and coating methods.

Lacquer blanks differ according to manufacture and are inconsistent from batch to batch; they also change with time. Fresh lacquer tends to be soft; as aging takes place, it first turns tough and eventually begins to show signs of cracking. The moment of perfect suitability for cutting can't be determined by inspection or even by dating. Normal practice is to make a test cut outside the area in which the music will be recorded and play back this cut. Blanks are then evaluated in terms of the quantity and quality of their background noise. Standards are obviously higher for superrecords than for ordinary commercial issues, steeply increasing the rejection rate. Engineers for Telarc Records report that often 40 or more blanks are rejected before an acceptable one is found.

Since the blank continues to age after cutting, it should be processed at once. Even when pressings are to be made overseas, most producers look for plating plants near the mastering facility.

The most important and potentially far-reaching element in superrecords, however, is one that also involves genuinely new technology: digital recording. In theory, at least, there's hardly a problem in conventional analog magnetic recording that isn't banished from the digital domain. Noise, distortion, high-frequency losses with repeated playings, noticeable splices, and so on are unknown in digital recordings.

Although Nippon Columbia of Japan—known here under the Denon brand name—was the first company to offer digitally recorded discs commercially, Telarc Records has been the notable pioneer of digitally recorded superrecords. Telarc uses recording equipment developed by Soundstream, another U.S. company. Soundstream also contracts its services to numerous other record companies.

Digital master tapes are now almost commonplace, and many receive only standard treatment through disc mastering and pressing. Thus some of the superiority of the digital technique never reaches the consumer's ears. But a case can be made that this is true even of superrecords. If the full potential of digital recording is to be realized, the argument goes, the LP itself will have to give way to a disc that retains the music in digital form right up to playback. Such discs are in the works [see "Bach in Bits," Oct./Nov. 1981].

Recently, dbx, a company that produces signal-processing equipment, has promoted a series of discs in which the wide dynamic range (the difference between the loudest and softest sounds) of a digital recording is compressed onto a standard analog disc and reexpanded on playback. CBS Records has introduced its somewhat similar CX encoding amid some controversy over the claim that CX discs give acceptable quality when played back without decoding. No such claim is made on behalf of dbx discs.

The compact DAD (digital audio disc) developed by Philips of the Netherlands and Sony Corporation of Japan may appear on the market (at about $20 for a pocket-size disc holding twice the recording time of a 12-inch LP) as early as next year. It seems a safe bet that whatever the quality of their current discs, companies with libraries of digital recordings will waste no time reissuing them in the DAD medium, if and when it comes.

Robert D. Long has been reporting on electronics and audio for some two decades—including 13 years as audio-video editor of High Fidelity *magazine—and has firsthand experience in the recording studio.*

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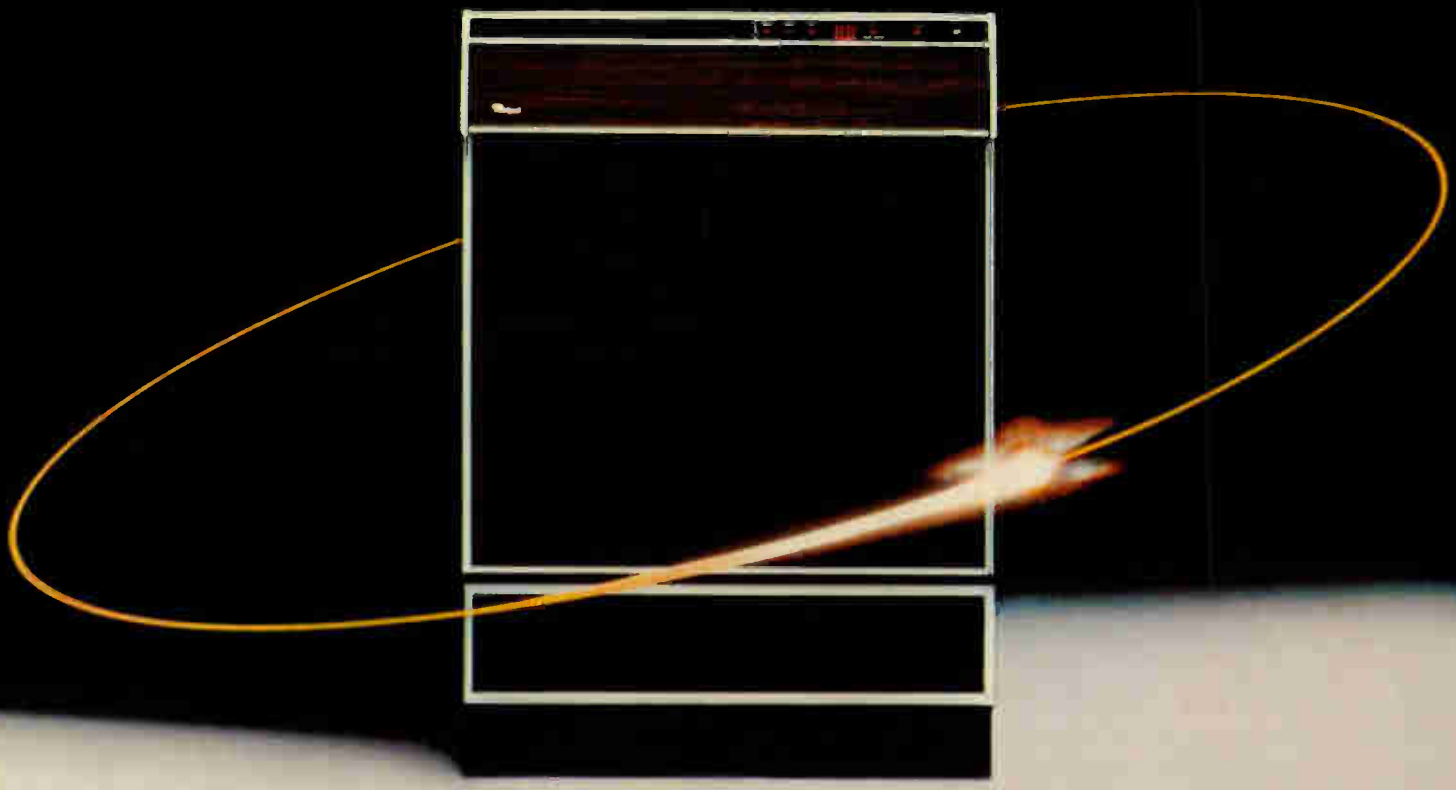

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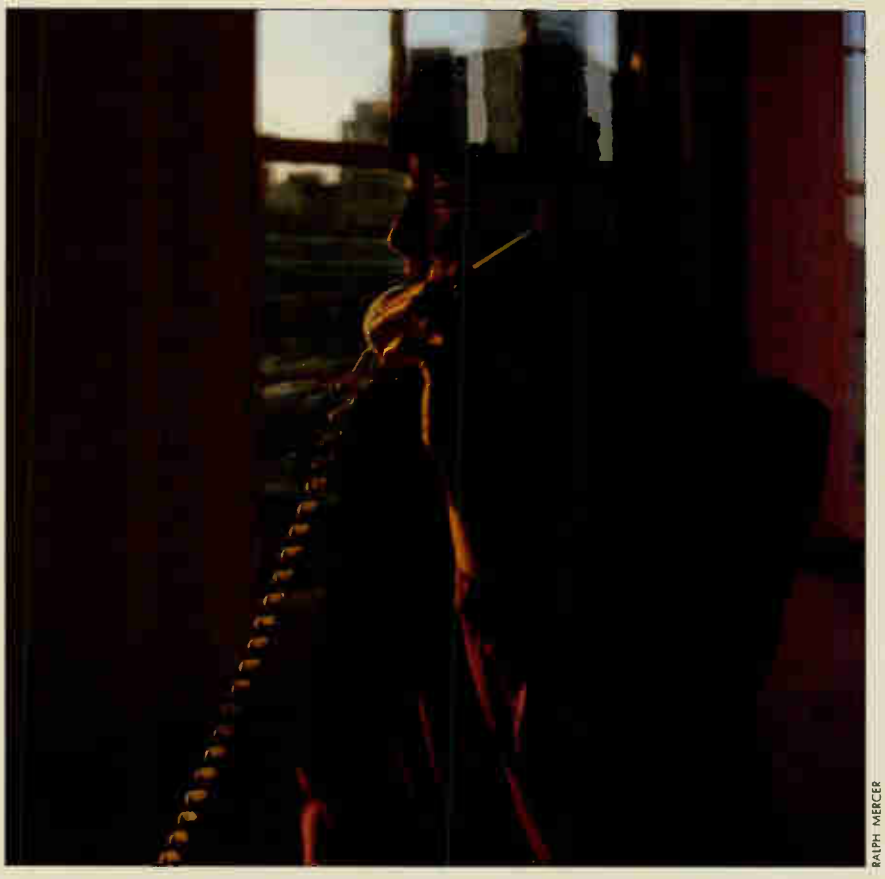
RALPH MERCER

As a writer, I depend on my telephone. It's my main source of news, research, and assignments—and my main link to social life. If I'm not around to answer my phone, I'm half out of business and three-quarters out of the social whirl. Yet there are times I can't cover it, times I'd just as soon not, and other occasions when I need to be selective about it.

That's why I use an answering machine. It answers my calls when I'm out and takes messages. When I'm in, it lets me hear who's calling before I decide to pick up or lets me ignore the phone while otherwise occupied. And it relays my messages to me when I'm away.

Some newer models do even more. They count messages, let you change outgoing messages by remote control, or automatically change those messages at scheduled times. With more than a dozen major brands and several dozen models around, the choice is wide.

You can buy an answerer for surprisingly little. The $80 Phonesitter P-50, for example, is a bare-bones machine. Its single tape holds 36 repetitions of factory-recorded, outgoing messages, plus space for 36 incoming messages up to 32 seconds long. It will answer calls and let you hear them on its built-in speaker. Fast-forward and rewind functions make it easy for you to find specific calls on the tape. You can also decide how many rings to let go by before the machine answers: one ring if you're too busy to take calls and don't want to be bothered, or more if you want a chance to answer before the machine does.

Model P-70, for $20 more, adds a microphone so you can tape your own outgoing messages. You can also tape both sides of a phone conversation if you're home and want a permanent record. Another $30 gets you model P-90, with a pocket-size beeper that commands the machine to play your calls back when you call in from outside. The beeper signal is tone-coded to prevent unauthorized parties from having access to your calls. The coding scheme, though, is not very sophisticated.

The big limitation of low-cost machines like these is that they use a single tape. Putting your outgoing message and incoming calls on separate tapes can make a machine a lot more versatile. Since the outgoing-message tape is an endless loop, you need record its message only once. If this tape is easily changed, you can build up a library of outgoing messages to cover any and all occasions. Incoming-message tapes are usually recorded on standard cassettes.

With separate tapes, the lengths of incoming and outgoing messages are easily made independent. Some dual-tape machines have fixed incoming-message lengths (selectable from 30 seconds to 30 minutes), but more and more (such as Panasonic's Easa-Phone KX-T1505 and KX-T1530) are voice-operated, staying on until the caller hangs up or stops talking. (This feature is known as VOX.) That saves not just tape but also the time you'd otherwise spend listening to blank tape after short calls. Phone-Mate's $300 SAM-950 even backspaces to delete "null" calls, those on which callers decline to leave a message. Since an oversensitive VOX

system could be confused by noise on the line, some VOX machines limit the amount of time per call too.

What happens when the tape runs out? Some machines just stop answering the phone, which is frustrating, especially if you're trying to phone in for your messages. Others may continue to answer without recording messages. To spare you the wrath of callers who think their messages got through to you, Panasonic's KX-T1520 and 1525 ($320) switch to a second announcement, telling callers that you're out and can't receive messages.

Listening to blank tape is a bore and a waste of time, so most machines tell you if calls have been received. Low-priced models use an indicator light; more expensive units have counters to show either the number of calls recorded or the length of tape used. The latter is especially useful if you would rather let your calls accumulate instead of erasing them each day.

Most units include rewind so you can go back to the beginning of the day's messages or replay a call to check details. But fast-forward, which is often not included, is handy too. It allows you to skip past messages you'd rather not attend to. Phone-Mate's Audio-Scan lets you sample messages quickly before deciding which ones to listen to in detail. When you rewind the tape, you'll record new messages over the old—but if the new ones are fewer and shorter, you may hear leftovers. Many decks have a provision for erasing the old messages manually or "last-message" tones to tell you when you've reached the end. Several machines (from Cobra, ITT, Panasonic, and others) permit you to leave messages for other family members while you are home. The intended recipients can either play back the tape or beep in from outside. This feature also enables you to use the answerer as a dictating machine.

Getting your messages isn't all that you can do by remote beeping. Cobra's AN-3500 and Phone-Mate's 950, for example, let you backspace to rehear messages you didn't quite catch first time through. Code-A-Phone's commercial model 5500 has remote backspace and fast-forward. Record-A-Call's 850 remote lets you decide whether to add new messages onto already recorded ones or just overlay the old ones with the new. Panasonic's KX-T1525 and 1530 and Webcor's ZIP 1010 ($380) let you call in and change your outgoing message.

The Webcor ZIP and ITT's Perfect Answer 2 (Model PC6500, under $350) even eliminate the beeper, allowing you to call in with your own voice. Phone-Mate's new IQ-3000 (about $430) will respond to three-digit codes punched in on touch-tone phones; it can also be programmed to switch between different messages at preset times. In Japan, Sanyo has demonstrated a prototype that recognizes spoken words to control both the answerer itself and household appliances. If you don't mind using a beeper, you can control appliances by phone today with BSR's System X-10 Telephone Responder.

Installing answering machines has gotten a lot easier. Thanks to the plug-in "modular" jacks used on most new phone installations and many answering machines, you can often set your answering system up without using tools. But don't forget that FCC regulations require you to inform your phone company that a telephone answerer will be in use on your line. When buying, try to get a money-back guarantee from the store. Since you can't get in-store demonstrations, you may not discover the machine's weaknesses until it comes home.

—Ivan Berger

THEA SHAPIRO

Electronic Green Thumb

The Micronta Light & Moisture Meter from Radio Shack is a hand-held electronic tester for checking the growing conditions of houseplants. Incident light is sensed by a solar cell, and moisture is sensed by a slender metal probe attached to the instrument by a coiled cord to allow easy handling. Both measurements read out on the same scale, the choice of one or the other being determined by the setting of a switch. The tester is self-powered and comes with an instruction manual. Cost of the device is $7.95.

Contact your local Radio Shack.

High-Speed Film for Color Slides

A new color film, said to be the fastest available to the consumer, has been introduced by 3M Corporation. Rated at ASA 640-T (and capable of being pushed to ASA 1280 and 2500), the color slide film is balanced for tungsten incandescent light. According to 3M it gives good results with fluorescent light, although for flash photography or outdoor use a Wratten 85B filter is necessary. Sold in 20- and 36-exposure rolls, 3M's ASA 640-T 35-mm Color Slide Film can be processed by conventional E6 chemistry.

3M Department PH82-203, Box 33600, St. Paul, Minnesota 55133

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**Manufacturer's suggested retail price. Price does not include tax, license, destination charges, aluminum sport wheels, touring interior and other optional or regionally required equipment.

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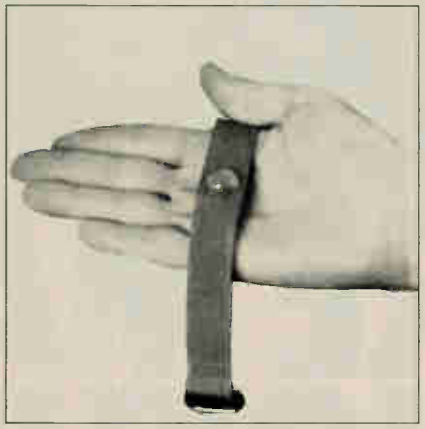
THEA SHAPIRO



British Brain Twister

Chris Wiggs and Chris Taylor, who run a small London design company called Origin Products, have devised what they hope will be England's answer to Rubik's Cube. Called Orbit (in the United States it will be sold as The Orb), the puzzle is a ball split into two hemispheres. The two halves can be rotated against each other to produce a variety of patterns in the U-shaped channels on the outside of the ball. At the start, the channels are in the form of four concentric rings; after a few twists and turns, they can be turned into, for example, a double helix.

The key to the game is the series of 56 beads of different colors that fit into the channels. Twisting the ball's halves allows the beads to cross over into different channels; the idea of the game is to return the beads to their original positions. This can be difficult, not to say time-consuming, as the number of possible combinations is astronomical (5.92×10^{27}, according to Wiggs and Taylor, who confess they have been too busy to count them all). When the puzzle reaches the United States (the target date is late summer), it will be sold by Parker Brothers; the price should be around $6.50.

Parker Brothers, P.O. Box 1012, Beverly, Massachusetts 01915, Attention—Consumer Response Department

Motion-Sickness Remedy

AcuBand is a drugless treatment for seasickness based upon Japanese Shiatsu, or acupressure techniques. Pressure applied to a Shiatsu point on the surface of the inner forearm, approximately three finger widths above the crease of the wrist and between the two flex tendons, causes the nausea and discomfort associated with seasickness and motion sickness to disappear. AcuBand is a simple strap with a round button on its inner side that can be worn to create the necessary pressure. The cost of a pair—one for each arm—is $9.95 by mail order, plus $1 postage.

Medquip, P.O. Box 794, Metuchen, New Jersey 08840

TV Audio-Pitch Corrector

Video buffs who want to review recorded programs at high speed and still be able to understand the audio portion may find the VV-100P Voice Tracker from Showtime Video Ventures of interest. By lowering the pitch of the audio signal, the unit abolishes the "Donald Duck" sound of a tape run faster on playback than when it was recorded. It works at up to two and a half times normal speed. Compact in size ($4\frac{1}{8}$ by $3\frac{1}{4}$ by $8\frac{1}{4}$ inches), it carries a suggested retail price of $337.

Showtime Video Ventures, 2715 5th Street, Tillamook, Oregon 97141

HOW IT WORKS

Power Steering

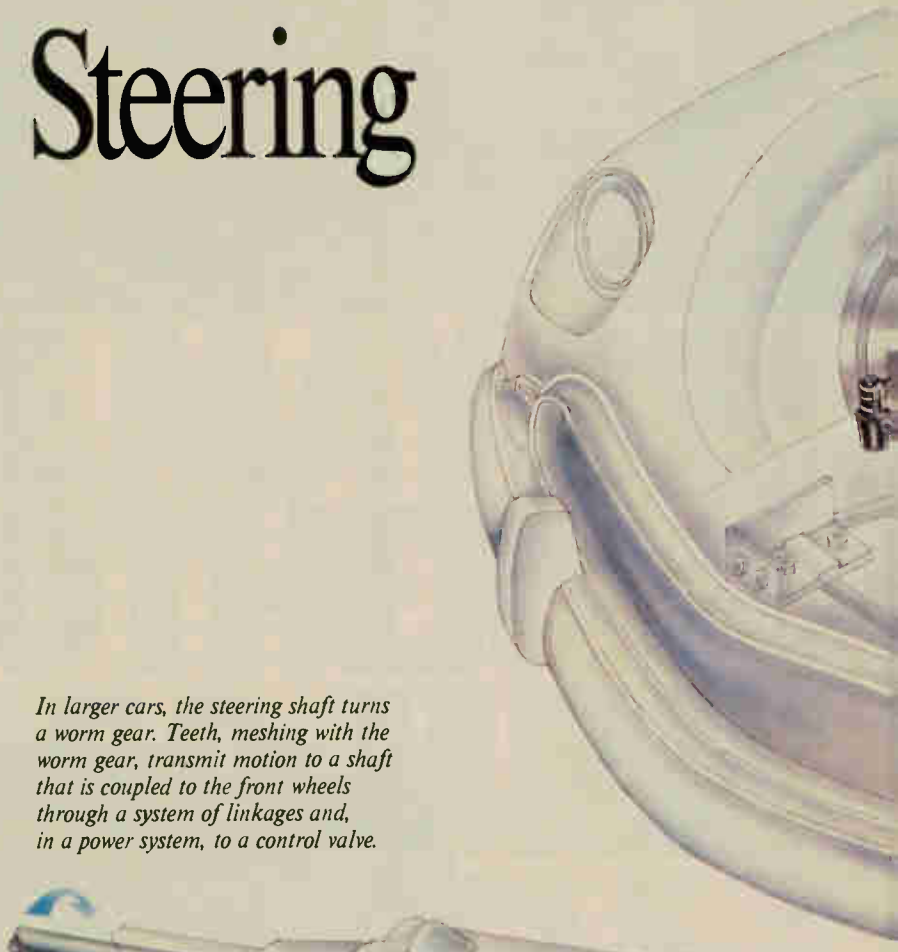
In 1912 the Touraine Six five-passenger touring car weighed 2,800 pounds and ran on tires only four inches wide. Forty years later, a car of equivalent majesty such as the Cadillac Fleetwood sedan weighed nearer to 5,600 pounds and carried its bulk on tires eight inches wide. By this time America had taken to wheels and often found itself in red-faced exhaustion wrestling an oversize, overweight car out of a parking space. Everybody—92-pound weaklings, petite women, burly cab drivers—wanted a little help with the steering wheel.

Answering the need, car manufacturers borrowed power-assisted steering from construction equipment and military vehicles. In the last 30 years power steering ("PS" in the used-car ads) has become so much the norm that it is now found on cars as small as the Honda Accord LX coupe.

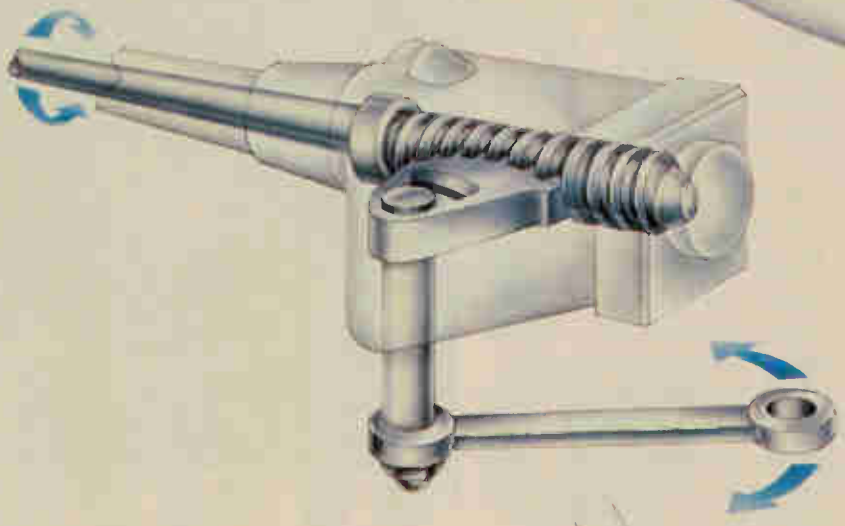
As a safety feature, the basic manual-steering system is kept intact, with power assistance added. That way, should the power system fail, the manual system remains as a backup, although it requires substantially greater muscular effort. (In large boats and construction equipment, the controls are often so remote from the actual steering device that the system is made totally hydraulic.)

Like many technological achievements, power steering is not a totally unmixed blessing. First, any help the driver gets ultimately imposes a fuel-economy penalty. Next, the very availability of the system helped spawn a generation of overly large, heavy cars. Further, the ease with which the system operates can obscure faults in the tires and suspension system and can lead drivers to make drastic steering inputs just when finesse is needed, as when driving on icy roads. Also, the diminishing quality of "road feel" with increasing assist leads to the phenomenon of long, heavy cars—the ones that should be most stable—weaving gently down an interstate highway. However, given that most driving is done in cities in the context of many tight turns and packed parking lots, power steering certainly earns its keep.

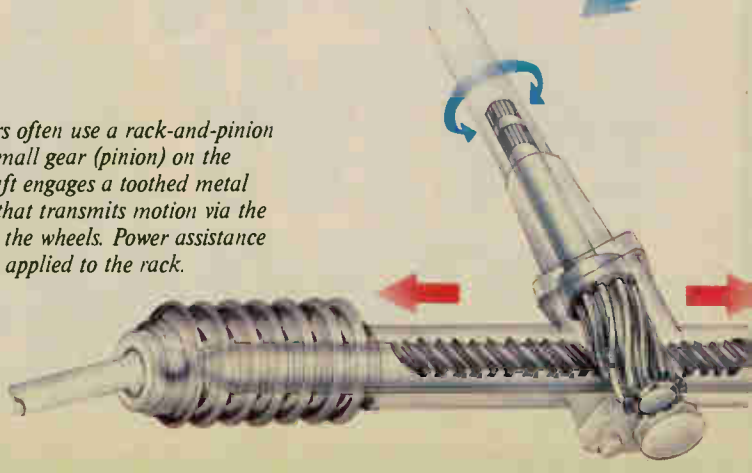
ILLUSTRATIONS BY JEREMY ELKIN



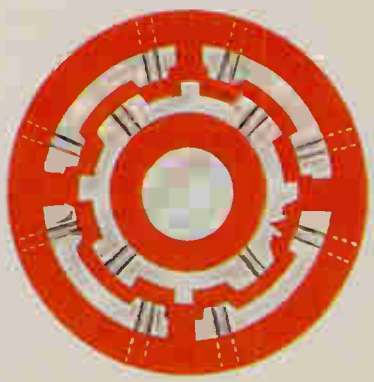
In larger cars, the steering shaft turns a worm gear. Teeth, meshing with the worm gear, transmit motion to a shaft that is coupled to the front wheels through a system of linkages and, in a power system, to a control valve.

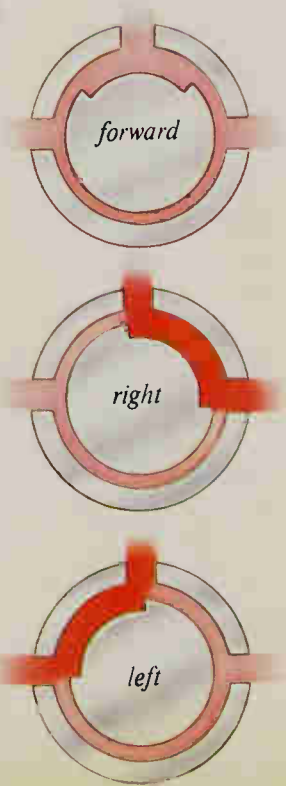


Smaller cars often use a rack-and-pinion system: A small gear (pinion) on the steering shaft engages a toothed metal bar (rack) that transmits motion via the tied rods to the wheels. Power assistance is generally applied to the rack.



The principal valve in a power-steering system is the spool valve, which resembles a spool with channels in it. As it is rotated by the steering shaft, more oil flows to one side or the other of the power cylinder.



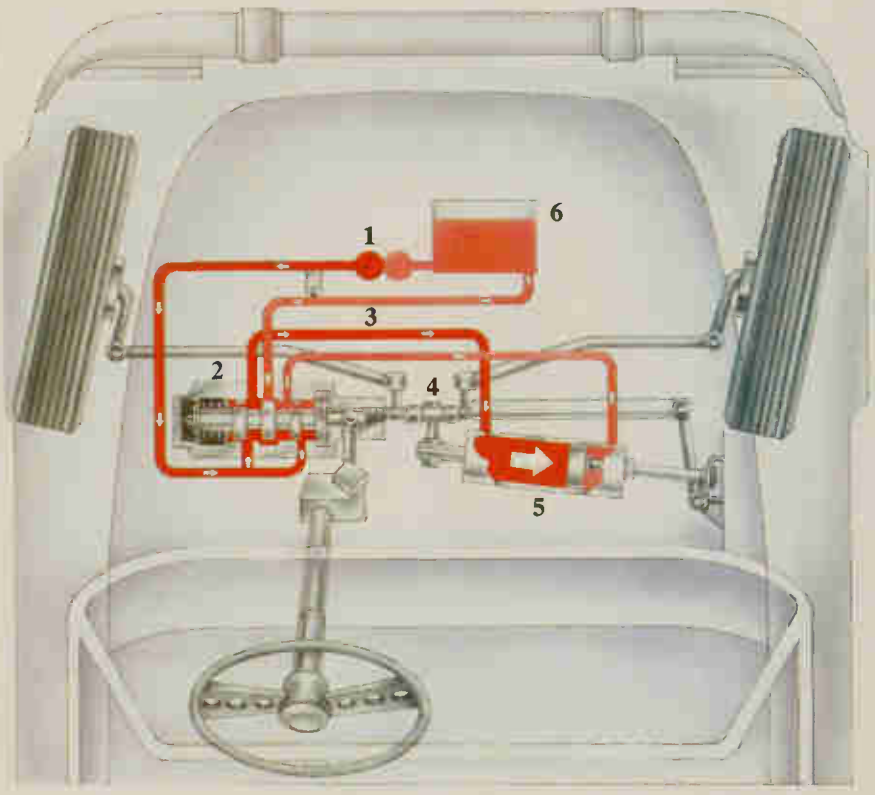


The power in power steering comes from the fuel tank by way of the engine. A drive belt transmits engine power to a pump that sends oil—automatic-transmission fluid—to the steering system. The oil, in turn, transmits force to a piston that provides assistance in turning the front wheels. Motion of the steering shaft is coupled to a valve that directs the oil. Oil pressure is applied to both sides of the piston at all times, but the balance favors the direction in which the piston is to move. To provide resistance to the steering wheel and give the driver a sense of "road feel," the piston does not generate quite enough force to turn the front wheels to one side or the other. By making up the difference, the driver exerts enough force on the steering wheel to experience a realistic impression of communication with the road. This arrangement also lets the driver return the steering wheel to the neutral or centered position without the need to override hydraulic pressure manually.

In the event that the power system fails, the basic manual system remains fully intact. Substantially more muscular effort is necessary, but the vehicle remains steerable.

continued on page 88

Going with the flow: How the hydraulic system does its job.



Details of the oil flow are shown schematically. Oil under pressure flows from the pump (1) to the spool valve (2). The pump is of the positive-displacement type that impounds oil and forces it into an outlet passage rather than sucking it through using atmospheric pressure, as most fuel pumps do. To assure adequate steering force, the pump delivers oil to the system at a pressure of about 125 pounds per square inch. Upon reaching the spool valve, the oil is directed more to one of two conduits (3, 4) leading to opposite sides of the power cylinder (5). Whichever conduit receives the least pressure also acts as a return path for oil. Back at the spool valve, the spent oil is finally ducted to a reservoir (6) that feeds the pump to complete the circuit.

As shown, the system is executing a right turn. When the steering wheel is once again centered, the spool valve equalizes pressure on both sides of the power cylinder, deactivating the system and cutting off the flow of oil.

To protect the pump and the engine from excessive loads, the system is equipped with a relief valve that opens if the oil pressure exceeds the designed working value. However, when the steering wheel is turned to one of its extreme positions and held, the relief valve itself may experience overload. In this case it protests by emitting a high-pitched squeal. Since this condition also tends to impose a heavy load on the pump, its drive belt may slip and add its note to the general cacophony. That is what causes all the noise when a driver attempts to park a power-steering-equipped automobile in a very tight spot.

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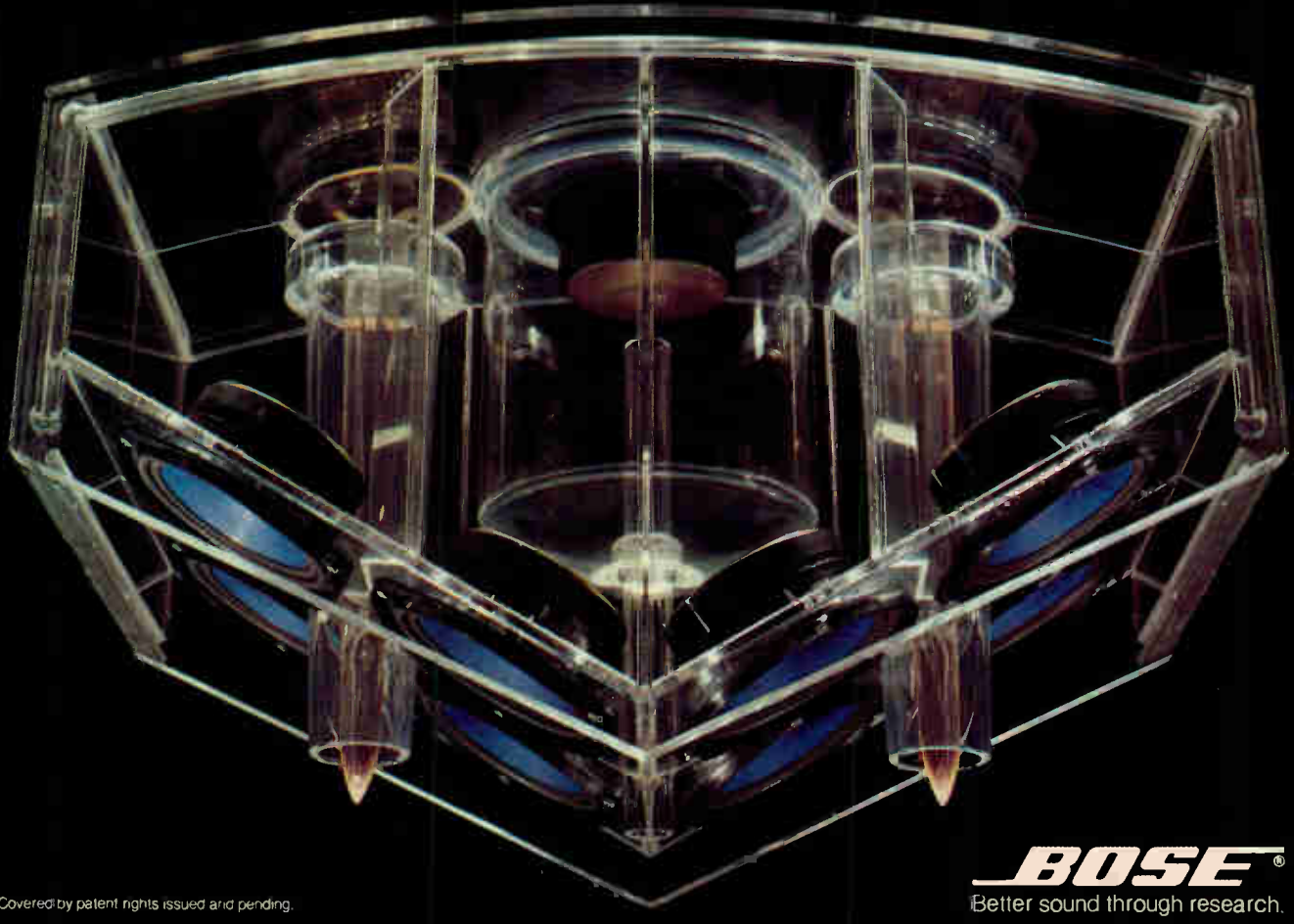
Past The first Bose 901 Direct/Reflecting® speaker was introduced in 1968. It was the result of research started twelve years before at M.I.T. under the direction of Dr. Bose. This speaker introduced the fundamental advances of a balance of reflected and direct sound, nine matched, full-range speakers, active equalization and uniform power response — all very controversial concepts at the time. But the performance produced by this new technology soon earned for the 901 speaker its international reputation as the most highly reviewed loudspeaker regardless of size or price.

Present The founders of Bose, all from the field of science, decided that Bose would reinvest 100% of its profits back into the company to maintain the research that was responsible for the birth of the 901 loudspeaker. The unprecedented success of the Bose® 901® in world markets, coupled with this 100% reinvestment policy, has created what we believe is by far the best research team in the industry. This team has made over 300 design improvements in the 901 speaker since its introduction — including such basic developments as the Acoustic Matrix™ Enclosure (illustrated), the helical, low impedance voice coil and the advanced full-range precision drivers. And the new concept of controlling the spatial properties of the 901 speaker has just been introduced via the unique Bose Spatial Control™ Receiver.

Future At Bose we have decided that "901" will continue to be the designation of the product that represents the state-of-the-art of our technology — whatever size, shape or form that product may take. In our research we continue to look at any and all technologies and product concepts that might hold possibilities for better sound reproduction. Consistent with the past, we will introduce new technology into the 901 speaker as it is developed — often without announcement. This is our dedication to the goal that whenever you invest in the Bose® 901® system you will receive the latest technology and the best in music reproduction.



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IN REVIEW

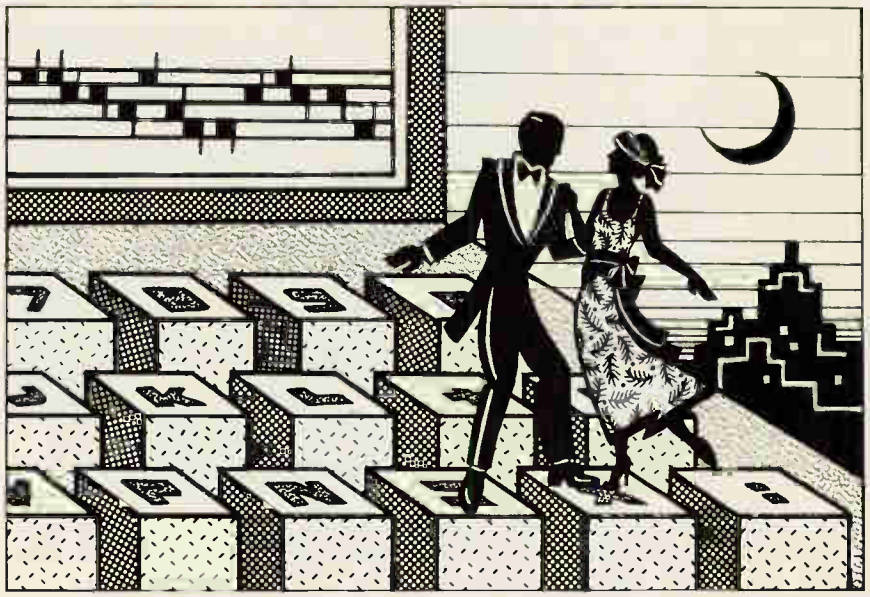
Exploring the World of the Personal Computer by Jack M. Nilles. Prentice-Hall, 1982. 234 pp. $12.95

Owning Your Home Computer by Robert L. Perry. Everest House, 1980. 224 pp. $10.95

Computers for Everybody by Jerry Willis and Merl Miller. Dilithium Press, 1981. 171 pp. $6.95

Computer Choices by H. Dominic Covvey and Neil Harding McAlister. Addison-Wesley, 1982. 225 pp. $8.95

Mindstorms by Seymour Papert. Basic Books, 1980. 230 pp. $6.95



Unlike many of the books on personal computers, *Exploring the World of the Personal Computer* doesn't assume that the reader has or is planning to buy a personal computer. Instead, it is a well-written overview of the opportunities and the possible dangers you should know about before buying a personal computer. As Nilles says, "This is not a 'how to' book. If anything, it is a 'why to (or why not to)' opus."

The book is divided into three parts. The first part describes the nature of personal computers and different ways of using them. In the second part the uses of personal computers for entertainment, education, home maintenance, health, and business are explored. In the last part Nilles deals with the possible economic and social impacts of the personal computer—both positive and negative—including issues such as privacy, equality of access to information, and the extent to which computers might be addictive.

If you already think you may want to buy a personal computer, then Perry's *Owning Your Home Computer* and Willis and Miller's *Computers for Everybody* will help you in selecting and acquiring one. Each book contains a brief description of what personal computers are and how they work, extensive lists of what you can do with a personal computer, descriptions of the most popular personal computers on the market (as of 1980 and 1981), and most important, step-by-step guides for selecting and buying a personal computer. Of the two, I liked Perry's a little better because it talked more about trends in the industry and innovative applications. He discusses the possibilities of coupling computers with cable television and videodiscs, as well as using personal computers to access information services and public data bases. I also thought Perry's illustrations were more informative.

It's easy to get swept away in a wave of initial enthusiasm and buy a computer that isn't right for you. Before you spend your rent money, you may want to read Covvey and McAlister's sobering book, *Computer Choices*.

Covvey and McAlister urge the consumer to let the computer experts know who the boss is. "The computer invasion is on, and the computers are winning," they write. "Look around you. They're stealing your money, your time, your jobs, your privacy, and even some of your freedom. You no longer have any choice about whether or not computers will affect your life: they *do* . . . . The only choice remaining to any of us is whether we will be the ignorant, helpless victims of the computer revolution or . . . will acquire sufficient knowledge and confidence to insist that computers be used in accordance with acceptable standards."

Covvey and McAlister are neither for or against computers. Their goal is to "issue warnings, educate, and provide practical guidelines for the consumer." They see *Computer Choices* as a weapon in the fight against " 'conspicuous computing'—an irrational lust to fill our homes and offices with computers merely because these machines are modern and impressive" and against "digital obfuscation—the use of techno-jargon by the elite of the computer age to keep us all at bay."

After telling a number of "horror" stories about the misuse of computers, Covvey and McAlister discuss good and bad reasons for acquiring computers and such related consumer issues as how to avoid being a mark for a computer salesperson, how to evaluate the cost-effectiveness of a proposed system, and how to maintain privacy and security in a system.

A drawback of *Computer Choices* is that only the first part of the book deals specifically with personal computers. The rest of the book is more relevant to

people in organizations considering acquiring a computer.

Computer hardware is not much good without good software, and even good software isn't very useful without a vision of how to use it. Today, unfortunately, many vendors and users lack such a vision, and as a result many of the current uses of personal computers are pretty mundane. The personal computer is still to some extent a solution in search of a problem.

One group that does have a powerful vision is Seymour Papert and his LOGO Group at the Massachusetts Institute of Technology. For several years Papert and his colleagues have been exploring the uses of their LOGO programming language with the LOGO Turtle, a small computer-controlled robot that can be programmed to move about and draw pictures on the floor, to teach elementary-school children how to program computers and learn mathematical concepts while they do so. Papert's book *Mindstorms* describes these experiments and the theory of learning on which they are based.

As Papert states in the introduction, two powerful ideas run through *Mindstorms*: "The first is that it is possible to design computers so that learning to communicate with them can be a natural process, more like learning French by living in France . . . . Second, learning to communicate with a computer may change the way other learning takes place." Specifically, Papert believes that the computer can be used to "concretize" formal and abstract concepts, making them easier to grasp and assimilate. Papert gives numerous examples of this process, taken from actual classroom experience with LOGO, such as how it was used to teach children to juggle.

In the last year LOGO has become available for many home computers. Papert's vision of a learning society may stimulate people to come up with more innovative ways to use personal computers.

—Craig Decker

Radwaste, by Fred C. Shapiro. Random House, 1981. 288 pp. $14.50

Storage of radioactive waste—radwaste—from civilian and military atomic power programs is one of the most serious issues facing the nuclear community. Since the 1940s radioactive wastes of many different kinds have been piling up here and abroad. There are intensely radioactive high-level wastes such as the spent-fuel assemblies from reactors. [See "Hot Garbage," April/May 1982.] There are also much vaster volumes of lower-level wastes, including uranium mill tailings (leftovers from refining operations) and contaminated hardware from medical and research labs.

All this radioactive garbage will have to be stored somehow, for up to several hundred thousand years. And the quantities to be stored are staggering. In *Radwaste*, Fred C. Shapiro, a professional journalist and contributor to *The New Yorker*, reports that uranium mill tailings alone are building up at a rate of about 141 million cubic feet per year—enough to fill a cube that measures over 500 feet on its edge.

High-level wastes, he adds, are less abundant but still exist in massive amounts. In 1980, 10.2 million cubic feet of these materials were stored in the United States and were accumulating by 85,000 cubic feet per year.

Is there any hope that we can dispose of all this hazardous rubbish safely? So far the record of nuclear-waste disposal—for high-level wastes, at least—is less than admirable.

Shapiro recounts the story of an alarming leak at the federal government's Hanford nuclear-waste repository in Washington State. At the Hanford site are 140 buried carbon-steel tanks designed to hold liquid high-level waste for 50 to 300 years. In 1958, only 15 years after their construction, some of the tanks were discovered to be leaking. Since then about half a million gallons of high-level waste have escaped from storage at Hanford—115,000 gallons in one 1973 leak alone.

Even in the face of such chilling facts, Shapiro is no antinuclear zealot. One strength of *Radwaste* is that the author carefully avoids the shrill rhetoric of the "no-nukes" movement. In plain and uninflated prose, he lets the evidence speak for itself. The evidence tells us that the nuclear community must come up with a comprehensive long-term plan for dealing with radioactive waste—and soon.

—David Ritchie

The Ornithopter

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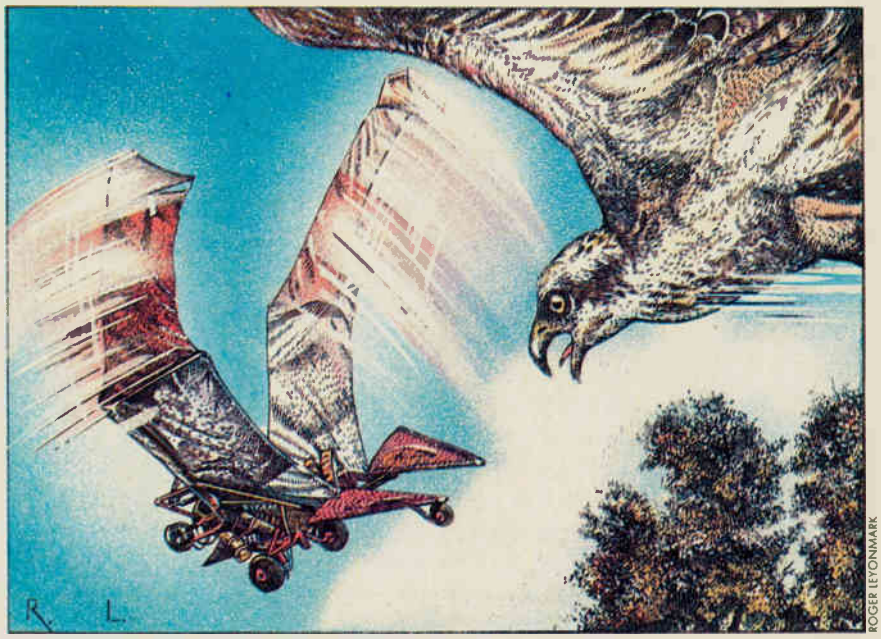


ROGER LEYONMARK

For more than 40 years James L. G. Fitz Patrick has been trying to fly like a bird with flapping wings. Nature is a good engineer, says Fitz Patrick, and mimicking it with a beating-wing aircraft, better known as an ornithopter, is not such a bad idea. The only problem is getting it to work.

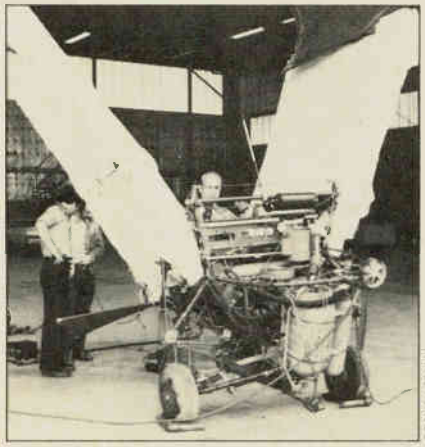
A former dean of Staten Island Community College in New York City and now considered the leading U.S. expert on ornithopters, Fitz Patrick points out that the dream of the beating-wing aircraft goes a long way back in history. There are records of would-be pilots building models of ornithopters as early as 400 B.C., and some adventurous types constructed human-carrying models in the 19th century.

Fitz Patrick refuses to let what he considers to be a good idea die, and since the 1940s he has carried on what sometimes has been a one-man crusade to build a machine that will fly like a bird. And like a bird, an ornithopter would need little room to take off and land and could travel at a leisurely speed, between 30 and 40 miles per hour, guesses Fitz Patrick. It would be more fuel-efficient than a helicopter because of its ability to glide and soar. An ornithopter would become what Igor Sikorsky always hoped his helicopter would be: a personal flying machine.

To make the difficult transition from theory to fact, Fitz Patrick spent years studying birds. He has dissected hundreds of them, analyzed the skeletal structure of their wings, and built dozens upon dozens of model wings in an effort to duplicate their flying efficiency. In the process he has turned his whole house into a one-man ornithopter research center.

In 1973 he finally built a full-scale model. It was 12 feet long with a wingspan of about 37 feet. Unlike a conventional airplane, it had no tail and no propeller, and when not used, its wings folded snugly against its sides, much like a nesting bird's. Selecting material for the wings was especially difficult. The wings had to be strong but highly flexible. He settled on sailcloth stretched over folding wing skeletons of steel cables, fiberglass, and wicker. He has since replaced the sailcloth with a tough synthetic material called Kevlar.

The wings are to provide lift, thrust, and steering for the aircraft. To make them flap, he has experimented with a series of compressed-air cylinders powered by a one-horsepower gasoline engine. In one ground test Fitz Patrick got the wings beating so fast they generated over 40 pounds of lift per horsepower, twice what a light plane produces and more than four times the lift per horsepower of a helicopter. But it didn't fly.


CORNELL FRANK

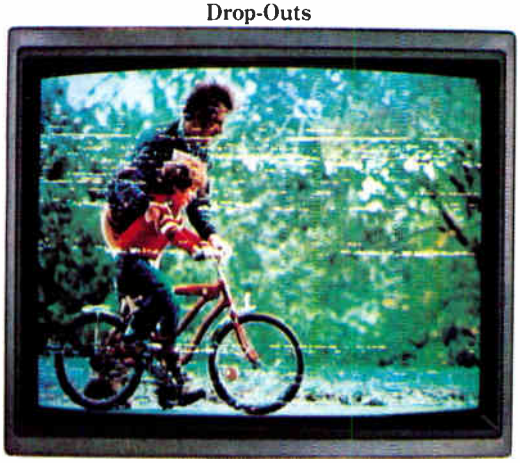
Fitz Patrick sits in one of his ornithopters. The wings flapped, but it never flew.

Now retired, the 75-year-old Fitz Patrick commutes three times a week to Princeton University's Forrestal Flight Research Center to tinker with his aircraft. He has recently finished making a lighter, simpler fuselage and has a more powerful gas engine. His ornithopter has even made a maiden flight of sorts. "We got it off the ground once accidentally, back in '78, I think, for a hop of thirty to forty feet," Fitz Patrick recalls.

In spite of the long process of getting his machine to work, Fitz Patrick, the perennial optimist, remains patient. "How long this will take, the Lord alone knows."

—Douglas Colligan

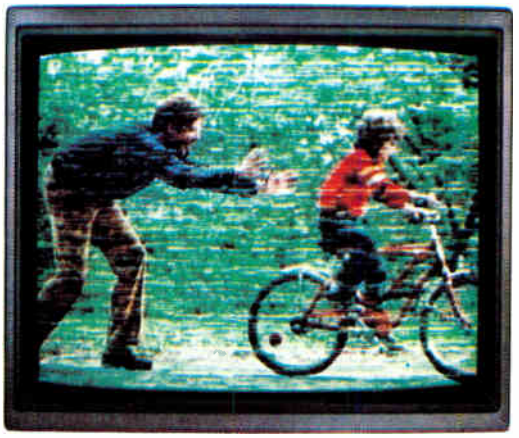
Drop-Outs



Particle Shedding

Color Distortion

Noise



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