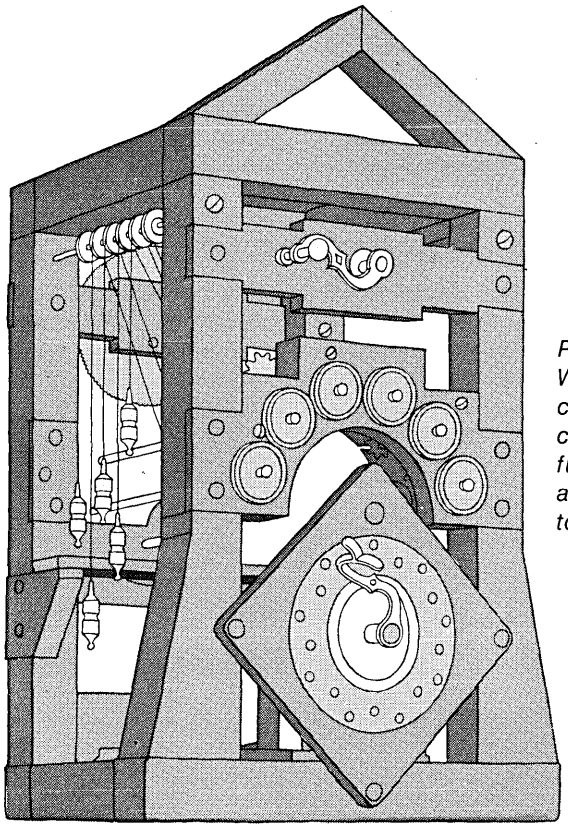
DATAMATION®

69

September

In 1709, Giovanni Poleni had a wild idea.



Poleni's passion. Wind it up, and you could automatically compute the four fundamental arithmetic operations to three figures.

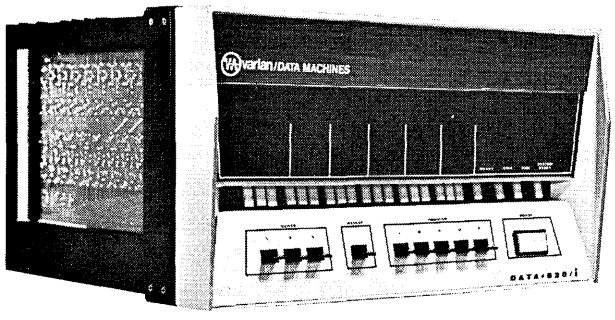
The Varian Data 620/i is the latest word in 1969. It may give you some even wilder ideas.

Imagine a system-oriented computer that takes only 10½ inches of rack space, yet will out-data any machine in its class. A computer with hardware indexing, over 100 instructions, 1.8 μsec cycle time, 16/18 bit words, easy interfacing capability, optional multilevel priority interrupts, a 4 to 32K memory, and is available in a ruggedized version.

Congratulations. You've just imagined Varian Data's 620/i computer. Now you know why there are over 500 delivered.

Now here's something else that may boggle your imagination. The 620/i costs only $13,900 with ASR 33 TT.

Write for your brochure today. Then tomorrow you can start figuring the money you'll save.



varian data machines

a varian subsidiary/
2722 Michelson Drive / Irvine / California 92664
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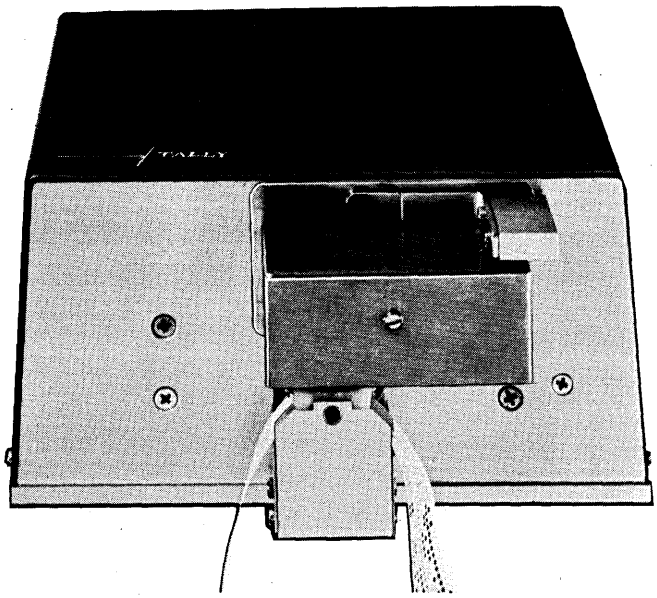
CIRCLE 1 ON READER CARD

Start your own Data Communications System with this easy to use plug-in terminal.



You don't have to upset your present paper tape data preparation routine to take advantage of a high speed data communications system. The low cost, easy to use, Tally data terminal shown above transmits paper tape data over the ordinary dial-up telephone network at 72 characters per second.

Cost is low. Lease or buy. Ready to deliver. Collect digital data from any number of remote locations for computer processing.

Features include automatic error correction capability during transmission and unattended operation so that the data site can be polled at convenient and low cost line charge times.

Other Tally send/receive/duplicate data terminals are available at operating speeds up to 1200 words per minute. Choose from the broadest, most complete line of punched card, magnetic tape or perforated tape data terminals on the market today. For complete information, please write or call **Tally Corporation, 8301 South 180th Street, Kent, Washington 98031. Phone 206-251-5500. TWX 910-423-0895.**

Or contact one of the regional offices:
New York: 45 N. Village, Rockville Centre, N. Y. 516-678-4220
Chicago: 33 N. Addison Rd., Addison, Ill. 312-279-9200
Seattle: 8301 South 180th St., Kent, Wa. 206-251-5500
Washington, D.C.: 1901 Ft. Myer Dr., Arlington, Va. 703-525-8500
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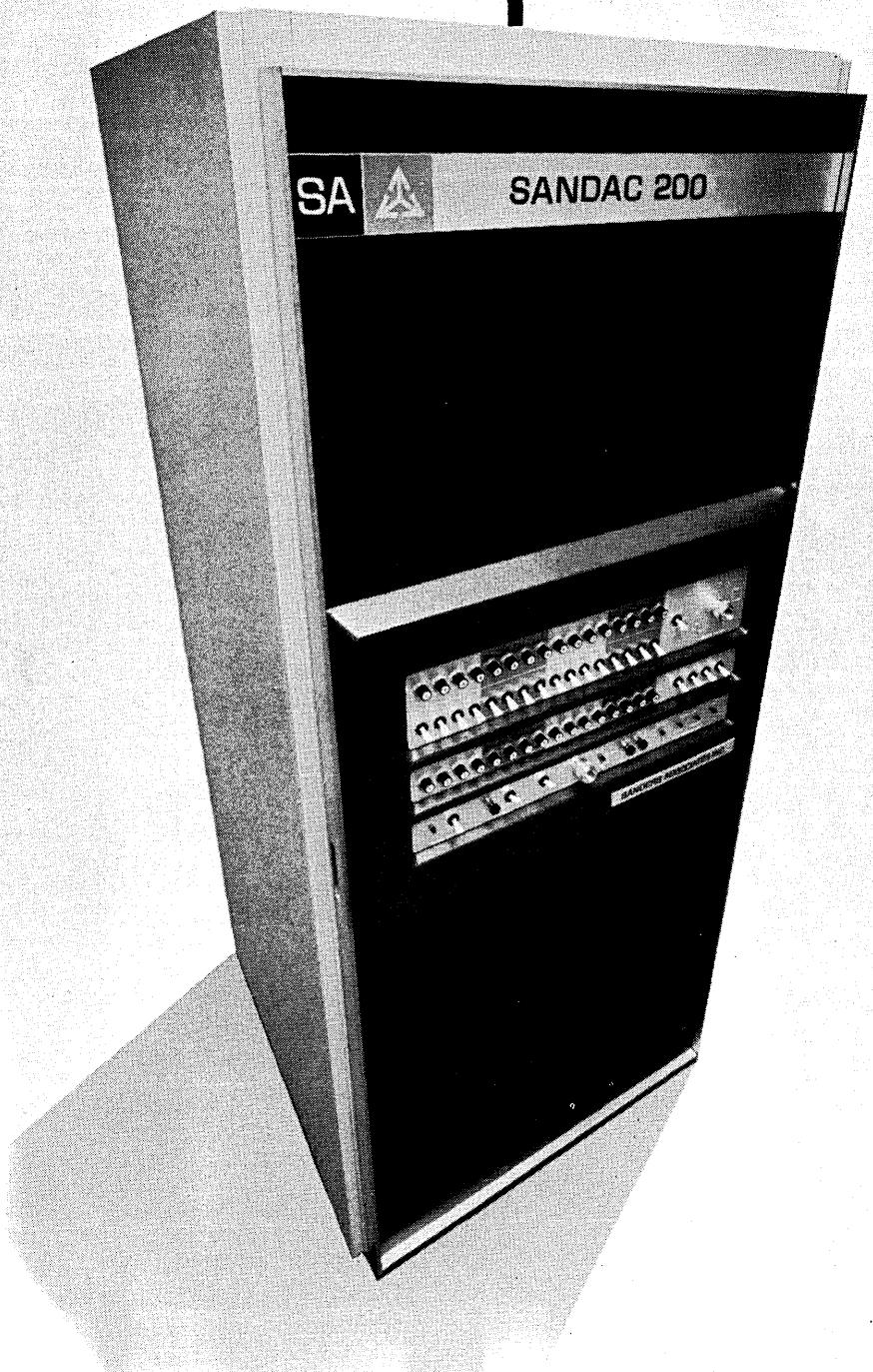
TALK TO TALLY®

CIRCLE 54 ON READER CARD

This computer doesn't compute.



It communicates.

Is your EDP system in real time? Or going into it? Don't bug the main frame by using core space for a communications job it wasn't designed to do.

The Sanders SANDAC* 200 is a Programmable Communications Processor. That's exactly what it was designed to be.

A SANDAC 200 lets you start with what you need now. You can add I/O channels as required. Up to 256, all simultaneously active. And you can multi-drop terminals on each channel if desired.

Interface a remarkable variety of peripherals. Low speed or high speed. You tell us and we'll make them fit. There's a choice of single bit, serial or parallel character, and parallel word buffers.

Expand from 4K to 65K (131,072 bytes) of directly addressable core memory. With memory parity and protection bit for each location.

Software includes diagnostics, assemblers, debugging and utility routines. A real-time supervisor offers dynamic core allocation.

Put a SANDAC 200 in front of your EDP system, a System/360 or any other. You'll be able to do more computing with a smaller computer. And you'll end up with a more efficient data communications system.

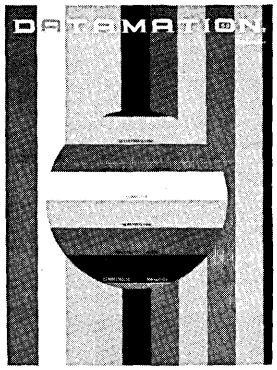
For information, contact Marketing Manager, Data Communications Systems Group, Sanders Associates, Inc., Daniel Webster Highway South, Nashua, New Hampshire 03060. Or telephone (603) 885-4554.

SA SANDERS ASSOCIATES, INC.

*TM Sanders Associates, Inc.

CIRCLE 126 ON READER CARD

DATAMATION



september

1969

volume 15 number 9

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This issue 98,448 copies

The computer selection team helped.

It was great for first screenings. Comparisons. Weighting the computing requirements for your particular job. Then more screenings. And then, the recommendations . . . but that can't make the decision for you.

Signing that half million dollar purchase order is your problem, and your problem alone. That signature commits your judgment, your reputation, your own knowledge of what you need now . . . and what you may need two, three years from now. No one commits that much without serious private thought. No committee helps now.

We understand how you must feel, and we respect it.

Somewhere in those evaluation reports, you may have seen a comment that the PDP-10 is the most versatile big computer on the list. That it will stay most useful, longest. We think you should consider that point longer and more seriously than any other. We did when we designed the PDP-10.

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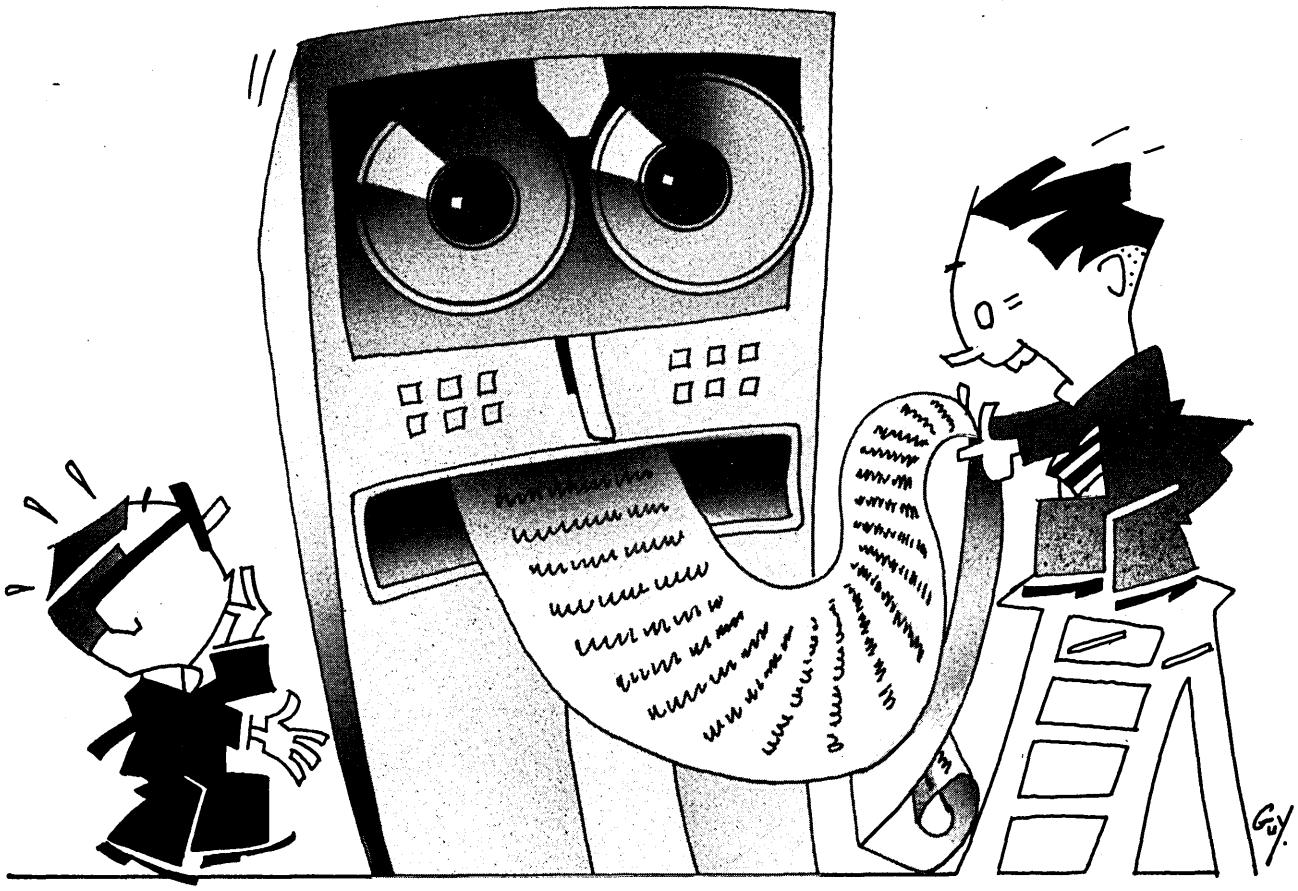
CIRCLE 20 ON READER CARD

DATAMATION 69®

september
1969

volume 15 number 9

datamation departments



It says: Pardon my prognostication . . . but pandiculation as applied to your present computer is problematic. Provide peripheral paraphernalia permitting more proficient, profitable performance . . . preferably the

MDS 7500 SYSTEM

In plain English, there's a limit to how far your computer's on-line capabilities can be stretched. Switch your slow-down operations to the off-line MDS 7500 SYSTEM.

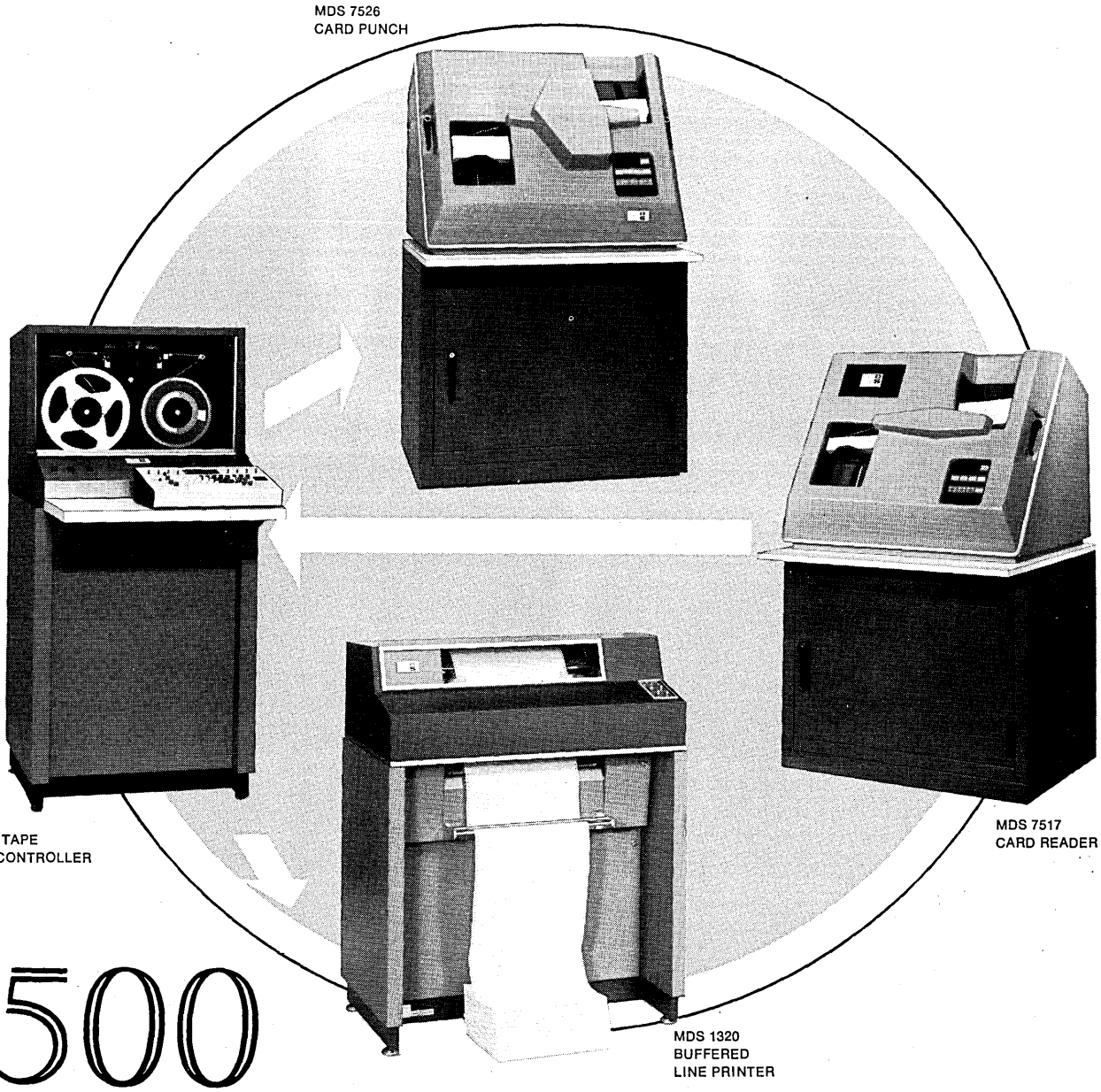
The MDS 7500 System provides a "flexibility package," with multiple off-line capabilities that take the squeeze off your computer. We call it the "Computer-Stretcher." It works equally well adjacent to your computer, or in a remote location.

The 7500 is an off-line data conversion system presently offering five different types each of input and output devices. The complete 7500 System consists of the 7505 Magnetic Tape Handler/ Controller and Keyboard; 7517 Punched Card Reader; 7526 Card Punch; 7515 Paper Tape Reader; 7525 Paper Tape Punch; 1320 Buffered Line Printer.

Units in the system are cable-connected. With the addition of a modem, the system can communicate with another 7500 System, or an 1103 or 6403 Data-Recorder. Switches permit selection of an input and an output device.

A minimum 7500 System consists of the Magnetic Tape Handler/Controller and one of the other units.

The 7505 CONTROLLER is the primary component. It accepts data from magnetic tape, from a data communications module, from cards, paper tape or the keyboard. Data then is channeled to a selected



7500

output unit to produce either magnetic tape records, punched cards, paper tape records, communication messages, or printout. The 1320 Buffered Line Printer can operate simultaneously with any of the other output devices.

OTHER COMPONENT UNITS

7505 MAGNETIC TAPE HANDLER: Input/output medium . . . reads or writes at 800 bpi density on either 7 or 9-channel magnetic tape . . . a 7-channel 7505 also can read 200 bpi tape . . . max. record length, 180 characters . . . BCD, EBCDIC or USASCII tape codes.

7515 PAPER TAPE READER: Reads 5, 7 and 8-channel tapes.

7525 PAPER TAPE PUNCH: Punches data in 5, 7 or 8-channel codes (paper, mylar or mylar-combination tapes).

7526 CARD PUNCH: Rated speed—200 fully punched 80 column cards per minute . . . maximum speed—300 cards per minute, punching 16 columns . . . Hopper/Stacker capacity 1000 cards each.

7517 CARD READER (standard): Reads 80-column cards, face down, at 1000 cards per minute . . . Hopper/Stacker capacity 1000 cards each . . . effective throughput rate approx. 550 cpm.

7516 CARD READER (optional): Reads 51 or 80-column cards, face up (face down optional) at 400 cards per minute . . . Hopper/Stacker capacity 500 cards each.

1320 BUFFERED LINE PRINTER: Prints 132 columns, operating at a nominal rate of 300 lines per minute. It can operate in Edit, List or Line Edit mode.

If your computer is up tight, investigate the computer-stretching possibilities of the MDS 7500 System. Ask for full details.

YOUR COMPUTER'S BEST FRIEND

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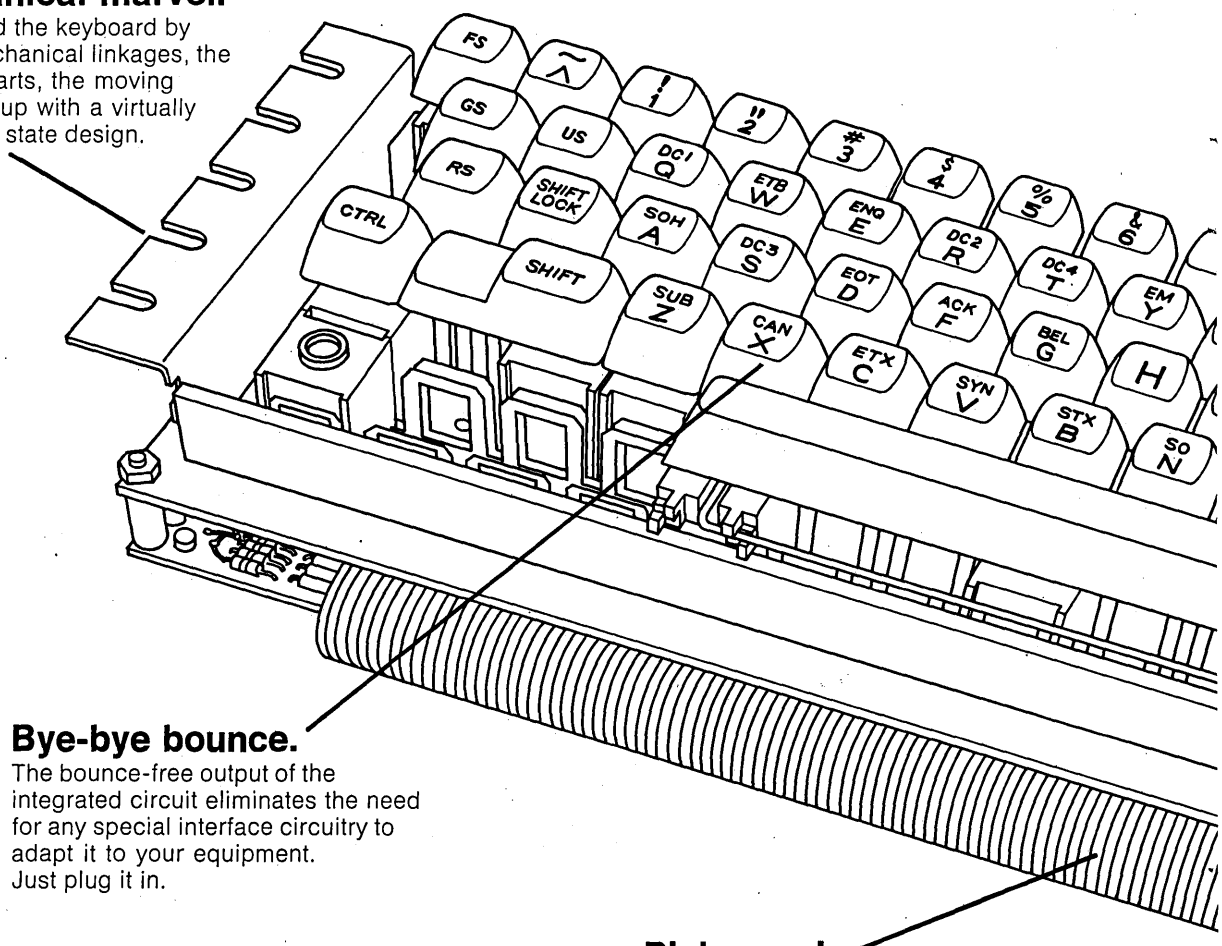
We've re-invented the name is the same.

The unmechanical marvel.

We've uncomplicated the keyboard by getting rid of the mechanical linkages, the electromechanical parts, the moving contacts. And came up with a virtually trouble-free, all solid state design.



Bye-bye bounce.

The bounce-free output of the integrated circuit eliminates the need for any special interface circuitry to adapt it to your equipment. Just plug it in.

Pick a code.

We supply any 8-bit code (or less); hexadecimal; Baudot, BCD; USASCII mono-mode, dual-mode and tri-function; plus EBCDIC and custom codes.

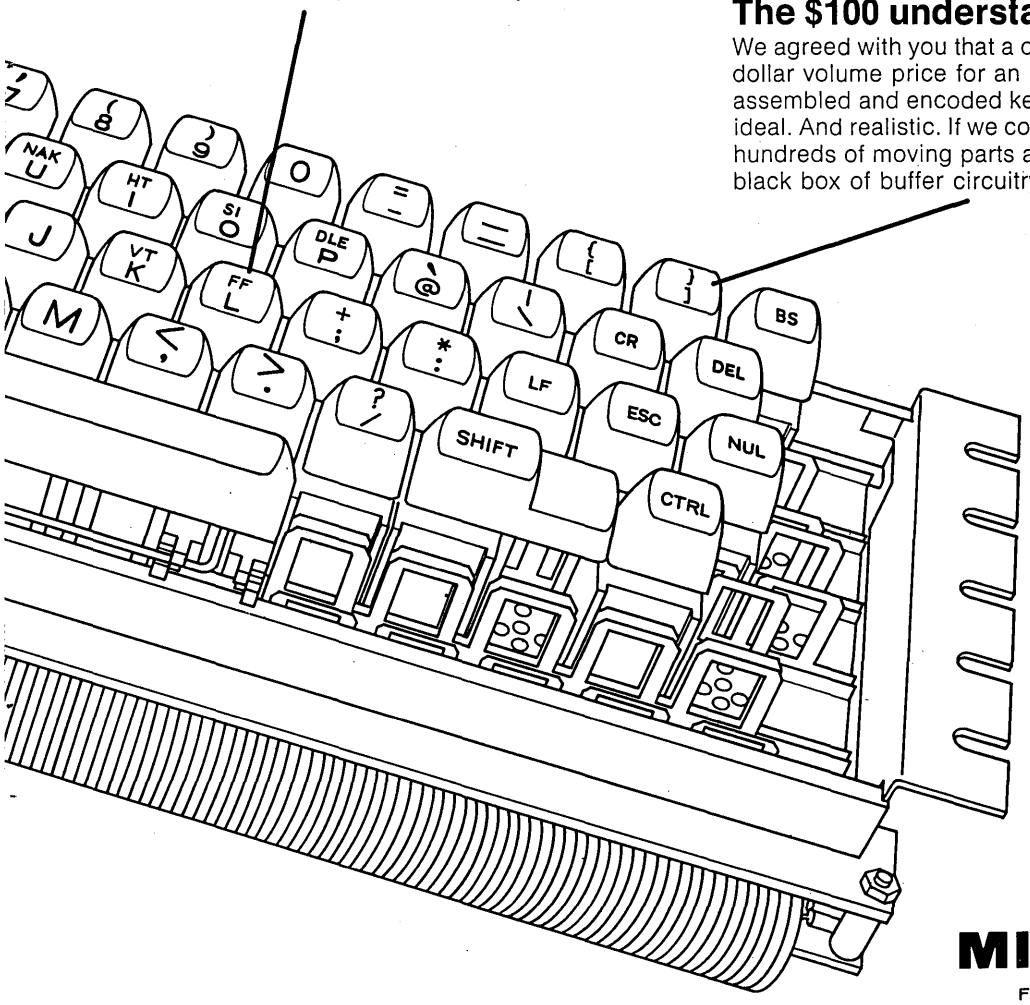
keyboard. Only the

Solid state all the way.

The re-inventing started with the world's first application of an integrated circuit as a keyboard switching element. Actuated by a magnet on the key plunger, the integrated circuit delivers a digital output which is fed into the encoding matrix of the keyboard.

The $100 understanding.

We agreed with you that a one hundred dollar volume price for an all solid state, assembled and encoded keyboard was ideal. And realistic. If we could get rid of the hundreds of moving parts and the big black box of buffer circuitry.



A good start.

Our handy "Condensed Keyboard Guide" briefly discusses keyboards and options to give you an idea of the broad offering that we already have available. MICRO SWITCH application engineers are ready to work with you in developing the most economical keyboard designs to meet your precise format and encoding needs.

MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

CIRCLE 65 ON READER CARD

If she types, she's already trained to use a COMPAT™ 88-23 Data Terminal

...and you get 3 times her value for half her monthly pay.

- 50,000 CHARACTER DATA STORAGE
- 1200 BAUD TRANSMISSION RATE
- PROGRAMMABLE FLEXIBILITY
- COMPLETELY FLEXIBLE FORMATTING
- ANYTIME EDITING—0.5 SEC. DATA RETRIEVAL
- AUTOMATIC SEND/RECEIVE ERROR CONTROL
- SIMULTANEOUS HARD COPY

COMPAT 88-23 data terminal contains a 4K x 16 stored-program computer with a powerful instruction set... capable of handling parallel keyboards or performing peripheral tasks. And the unique tape loop completely empties in six minutes with vertical and horizontal parity assigned each message block and automatic retransmission of blocks with transmission errors.

The keyboard in this designer-housed unit is identical to the "selectric" typewriter. Low operational costs become even lower when idle WATS lines are used for transmission.

Other COMPAT terminals are:

COMPAT 88-13 batch terminal with 50,000 character data storage; unattended transmission at 1200 Baud; error control; format control; and other features.

COMPAT 88-03 conversational mode terminal with ASCII code; simultaneous hard copy production using "selectric" typewriter. Off-line duty as office machine.

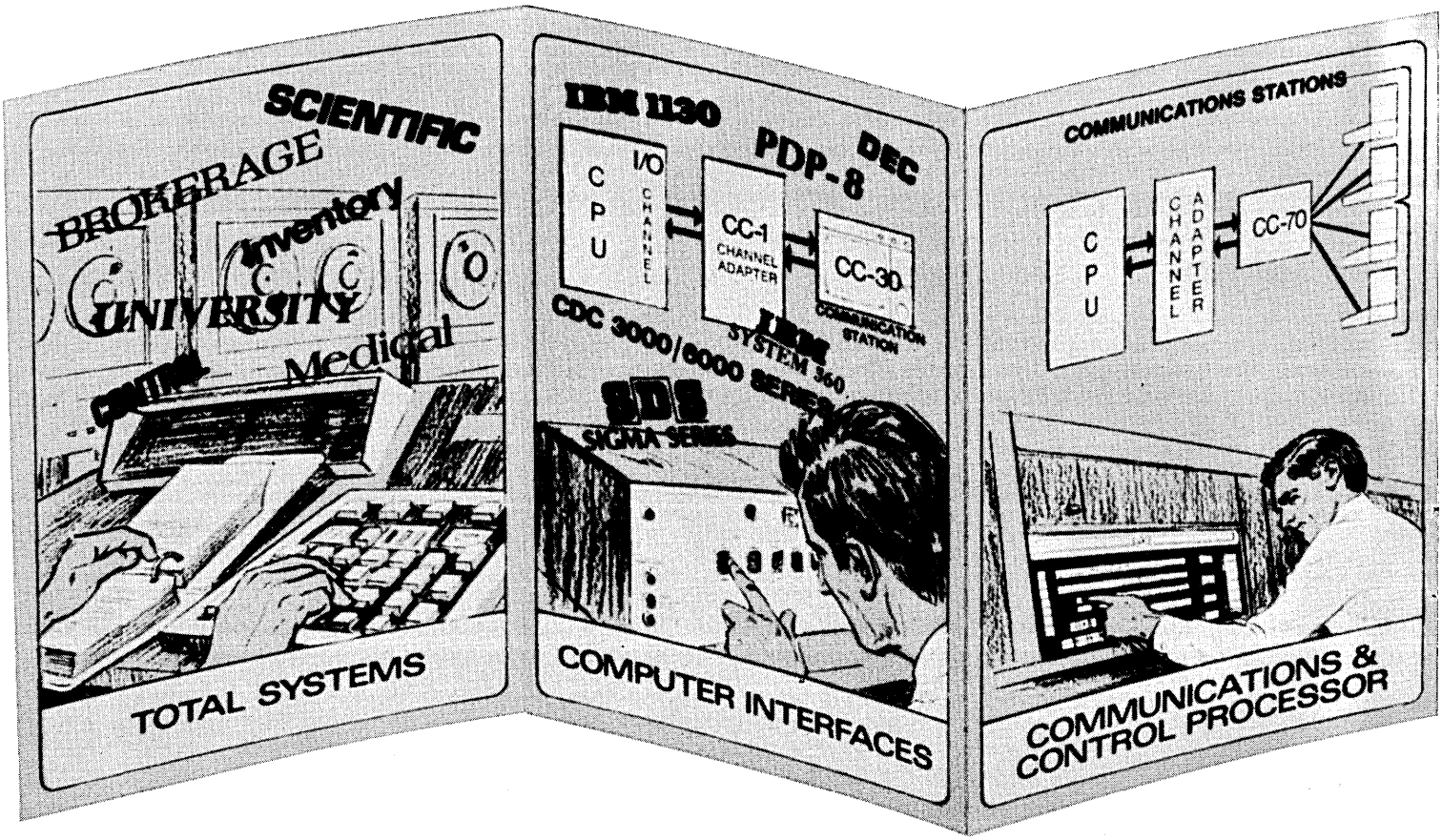
COMPAT 88-23 or our other terminals can be leased or purchased with 90 day delivery. For fast, complete information, call our Systems Engineering Department. Or visit our plant.

COMPAT CORPORATION

177 Cantiague Rock Road, Westbury, N.Y. 11590 (516) 822-1320, TWX 510-221-1821.

CIRCLE 216 ON READER CARD

The SYSTEMS approach to CCI already provides everythin



We began with the CC-30 Communications Station, a low-cost, portable input/output terminal based around the powerful CC-301 station controller with a 1024 character random access core memory (for *high-speed* man/machine interaction). In its most basic form, the CC-30 adds a CRT (which can be any standard television set or monitor depending on specific viewing requirements) and a keyboard functionally designed to resemble a conventional electric typewriter (but without the noise).

Then, because we wanted a terminal that was universal (most others are not), we built everything necessary to tie the CC-30 to phone lines, to switching devices, and to computers:

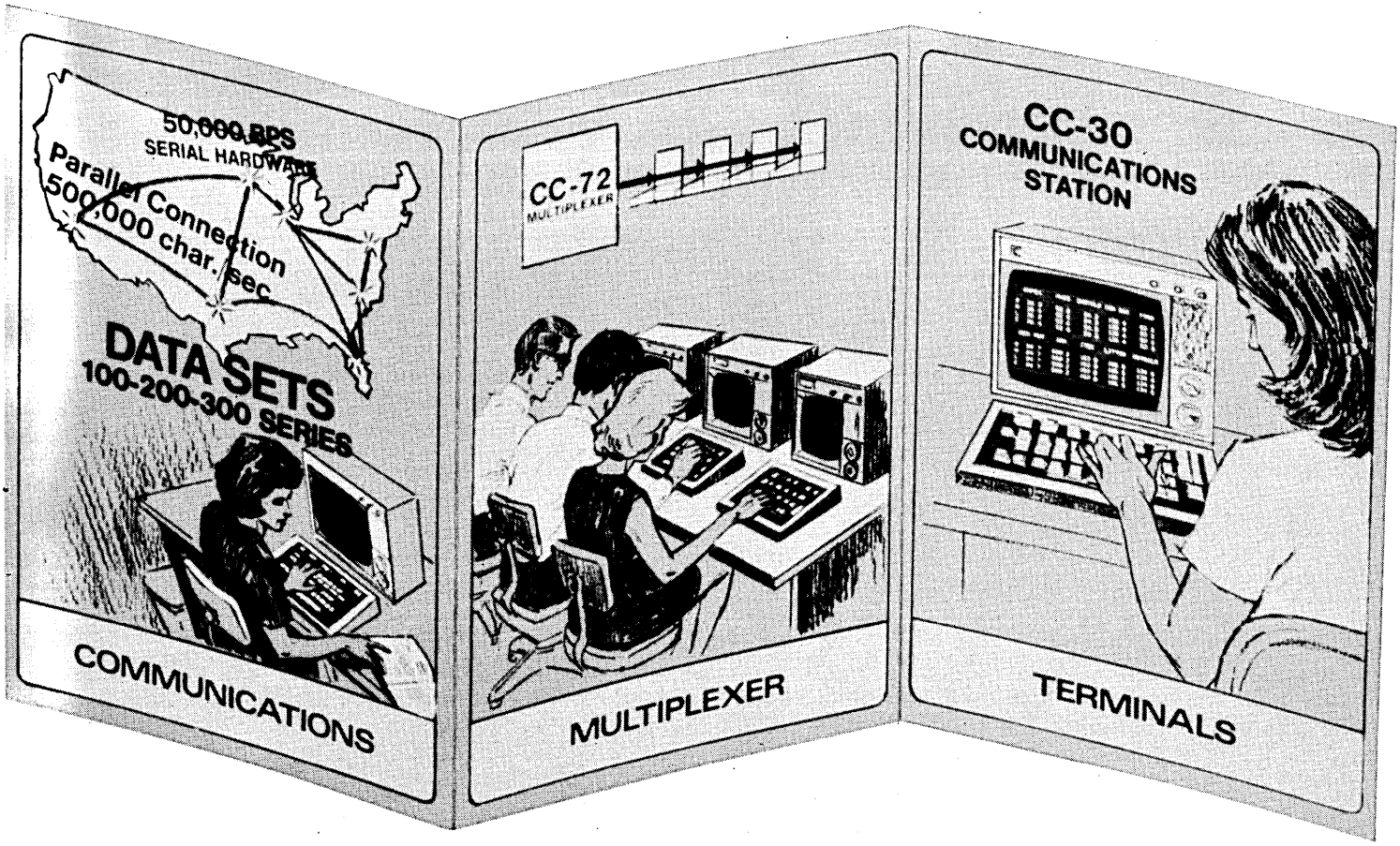
- Standard communications interfaces for all 100-, 200-, and 300-series data sets (dial-in, dedicated, or multi-drop lines), serial hardwire at speeds up to 50,000 bps, and for parallel connection at speeds up to 500,000 char/sec. We have delivered, and smoothly installed, many installations with all of these communications connections.

- Standard multiplexers, concentrators and switching devices allow multiple stations to share a single transmission line or direct connection with a computer, or provide a complete communications processing and message queuing "front-end" to a central computer system. Our CC-72 remote multiplexer is in use on many systems; our soon-to-be delivered CC-70 will provide high speed buffered multiplexing at the computer site.

- Standard channel interfaces permit CC-30 Communications Stations to communicate with almost all of the most popular computers and operate in conjunction with the system as local peripheral devices or as remote terminals over phone lines. Our channel interfaces are in use with a number of IBM 1130 and System 360 installations, on CDC 3000 and 6000 series computers, and in a number of SDS Sigma Series and PDP-8 installations.

From the computer I/O channel on out to the terminal, the emphasis has been on flexibility, universality, and ease of operation. The result of this emphasis has been that networks using CCI standard building blocks can be — and have been — installed smoothly, quickly, and efficiently on almost any computer over almost any transmission network

computer-communications... g but the computer mainframe



conceivable. In short, we have a standard, *field-proven* product line that helps our engineers and programmers apply our total systems capability to satisfy just about any computer-communications network application.

The same principles apply in the operation of the terminal. The CC-301 Display Controller, heart of the station, displays alphanumeric or graphic data on the CRT (we were the first to offer both capabilities in a single low-cost unit). The CC-301 controls up to seven local peripheral devices (which can include card readers, line printers, magnetic tape and disc drives) and a light pen. And for the systems programmer, powerful but simple to use control features are made available in the CC-301 which give complete flexibility in all aspects of system operation.

Other terminals in CCI's family of communication stations are designed for specific requirements. The CC-33 Teletype Compatible Display Station is fully code and transmission compatible with Model 33 and 35 Teletype units. With the CC-33, users of time-sharing systems can update their terminals to the new generation of remote display stations without any change in existing Teletype-oriented software.

The CC-36 Televideo Conversational/Batch Station is a surprisingly low cost family of integrated console systems designed for use as remote batch terminals, as remote on-line conversational stations, or for off-line peripheral operations. A typical version of the CC-36 includes a keyboard, CRT, a card reader, a line printer, and control electronics for specified batch operations.

Continued . . .

Computer Communications, Inc.
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Inglewood, California 90301
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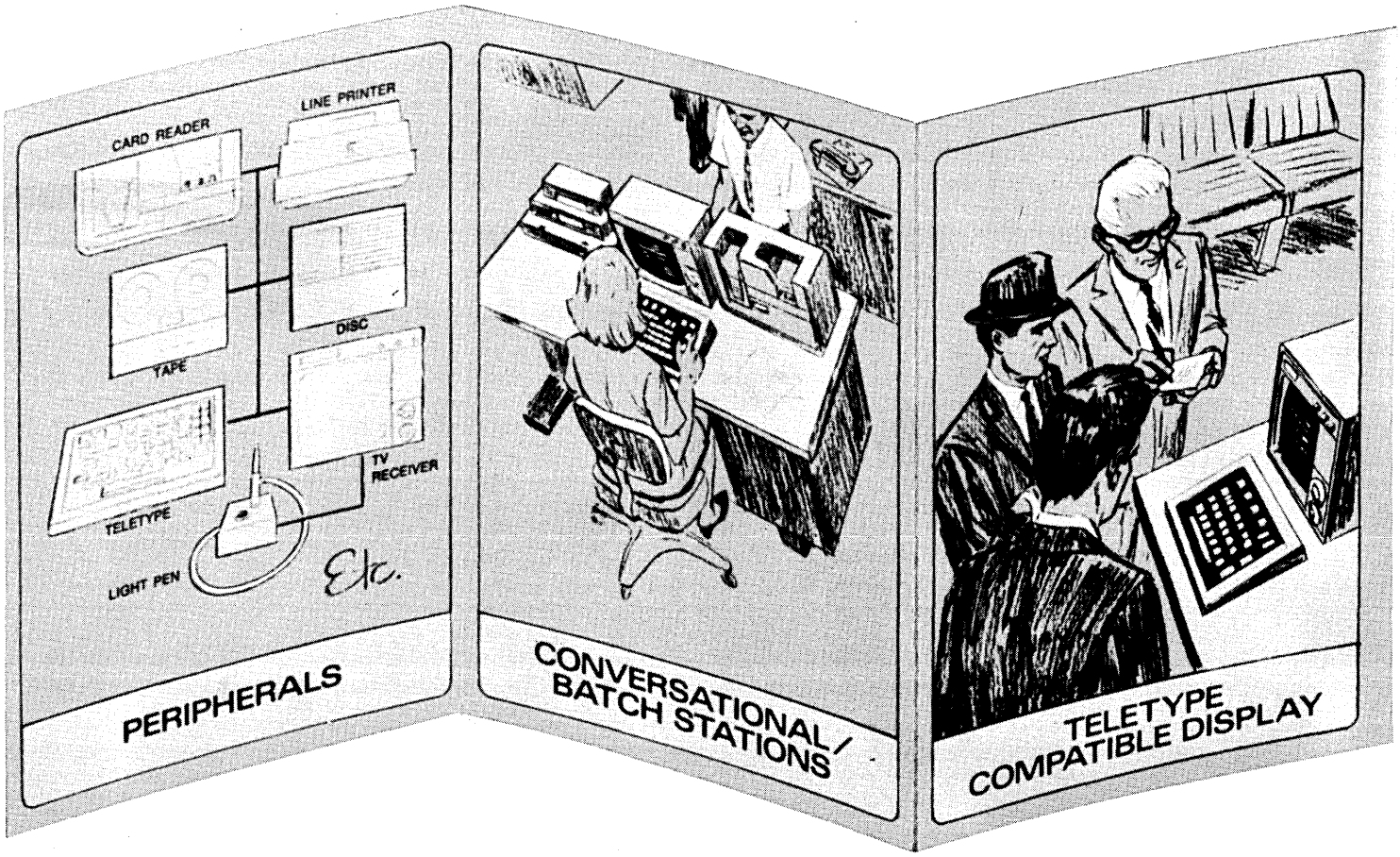

What we've been saying here about our system approach and product line building blocks is not a drawing-board concept. It's been done. And done successfully. CCI communications terminals and their related products are in use now in business and industry, at hospitals, government agencies, universities and research labs throughout the country. Installations range from sophisticated single-station dedicated applications to complex multi-station on-line or time-shared networks where CCI provided everything but the computer mainframe. Optional software packages such as CAP 1130 and CAP 360 provide powerful network and display drivers for installations wishing to program terminal applications using FORTRAN. CCI has also supported users in every type of programming — from engineering diagnostics, through special drivers, to complete operating systems and applications programs.

Since all CCI equipment is modular and standard, reliability and maintenance is simple and routine. We have a nationwide service and installation organization and systems centers in key cities around the country for field analytical and engineering support.

CIRCLE 145 ON READER CARD

We believe it's the *total system* that counts: in power and convenience of operational characteristics, in rapid delivery and installation, in system use and programmability, and in price. We have a company that can and has combined superior systems design, systems engineering, and systems programming with superior "building block" systems products to get customers with complex applications and networks on the air quickly.

We've delivered. We're delivering now.

For a technical description and detailed information on installations and applications, write Computer Communications, Inc., 701 W. Manchester Blvd., Inglewood, Calif. 90301.

Computer Communications, Inc.

701 W. Manchester Blvd.
Inglewood, California 90301
Telephone (213) 674-5300

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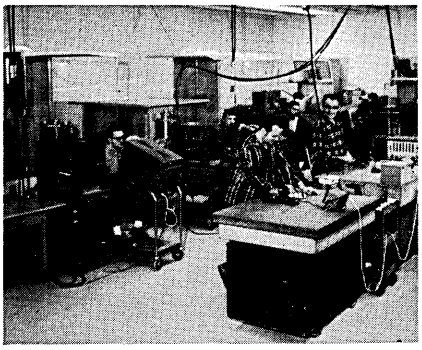

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The reasons? VRC's broad line of drum capacities, from 2.6 to 67 megabits . . . a standard, interchangeable, digital interface for all models . . . complete documentation and customer support . . . outstanding reliability . . . and the ability to fill your order for drums by the hundreds.

We've had several like that recently.

Computers are known by their MEMORIES...

...so is

Vermont Research
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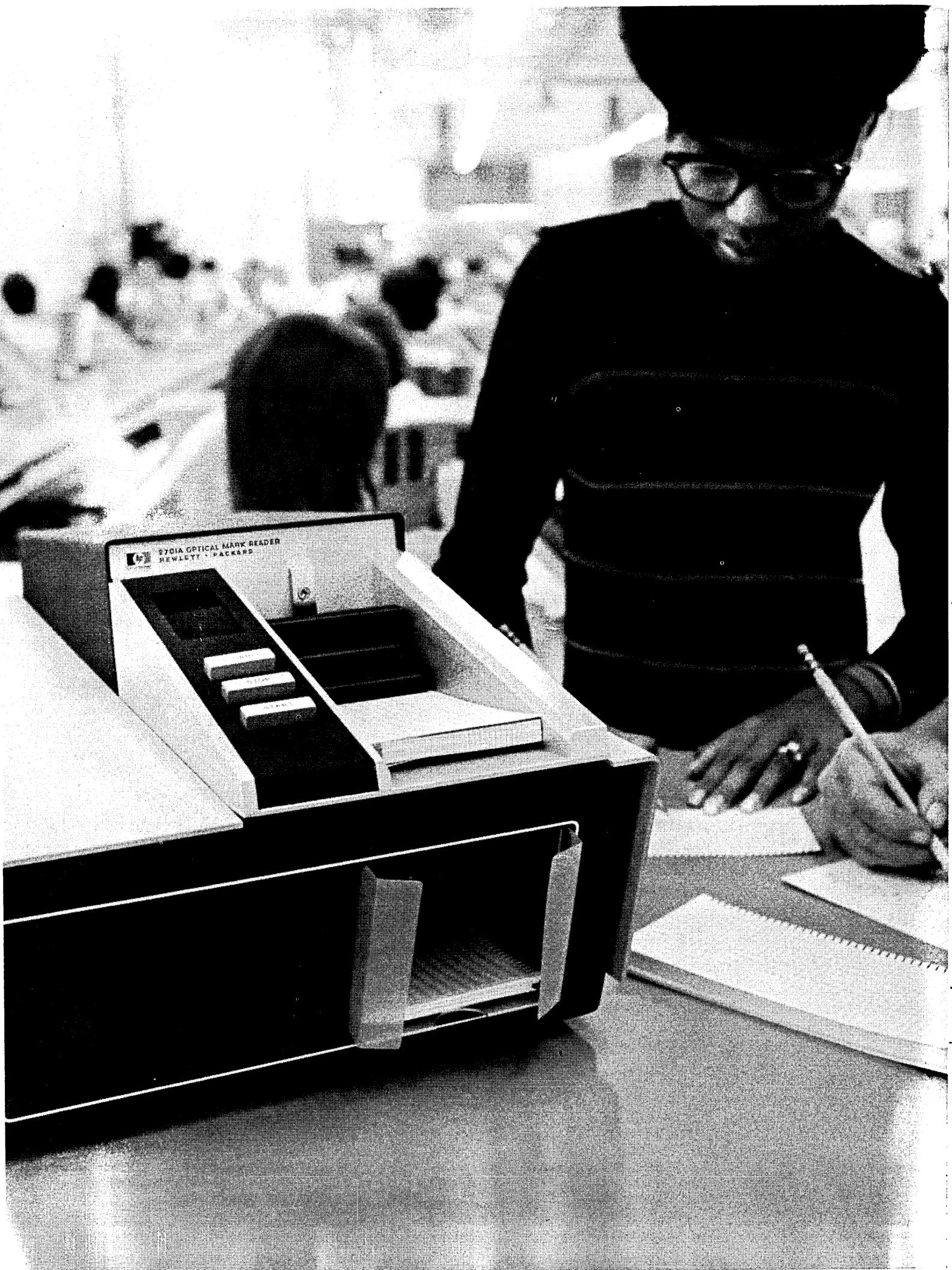
2701A OPTICAL MARK READER
HEWLETT · PACKARD

We know our optical mark readers can save you money.

Just one is saving us $32,000 a year.

We did it by cutting out the keypunch bottleneck at our Palo Alto plant.

Instead of slow, costly keypunching, we now use one of our optical mark readers. And we're already saving more than $32,000 a year on payroll processing alone.

The reader handles 125,000 job cards turned in by 3000 employees each month. Everyone writes his own work record on a simple tabulating card, using an ordinary pencil. The process is so easy and efficient, payroll accounting is ready three days earlier than before.

And we don't build our optical mark readers just to handle payrolls in plush offices. They're rugged enough to work in machine shops, warehouses, even on construction sites. In fact, you can put them just about anywhere you need important information fast. Information on material movement, order entry, quality assurance, inventory control.

New design techniques are the key to our readers' reliability. For example, we've developed a special feed system that virtually eliminates card jamming and mutilation. And a unique mark detection feature assures accurate reading of even poorly marked cards.

All our optical mark readers cost less than $3000. That's another reason they make it so easy for you to save. Your local HP computer specialist can show you just *how* easy. Call him. Or write to Hewlett-Packard, Palo Alto, Calif. 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT hp PACKARD

DIGITAL COMPUTERS

22932

CIRCLE 64 ON READER CARD

80 lines per second!

Clevite's new hardcopy electrostatic printer zipped out the facing page in 1.8 seconds flat. That's up to seven times faster than most printers on the market.

Eighty lines per second . . . 412,000 characters per minute . . . 4800 lines per minute. No matter how you figure print-out speed, dollar for dollar Clevite 4800 is far and away the fastest and most economical. It's four to seven times faster than most line printers . . . ten to twenty times faster than usual photographic hardcopy techniques. No other print-out system is even in the same ball park.

Words. And pictures.

Clevite 4800 handles both alphanumerics and graphics. Simultaneously. It will reproduce words, numbers, drawings, charts and graphs. Paper is an easy-to-file 8½" wide and page height is infinitely variable up to the full 300' length of the paper supply roll!

More of the fonts you want.

Clevite 4800 generates a wide variety of fonts from the smallest matrix on up. In an equally wide variety of weights, sizes and styles.

Archival quality.

Clevite 4800 uses a special, high-contrast paper. The electrostatic print-out won't smear. And the paper won't curl, yellow or get brittle in storage. You can write on it with ball point pen, pencil, felt-tip or whatever.

The sound of silence.

Clevite 4800 is an electrostatic printer. So it is quiet. (Think about that next time you're trying to make yourself heard above a chorus of impact-line printers.) And no impact means less wear and tear on the printer, less maintenance and downtime.

Beyond the computer.

Clevite 4800 has uses beyond the computer. In communications it can replace banks of teletypes and prints out data transmitted by telemetry, radio microwave and/or land lines. And it prints out graphic displays from CRT's using a TV raster display memory. The Clevite 4800 whips out full pages of alphanumerics and graphics as fast as signal sources can feed it. You may have other application ideas. Let's kick them around.

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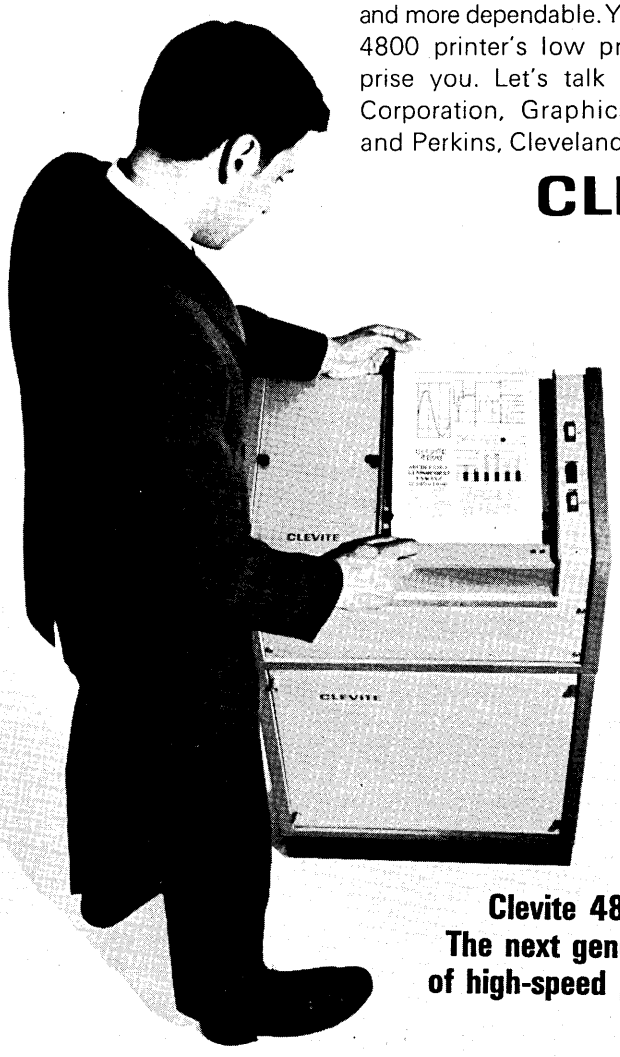
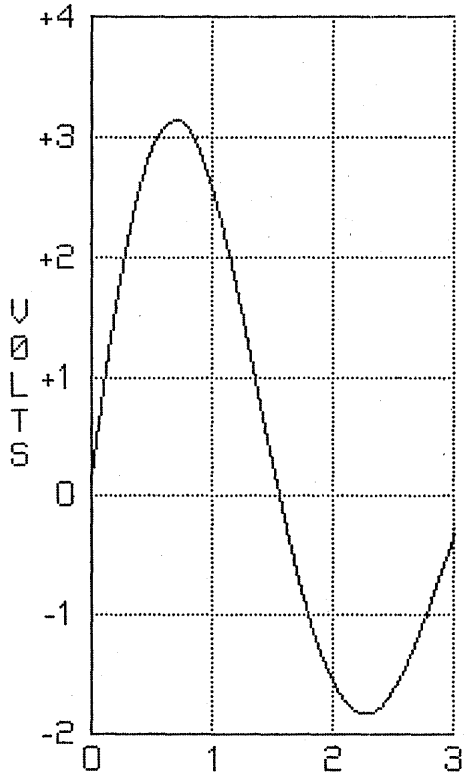
Clevite 4800 is based on proprietary equipment and proprietary paper. There is nothing else quite like it. It's faster, more versatile, quieter and more dependable. Yet, the Clevite 4800 printer's low price will surprise you. Let's talk soon. Clevite Corporation, Graphics Dept., 37th and Perkins, Cleveland, Ohio 44114.

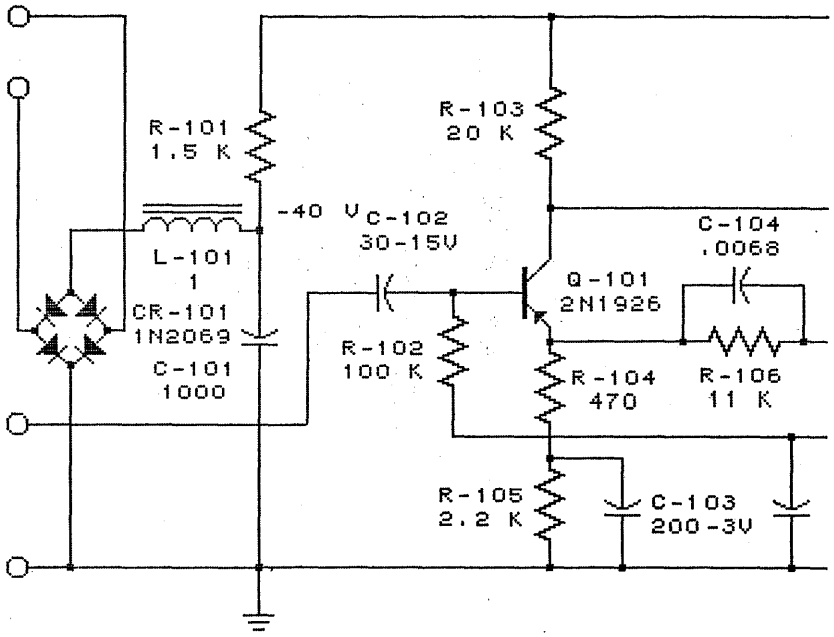
CLEVITE



Clevite 4800.
The next generation of high-speed printers.

CIRCLE 174 ON READER CARD





CLEVITE 4800

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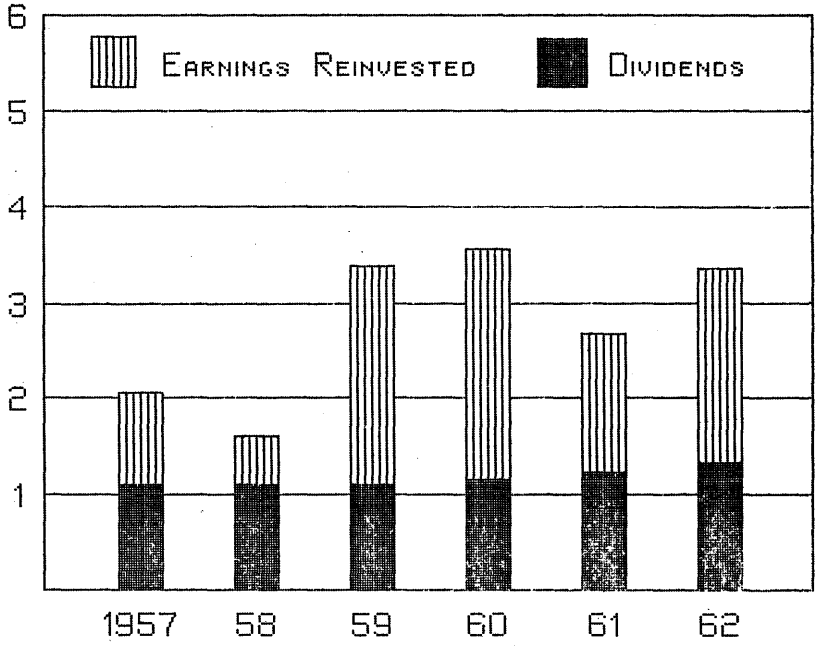

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calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
Oct. 1-5	32nd Annual Meeting	San Francisco	ASIS 2011 Eye St. N.W., Washington, D.C. 20006
Oct. 6-9	Fall Conference	Los Angeles	EIA 2011 Eye St. N.W., Washington, D.C. 20006
Oct. 6-10	2nd Int'l Congress on Project Planning by Network Analysis	Amsterdam, Neth.	INTERNET/Holland Organizing Centre, 16 Lange Voorhout, The Hague, Netherlands
Oct. 22-24	Systems Science & Cybernetics Conference	Philadelphia	IEEE/J. E. Kienle UNIVAC, Box 500, Blue Bell, Pa. 19422
Oct. 24	4th Annual Symp. Computers & Urban Society	New York City	ACM/Jessica Hellwig Columbia U. Computer Center New York, N. Y. 10027
Oct. 26-29	EASCON	Washington, D.C.	IEEE 345 E. 47th St., New York, N. Y. 10017
Oct. 26-30	Joint Conference Math & Computer Aids to Design	Anaheim, Calif.	ACM, IEEE, SIAM 33 S. 17 Street, Philadelphia, Pa. 19103
Oct. 27-29	DP OCR I/O Technology Meeting	New York City	DPSA/T. R. Evans P. O. Box 1333 Stamford, Conn. 06904
Oct. 27-30	24th Annual Conference & Exhibit	Houston	ISA 530 William Penn Pl., Pittsburgh, Pa. 15219
Oct. 27-31	11th Annual Exposition	New York City	BEMA 235 E. 42nd Street, New York, N. Y. 10017
Nov. 5-7	12th Annual Conf. Production & Inventory Control	New York City	APICS, Suite 504 2600 Virginia Ave. N.W., Washington, D.C. 20037
Nov. 10-15	Systems '69 Congress	Munich, Germany	Ger. Sci. Res. Ministry/ Kallman Assoc. 30 Journal Sq., Jersey City, N. J. 07306
Nov. 18-20	Fall Joint Computer Conference	Las Vegas	AFIPS/P. O. Box 49672, Los Angeles, Calif. 90049
Dec. 8-11	Computer Management '69 Int'l Conference	Munich, Germany	IAG 6 Stadhouderskade, Amsterdam W. 1, Neth.

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Boole & Babbage developed Systems Measurement Software because we are unabashedly dedicated to cutting costs for the entire data processing world. Call us old-fashioned if you dare, but we believe constantly improving profits is every user's ultimate goal. Knowledgeable computer managers in many businesses and industries agree: A system which lets you see in real time what's actually going on, and gives precise measurement analysis of every step, must supply the critical ingredients for optimum efficiency. As a result, they have more interesting profit pictures to show.

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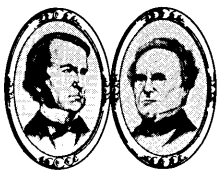
Considering what's happening to the price of software following policy revisions within the industry, your need to reduce operating costs is now more pressing than ever. Boole & Babbage invites you to start evaluating at once. We make matters as simple as possible by offering SMS/360 for immediate purchase, installation, and fast employee take-over. Additionally, we provide a full range of product-oriented services supported by competent advisory personnel. Both are available now from our regional offices. Write today.

George Boole, algebraist, and Charles Babbage, inventor, were the innovators of the computer movement. Let their names remind you — We are the innovators in software and systems management.



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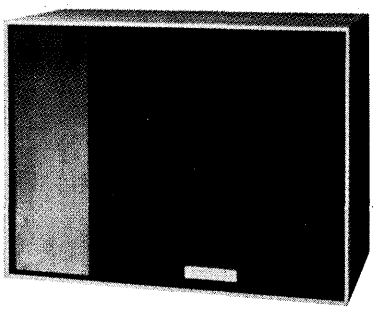

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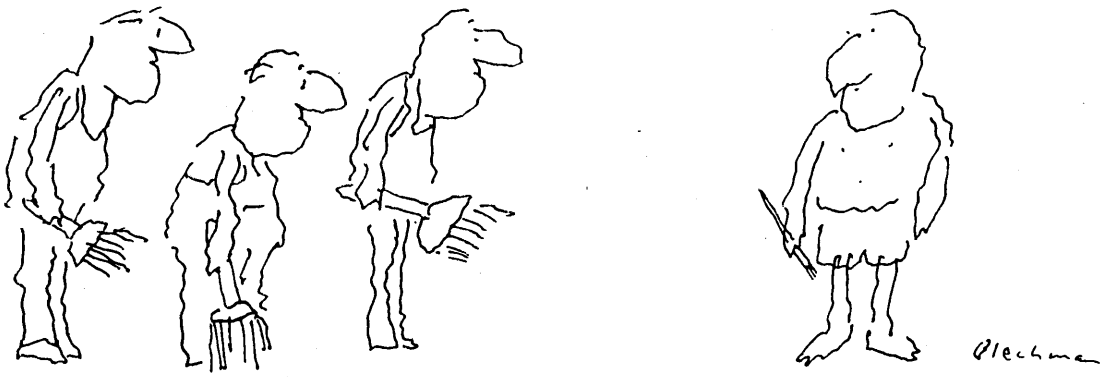

PDP-15 is a Picasso at a House Painter's Union Hall.

Nothing against house painters. Or unions. But in the world of middle size, middle-priced computers, PDP-15 is different. It is monitor controlled. It comes in 4 versions to fit applications and budgets. It is expandable. And its software is complete — including an advanced package — and proven in 400 computers already in the field. Write.

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letters

the sins of ibm

Sir:

Those who accuse IBM of malfeasance have failed to identify more flagrant premeditated acts IBM has committed. Surely I am not alone in recognizing IBM's following sins:

- —Getting the customer to buy what he "knows" he wants.
- —Hiring and training good people in their products, personal relations, and company loyalty.
- —Serving existing markets and exploiting new ones.
- —Servicing what they sell.
- —Dealing at a higher echelon than the competition.
- —Selling conceptually imperfect hardware with similar software thus allowing hundreds of new companies to prosper.
- —Staffing these new companies with well trained ex-IBM personnel. (This charge may be dropped since the only evidence suggesting IBM directly supports formation of new companies is that IBM still accepts resignations.)

If the current trend in critique of IBM's capability to get business is well founded, then we now have a new American dream, "prosper as best you can, but don't be too prosperous."

Assuming that the purpose of antitrust considerations is to maintain a fair competitive climate, some IBM detractors seem to have "lost sight of the objective and redoubled the effort" through spotlighting a worthy opponent's attributes.

GORDON G. HILL
Anaheim, California

the name game

Sir:

In his June article (p. 83) concerning the naming of new edp firms, Mr. James McCrohan did not consider the field of religious edp. May I suggest Datamen for a firm serving church groups, while synagogues can be served by Cybergogue, Inc.

NORMAN BENOWITZ
North Hollywood, California

excelsior

Sir:

As a graduate student in computer science who has been watching the industry, and as one who has worked for both manufacturer and user, who has participated in both hardware and software design, and in manufacturing, I would like to share with you my perspective concerning the current rash of suits against IBM.

Among certain members of my generation, there is cynicism concerning the operations of the capitalist system. These people feel that capitalists are entirely self-serving, to the detriment of other people and to society. We in the industry are cursed with the age-old problems of greed and lust for power. According to B. C. Forbes, business was originated to produce happiness, not to pile up millions; what is our view? We seem to think that "all's fair in love and war" also applies to business; but even war is limited today. We may take the attitude that "If it costs $1 million to sue, that's only 3¢ a share!" Thus, a lawsuit is only an investment; anything we can get out of it, we will. It is not really a matter of whether we were wronged or not. And if one thing is really wrong, we will invent ten others to go along with it in the hopes that we will score on at least one count. Unfortunately, our adversary legal tradition encourages this kind of extremism.

Who among us would operate his business as did Henry Royce under the motto *"Quidvis recte factum quamvis humile praeclarum,"* "Whatever is rightly done, however humble, is noble"? The Rolls-Royce is still the symbol of quality today. Will our industries survive in good reputation or will we make our fast buck and fly by night? Are we willing and interested in making "better mousetraps" or are we only trying to prevent the other guy from doing so? There are a lot of mice running loose, and we can all help catch them. Business is *not* a football game. Certainly today, at least in the computer business, there exist whole fields of technical problems to tackle; we needn't go after each other. Unfortunately, it is too easy to lose sight of the whole picture; too hard under pressures to sit back and think about what's going on. In our day to day struggles we become victims of the "corporate truth," as John Kenneth Galbraith has described it. But of course there *is* no *IBM truth,* or *CDC truth,* or *DPF&G truth,* or *ADR truth,* or any other kind but the one Truth.

As an individual, I cannot speak for a generation. But I for one am not impressed by opportunists. I *am* impressed by a job well done and by a product well made. We have the ability to provide not only quality products but also quality in our lives; I appeal to all men, young and old, to learn the value of cooperation and to strive to see that what is good for ourselves and our companies is also good for our industries and for mankind. *United We Stand; Divided We Fall.* Let us not put ourselves in a position to kill the goose that lays the golden eggs.

ARCH C. DAVIS
Princeton, New Jersey

making a decimal point

Sir:

In Look Ahead, July, 3% of $13K is $390, not $3900. Watch those decimal points, bub!

The corrected figure indicates that only 2 days of SE charged time could wipe out a month's rental reduction.

DP Managers will have to control all calls for systems help since charges can be incurred without a purchase order. Oh, my aching budget!

JERRY FRAENKEL
Associated Press
New York, New York

sour grapes of wrath

Sir:

In your July issue, a letter appeared (p. 27) from a Mr. R. T. Sullivan taking systems analysts to task for not knowing how to code. It seems to me that Mr. Sullivan may have been guilty of an overgeneralization (if not "sour grapes") in condemning those analysts who do not learn programming. While it may be true that systems analysis may cloak a multitude of nonspecialized sins for some individuals, I consider it an injustice to categorically denounce the whole lot.

In a sense, systems analysts-vs-programmers is analogous to systems engineers-vs-design engineers and technicians. In each case, the systems man does what his title implies: he ensures the adequacy of system design, the meeting of overall requirements, the interfacing of multiple complex operating units, and performs other tasks somewhat out of the province (and in many cases the capabilities) of technicians and programmers who cannot (or will not) extend their collective visions beyond the narrow limits of their individual circuits or subroutines.

To be sure, there are extremes on both sides. Some programmers perform admirably in a systems analysis or systems engineering sense. The type that probably comes to mind first is the executive or operating systems programmer who has responsibility for controlling the operation of several complex routines and hardware units. At the other end of the scale, "systems analysis" may only be a cover up for a lack of drive in acquiring a specialty. My main point is this: There are good and bad programmers, and good and bad systems men. Analysts can learn a great deal about reading and designing flowcharts, analyzing listings and the like without having to sit down

with a coding sheet, a pencil and a keypunch. Also, coders can (and should) learn about input and output requirements, system timing characteristics, failure probability and redundancy implications, by osmosis, if not by formal training.

Probably the ideal mix is one who sports a technical degree (possibly in mathematics) and has also taken courses in machine coding, then worked both as a programmer and as an analyst to gain generalized and specialized experience. Since such combinations are somewhat hard to come by, however, I suggest that Mr. Sullivan spend less time criticizing systems people and begin working with them, just as they must sometimes grit their teeth and work with programmers.

R. W. BILEK
Thousand Oaks, California

doesn't need coaxing

Sir:

"COAX: A Preprocessor for COBOL" (July, p. 69) demonstrates once more how far removed the theoreticians of the ACM are from the world of business data processing. Not that their removal is in itself necessarily a bad thing, but some of them now apparently want to get their hands on COBOL with little or no knowledge of the needs of the people who use this much abused language.

For the information of the authors, many business data processing COBOL programs are not 61 card, 20 data name "quickies," but large, complex, constantly changing, multifile conglomerations of six to twelve months work by several analysts and programmers. I for one would not relish the idea of being called upon to take over a large partially coded program written in COAX (and despite the authors' contention to the contrary, COAX is a separate language). Nor do I think that very many keypunch departments would leap for joy at the prospect of punching a 3,000 card Procedure Division with 8-10 special characters per line. Does it not occur to our authors that such a program would contain innumerable keypunch and coding errors, many of which would slip by the preprocessor and merely create incorrect source statements? The probability of errors in an initial compilation is already high and if a programmer is further restricted and required to keep track of the rules for 2 compilers the probability of errors is substantially increased. He must also keep track of 2 sets of reserved words and 2 sets of programmer supplied words. What COAX does is cause more programmer headaches, longer debugging times, and extra computer time usage. Also, I do not think that many programmers are eager to maintain and change COBOL programs with sentences beginning on the same card as the previous sentence.

I do not maintain that COBOL is perfect, by any means. I simply believe that of the three difficulties mentioned at the beginning of the article, the one concerned with the amount of writing necessary to initially code a program is the least important. I object to the statement that the long compilation times have been nearly eliminated. I suspect that compilation times are lower because of increased internal machine speed and the improvements in direct access storage devices rather than in better compiler coding. I warrant that the statement, "The inefficient code generated by early compilers is a thing of the past . . . " is not only objectionable but patently false. It is the comment of a FORTRAN or PL/I programmer who has never looked at his generated coding or couldn't read it even if he did. Mr. Teague or Dr. Brady should see some of the examples I have on my desk right now! I suggest that if they are serious about improving COBOL, they should look first to creating efficient object code.

JOHN L. TURNER
Lombard, Illinois

conversion reduction

Sir:

In answer to the question in June's "Editor's Readout"—Who knows of an installation that reduced its data processing cost after converting to new equipment?—I have found that installation. I believe there are many more, so why slander the whole industry for the sake of a few incompetent people running inferior and inefficient installations? We go back to that word "planning," and if that is done correctly and completely, no one can lose.

In our installation, we upgraded from a 1401 to a 5-tape GE 415 system nearly two years ago. We are, at the present time, doing more—faster and more efficiently—and all at less cost, which is reflected in our budgets each year. In addition, more is planned to be implemented than was put on the system in the six months of conversion.

So I ask that data processers everywhere sit up and start planning effectively instead of dreaming about the days of exotic operating systems when your own system is not efficient—forget the fourth generation (?) as an excuse to get yourself out of a jam and start planning to make your current installation a money-maker, even in those "unglamorous" installations that process information for concerned management.

In summary, I would like to say that, as in every installation, we have some of the problems mentioned in the article, but let's try and eliminate those at the same time as we create a decent image to the public and, most important, to management.

J. D. COOPER
Columbia Records of Canada, Ltd.
Ontario, Canada

Sir:

Regarding the editorial, "Let's Hear It for the User," in the June issue, I couldn't agree with you more.

I have addressed myself to these problems as both a guest lecturer and course chairman for the American Management Association. Unfortunately, there is no easy solution.

In second generation days the computer industry was so young that the new breed "whiz" programmer, by his own technological expertise, ran the show to his own pleasing. By the time management began to understand some of the ramifications involved and could begin to apply some common management principles to the data processing function, the third generation was upon us—a whole new ball game with a different set of rules. Now the corporation does indeed find itself even more at the mercy of the "whiz kid" who in many cases, thru seniority, technical expertise, etc., became the data processing manager—unable to communicate adequately with top management, because in the process of becoming a technical expert he hadn't the time to learn management.

Now that the third generation is middle-aged and a new generation is rapidly approaching, the problems become even more critical, particularly so for those users you mentioned to whom edp is a support activity and not a way of life.

Much of the blame can indeed be laid at the feet of the data processing industry, but I think it also behooves the user to examine his criteria. For example, how to build a management information system now if the basic ground work was not long ago accomplished through applications implementation that did indeed justify themselves through solid "return on investment" criteria, and once justified, how many companies perform a post-audit a year later to see that the ROI is actually there?

How many companies devote relatively the same amount of effort to ongoing application and hardware eval-

(Continued on page 267)

IBM makes

That's right, small.

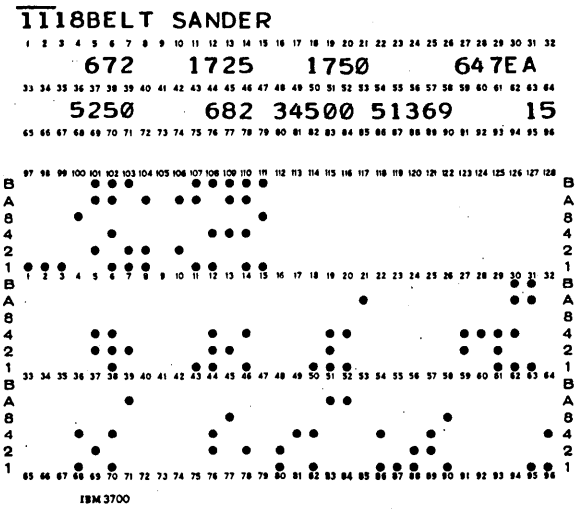
We're introducing a brand new computer.

A computer that uses a small punch card that can soak up more information than one three times its size.

A computer that's especially designed for the small businessman.

It's System/3. The small business computer.

The day of the small punch card begins.



This is it! Our tiny punch card. Actual size. It can soak up 20 percent more information than one three times its size.

With System/3, you'll use a new punch card that's one-third the size of the regular card.

And for good reason.

It's easier to handle. Easier to store. And easier to process through your machine.

Instead of 80 columns, it has 96 columns.

Which means it can actually absorb 20 percent more information than the 80-column card you're used to seeing.

Cutting it down to size.

There's one thing you'll notice immediately about System/3.

Its size.

System/3 is small. In fact, it's a lot smaller than any business computer we've ever made.

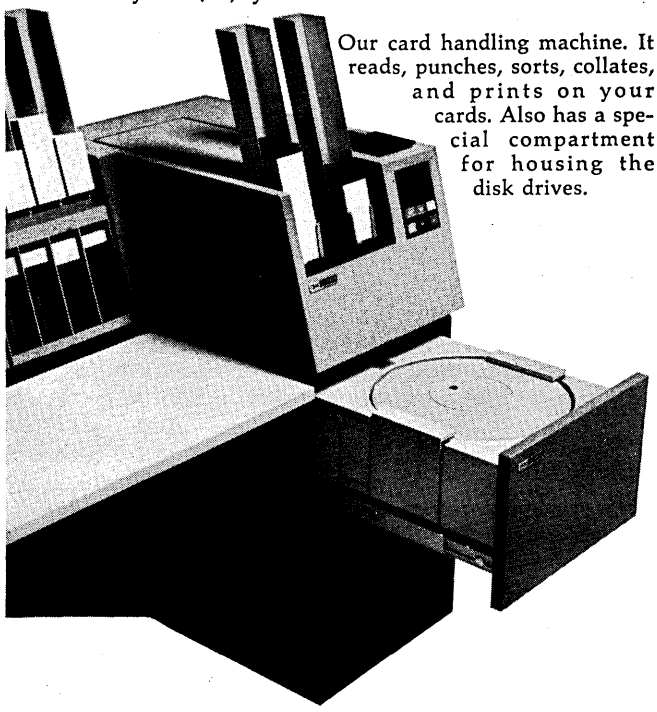
If you have a 350-square-foot room, you have room enough for System/3.

We've been able to cut it down to size because we've been able to use improved circuit families and the small card which lets you do more computing in less space.

But although it's small in size, System/3 is big in memory. You can have as much as 32,768 bytes of core storage.

More with less.

With System/3, you don't have to have a lot of



Our card handling machine. It reads, punches, sorts, collates, and prints on your cards. Also has a special compartment for housing the disk drives.

it small.

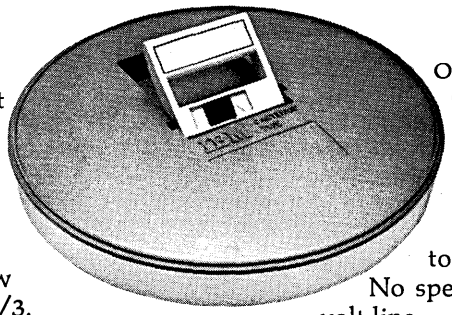
machines handling your cards.

Because our multi-function card unit can do as many as six different jobs.

It can read up to 500 cards a minute.

And it can also be used to punch, sort, print, collate and reproduce your cards.

For off-line work there are two new separate units you can use with System/3. A card sorter. And a data recorder for card punching and verifying.



Our long-playing disks. Each one can give you direct access to 2.45 million bytes of data. As your business gets bigger, just add more disks. Up to four in all.

Your choice: disk or card.

System/3 isn't just one computer.

It's your choice.

If you've got a small business, you might already be using some business machines. So for you the card system is worth considering.

If you have a lot of records to store, you might want to choose the disk system.

It gives you direct access to your files.

Which means you can update your inventory or billing records in minutes.

If you run a big business, you might find it economical to put System/3 in every one of your factories. Or in every warehouse.

It'll manage the paperwork.

No matter what system you use, System/3 can make running your business a lot easier.

You can keep tabs on whatever you have (or don't have) in stock. And reorder only what needs reordering.

You can spot a project in trouble. Track vendor shipments. And discover how your salesmen are doing this year compared to last.

In short, System/3 can manage the paperwork while you manage the business.

Easy does it.

And listen to this. System/3 is easy to put in your office. No cables to lay. No special wiring. Just plug it into any 220-volt line.

The growth computer.

If System/3 makes sense now, it'll make more sense as your business grows.

Because as you grow, it grows.

For example, you can change printing speeds from 100 to 200 lines per minute. Or increase the size of your core storage.

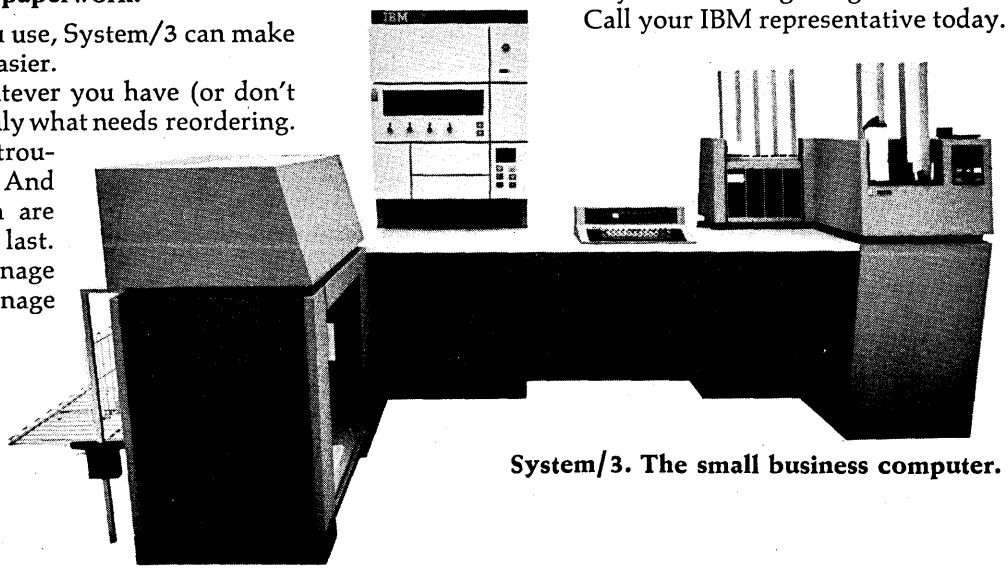
Or let's say you've got the card system and you want to upgrade to the disk system.

It's easy.

Because we pull out a drawer and install the disk system. All the work is done right on your own premises, right on your own machine.

Find out what it can do for you.

We've only told you a little about System/3. There are many more exciting things to find out. Call your IBM representative today.



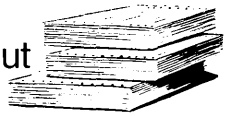
System/3. The small business computer.

IBM®

Announcing...

BCOM

Burroughs Computer-Output-to-Microfilm

BCOM reduces the volume of business data that your computer stores on a reel of magnetic tape  or on 2300 full pages of printout  *(printing time: 2 hrs., 7 min.)* to a compact 4 x 4 inch cartridge of microfilm  *(recording time: 4 min.).* Later, you can locate a record, view it, even make an 8½ x 11 inch dry copy in *seconds!*

BCOM—for records you refer to frequently, or distribute, or put in the archives. Ask us about it.

CIRCLE 9 ON READER CARD

look ahead

McNAMARA'S BAND TO PLAY DIFFERENT TUNE

Several members of McNamara's Band have been removed from DOD's Research and Engineering Directorate (DDR&E), including Dr. Jim Ward, who has been trying to speed development of transferable software. The "reorganization" is part of DOD Secretary Laird's plan to give his staff offices relatively less authority than they enjoyed under McNamara and the military services relatively more.

The number of casualties at DDR&E is estimated at "8-10" by one source and "20-25" by another. Two groups within the Electronics and Information Systems Division—command and control, and communications and electronics—have been consolidated. Herb Benington, who had been an assistant director, in charge of command and control, has been promoted to acting deputy director (E&IS). Dr. Gardiner L. Tucker, who is now DDR&E's principal deputy director, is chief architect of the reorganization.

More boxes on the agency's organization chart are going to be shifted, and additional changes are possible.

It seems clear that the "Laird Look" will strengthen the hands of those within DOD who are advocating single-source procurement of the new Worldwide Military Command and Control System; they are concentrated in the service commands.

As we went to press, a "final" decision paper, laying out alternative implementation strategies for the Wimmix buy, reportedly had been signed off by DDR&E and was making a last circuit through the services before being sent to Laird's office. He may approve release of final bid specs, send the decision paper back for rework, or do nothing for a while and let the whole project gather more dust.

NEW COM FIRM TO UNVEIL IN DEAN MARTIN'S SUITE

A six-month-old Computer-Output-Microfilm firm that has rung up a backlog of over $600K without making a sales call is ready to roll with a new system that may give it a running start on invading a small but growing market dominated so far by Stromberg-DatagraphiX.

Computer Micro-Data Systems, Northridge, Calif., will unveil its MCS 7000 system at FJCC . . . in Dean Martin's suite at the Riviera Hotel, yet. The system features a fast, modified Cinecamera; 120K cps (900 pages/minute) throughput, easy forms alignment, multiple (up to eight) forms capability, twin buffered core memories. It will handle 16 and 35mm film and 105mm microfiche.

About ready to raise more dough, the young 16-man company is confidently building five production models before its prototype is finished. And they're running hard. Ex-salesman Pres. Ron Mogen, who learned how to work under CDC's Bill Norris ("he's a tiger")

(Continued on page 35)

says he runs a tight ship: "We work from 8 a.m. to 10 p.m. six days a week." Other principals include Glen Kimball—designer of Information International's FR-80 COM system—Howard Poyer, and Leon Goodman, 10-year COM veteran. All four founders are under 33.

Still seeking a marketing manager, CM-DS will aim first at the COM service bureau market (some 20 companies, many with multiple installations). They may not need a marketing man: all sales so far have seen the customer come to their door, well filled by Mogen, who stands 6' 8" in his 15EEE's, and weighs 270 pounds. The prospects are probably afraid to leave without signing up.

MINICOMPUTER FIRM SIGNS WITH MAXICOMPUTER FIRM

Computer Automation, Inc., Newport Beach, Calif., maker of minicomputers, has taken a significant step by signing a contract with Control Data Corp. to provide international maintenance for Computer Automation's machines by CDC personnel. Computer Automation will train CDC customer engineers and stock spare parts in CDC's six regional offices and over 80 service centers, 34 of them abroad. The plan is to provide emergency 24-hour service, with a same-day response time. Computer Automation retains full responsibility for its computers. The firm has over one hundred of its machines in the field at present, sold the first one a year ago, and has a backlog of over 500.

UCC SELLS EDUCATIONAL ARM TO NEW DALLAS FIRM

Dr. Mike Fremming has resigned from University Computing Co. to form Financial Technology, Inc., Dallas, has purchased one of UCC's educational ventures, the Institute for Professional Education, and will conduct seminars for various business disciplines ("the top 10 of the Gross National Product") to orient them toward time-sharing and buying services from FTI. Dave Allison, marketing head for the Institute, will resign shortly . . . destination unknown at presstime. Fremming also wants to buy UCC's Academy of Computer Technology, which has 22 programming schools around the country, but UCC doesn't want to sell. Fremming says he's backed by "a bunch of businessmen," has bought computer centers in Dallas, Seattle, New Orleans, Oklahoma City and L.A., and hopes ultimately to go public.

COMING NEXT YEAR: VARIABLE T-S PRICING

They laughed when Maher Soliman sat down at the terminal and announced he didn't care about selling his payroll package but would just take royalties on the hours it was used. Now, though, nine time-sharing services have signed on with his company, National Payroll, Inc. All these use SDS 940's; a flock more are waiting impatiently for the program to be modified to fit the B5500, 1108, GE 635, and 360's.

But Soliman now has another project under way that will introduce a new marketing concept for the time-sharers to offer their customers: variable prices for computer time, based on the nature of the service and data base offered. To concentrate on this he will turn over National Payroll to his associates about the end of the year and start a new company to be called, inscrutably, Trans World Computer Business. One of the first products will be a medical/pharmaceutical retrieval system aimed at private doctors' offices—not hospitals. It will be sold to time-sharing services on the same royalty basis as payroll. The difference is that this will be a dual service. The doctor will be offered an

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Sometimes our first name makes liars of us.

A lot of SDS systems aren't scientific.

People keep thinking our computers are only good for science. But they're not limited to science. Here's a selection of applications. Read the lot, or just those in your area.

A university in Canada uses an SDS computer to run the library circulation department and help students select books. At other schools the same model computer handles student registration, class scheduling, grade reporting, teaches students about computers and runs research projects.

In industry you'll find standard applications like numerical control, of course. A southern oil company monitors over a hundred oil wells with a single SDS computer, while many others use them to analyze seismic data and blend gasoline. Engineers in the midwest are coping with the complex variables in designing large structures with the help of our computers. And there are a multitude of other systems designed for specific industries, like controlling a rolling mill.

Biomedical uses include running an entire hospital, from preparing payrolls to monitoring critically ill patients. In some hospitals they're formulating mathematical models predicting patient survival, analyzing ECG's and clinical laboratory experiments.

Business data processing applications include commercial time-sharing installations in several large cities, on-line general accounting, database maintenance and retrieval systems, payroll, accounts payable, purchasing, spares provision, parts explosion and production control, material control, cost accounting, purchases and manufactured parts inventory control and even an automatic motor transport rating and billing system.

In aerospace and data acquisition you'll find SDS computers almost everywhere. A federal agency uses one for air traffic control studies. Many of the largest aerospace companies use them for simulation of weapons and flight systems, and testing aircraft performance. Our computers also help control the launch of multi-stage space boosters and train pilots. They're involved in the world-wide spacecraft tracking and telemetry system, in making sure pictures transmitted from the moon are sharp and clear, and in a bundle of other applications.

Communications based systems are a relatively new area for everyone in the industry. Except us. Message switching and message concentration systems have been built for a major New York bank, a national credit rating system and classified government communications systems.

As we said before, this is only a selection. If you'd like more information about any of them, drop us a line. Our first name may sometimes make liars of us, but our applications won't.

SDS

Scientific Data Systems, A Xerox Company, El Segundo, Calif.

editor's readout

THIS YEAR, PERHAPS . . .

Since our last international issue there have been some massive upheavals in the industrial structure overseas. And it is far from clear as to who has lost most ground and who has gained some. It is the West European amphitheater which presents the most confused picture, with a host of manufacturers jostling for their slice of the cake. In spite of the spate of mergers last year, the scene is still one of an industry in some state of evolution.

The trouble comes because nobody is quite sure of the rules that apply from one country to the next. It is a hilarious scene (if you are an observer) or a nightmare (if you are an industrialist).

By comparison, the Japanese computer business has developed in an orderly fashion. In the Orient, cooperation with foreign companies is welcome but the formalities are strictly observed. Which means that the terms for open-door trading include negotiating agreements with local industry that will strengthen Japanese firms' capabilities.

Even selling to the Iron Curtain countries is a straightforward, if arduous, business these days. Western manufacturers have to spend more time convincing the NATO committee which keeps a watchdog eye on sales of goods of possible military importance to the Eastern bloc than they do persuading Eastern bloc buyers how good the computers are. The red tape may seem endless and an Iron Curtain country may prefer to barter a bunch of dump trucks for a computer because it is out of currency—but the machinery for negotiation eventually grinds.

But the West European market is a battlefield from morn till night. The main cause, not unnaturally, is a desire to maintain several of the indigenous machine makers.

Ironically, the corporation which causes most European executives to grab their pikestaffs and rush to the balustrades, IBM, has the logo "world peace through world trade" branded over the portals of its manufacturing plants, which proliferate across Europe.

Slowly—and not very surely—the major companies from America and Europe are learning how to live with each other. Firms like NCR, Burroughs and Honeywell have done it by pouring investment into manufacturing resources to become important economic props in a number of countries, thus removing the accusation and stigma of being "economic colonialists." However, this does not strengthen national industries per se.

The assets and profitability of computer operations of the European companies are still far below the most successful American competitors. And the hostility that was once reserved for invading hardware from across the Atlantic is now extended to the software houses, which have been making steady inroads over the past 12 months.

Perhaps a solution still lies in the once vaunted ideas for Anglo-Franco-German collaboration. This seems a far-off dream, though, since all three countries have implemented government-backed programs involving direct support of national industries.

Curiously, the one plan that is up for discussion for collaboration looks like the one which has the highest chances of failing. This is for a supercomputer some 10 times bigger than a 7600. In the light of experience, no manufacturer seems able to get the hardware and operating systems for such a giant out of one stable without great trauma. The thought of the biggest one yet being split three ways has an awesome quality to it.

Perhaps this year will show whether Europe can continue to compete across the board or whether the emergence of the smaller hardware house that packages for a more specialized market is the path for the future.

—P.W.

happy 10th anniversary

IFIP: EXPERIENCES AND POSSIBILITIES

by H. Zemanek

There had been conferences on electronic computers before, both in America and in Europe, with international contributions and with international participation. But the first congress conceived and organized internationally was the UNESCO-sponsored "International Congress on Information Processing 1959" in Paris.

One of the results of the cooperation of national representatives in the preparation of the programme[1] of the congress and of an exhibition of computing equipment was the conviction that this cooperation should be consolidated and extended by the establishment of an international federation. A committee was set up under the chairmanship of I. L. Auerbach (U.S.) to formulate the preliminary structure and the constitution of the planned organization. And in January, 1960, IFIP—the International Federation for Information Processing—came into existence, consisting, then, of 13 national societies (Fig. 1).

The tenth anniversary of the Paris congress and the edition of an international issue of DATAMATION offer an excellent opportunity to sum up and to reconsider experiences and possibilities of an international federation in our field.

changing concepts in a changing world

Back in 1959, the computer was not yet the mass product and the accepted tool of today. It had a highly academic character. At that time, most of the computers were designed by professors—maybe less so in the United States, but certainly in any other country—and the people around the computer mainly were of high academic level. IFIP of 1960 reflected this situation, as its member societies did.

The main objective of IFIP was to organize every three years a big congress on information processing (Fig. 2), and, in spite of many critical remarks, there is still wide agreement that these congresses shall remain the central

[1] In IFIP, "program" is used for computer instruction, while "programme" stands for conference contents.

Dr. Zemanek is vice president and general assembly member for Austria of IFIP. He is manager of the IBM Laboratory Vienna and a professor at the Univ. of Technology, Vienna. From 1956 to 1959, he was director of development for the Mailuefterl, one of the first digital computers in Europe using transistors.

Fig. 1 IFIP Member Countries and Associations

1960	Belgium	Société Belge pour l'application des méthodes scientifiques de gestion.
	Canada	Canadian Information Processing Society
	Czechoslovakia	Czechoslovak National Committee
	Denmark	Danish Federation for Information Processing
	Finland	The Finnish Assoc. for Information Processing
	France	Assoc. Francaise pour la Cybernétique Economique et Technique (AFCET)
	Germany	Deutsche Arbeitsgemeinschaft für Rechenanlagen (DARA)
	Japan	Information Processing Society of Japan
	Netherlands	Nederlands Rekenmachine Genotschap
	Spain	Consejo Superior de Investigaciones Cientificas
	Sweden	Swedish Society for Information Processing
	Switzerland	Swiss Federation for Automatic Control
	United Kingdom	British Computer Society (BCS)
	U.S.	American Federation of Information Processing Societies (AFIPS)
	USSR	USSR Academy of Sciences
1961	Argentina	Sociedad Argentina de Cálculo
	Australia	Australian National Committee on Computation and Automatic Control
	Italy	Associazione Italiana per il Calcolo Automatico (AICA)
1962	Norway	Joint Committee for Data Processing Societies
1963	Austria	Austrian Productivity Center
	Brazil	Associacao Brazileira de Computadores Electrónicos
	Israel	Information Processing Association of Israel (IPA)
1964	Mexico	Mexican Association for Computing and Information Processing
1965	Bulgaria	Bulgarian Academy of Sciences
1966	Hungary	Federation of Technical and Scientific Societies, Section for Information Processing, Cybernetics, and Operations Research
1967	Cuba	Academia de Ciencias de Cuba
	Yugoslavia	Yugoslav Committee for Electronics and Automation (ETAN)
1968	Chile	Chilean Computer and Information Processing Association

task of IFIP. What is constantly changed is the policy of the programme committees for those congresses. How many invited, how many submitted papers? How many panels, how many state-of-the-art reports? Each programme committee chairman finds his own answers and tries to correct shortcomings of the preceding congress. To a lesser degree the same is true for the local organizing committee of the congress. The considerable differences, however, between countries, cities, and professional attitudes make each congress a new adventure in organization.

Since one of the basic ideas of the foundation of IFIP was to extend cooperation beyond the congresses, it was only natural that more events and activities emerged, initiated and supported by IFIP. The coordinating body of IFIP and its legal representation is the General Assembly, consisting of one representative from each of the national member societies. The first president was I. L. Auerbach (U.S.), who served for two three-year terms; the second president was A. P. Speiser (Switzerland), and presently A. A. Dorodnicyn (USSR) holds this position. The names of other officers reflect the international character of IFIP: A. Walther (Germany), A. van Wijngaarden (Netherlands), L. Lukaszewics (Poland), D. Chevion (Israel), J. Carteron (France), M. Linsman (Belgium), E. Harder (U.S.), and many others.

Following a pragmatical course, IFIP developed stepwise and by organic growth. New activities were started only when there was an identified need and when there were people able and willing to do the work—besides their primary professional occupation: IFIP always has had to rely on the idealism of its people (and on the support of their employers).

In such a way, a variety of committees and groups have been established (Fig. 3). There are standing and ad-hoc committees for the organizational needs of IFIP, but here the technical committees (TC's) are of interest. The TC's consist of one national representative appointed by the member society, while the working groups (WG's) consist of specialists for the subject of the WG, independent of nationality.

TC1 deals with terminology and has a WG on the second edition of the IFIP vocabulary; TC2 deals with programming languages and has three working groups, WG2.1 on ALGOL, WG2.2 on formal definition, and WG2.3 on programming methodology. TC3 deals with education and has two working groups, WG3.1 on secondary school education and WG3.2 for the organization of seminars. The youngest, TC4, deals with information processing in medicine and has just started a working group on training medical personnel; further WG's on medical records and on bio-engineering may be considered.

A bigger step was made in 1966 by the formation of a new kind of suborganization, the IFIP special interest group on administrative data processing (IAG). It had been intended to design the bylaws in such a way that future special interest groups could be formed on the same model. But it seems that this particular SIG is very special and wants a structure which may not be easy to repeat. IAG is oriented towards the practical needs of administrative computation centers. This is why the present chairman of IAG, Mr. S. D. Duyverman (Netherlands), has conceived an organization of partners—data processing centers, in essence —who do not form strong national groups, but contribute a fee to the headquarters of IAG where many publications are produced and distributed and where the seminars, meetings and conferences are organized. Their aims result in a request for more financial and organizational autonomy for IAG than originally agreed; a change of their constitution is in discussion. *(Continued on page 40)*

Today the federation counts 29 member societies (Fig. 1), among which all countries with major activities in the information processing field are being represented. This situation means not only growing possibilities, but also increased responsibilities in the sense that the further development of information processing with its unique velocity may require that IFIP reconsider all activities and possibly change part of its scope, methods, people and aims.

achievements and experiences

International cooperation in IFIP has had many more results than publications and reports can show. The meetings of IFIP are an excellent opportunity and excuse for a trip to a place where specialists, working in the same field, will be together and where, therefore, a lot of problems outside the scope of the meeting can be discussed. One can learn about new work long before publication and get a feeling for future lines. Even without a particular purpose, the meetings and even the conference would contribute to the promotion of information processing.

But IFIP can indeed document contributions and results, and a few of them are reviewed here.

Between the big congresses, IFIP organizes medium and small conferences (Fig. 4). The medium-sized conferences are organized jointly with a second similar body, mainly IFAC (the International Federation for Automatic Control) and FID (the International Federation for Documentation), and the subjects are situated in some area of intersection between the cosponsoring body and IFIP. These conferences are usually attended by some 500 people and their aim is to make a broader community of interested specialists familiar with recent developments. The wide range of computer applications strongly invites this kind of cooperation, and possibly IFIP should do even more and encourage further

Fig. 2 IFIP Congresses

(1959)	Paris	[1]
1962	Munich	[2]
1965	New York City	[3]
1968	Edinburgh	[4]
1971	Ljubljana	

associations to co-sponsor common meetings.

The smallest type of conference IFIP has developed is the "working conference" of a TC. Its aim is the discussion of a highly special subject by a small group of people who are noted for having worked on it; the participants are expected to bring new results to a working conference and all of them can, therefore, take home new ideas and incentives. The limited attendance—no more than 60 people—ensures mutual contacts of all participants, valuable conversations and useful results. The members of the corresponding TC are familiar with the respective scientists of their country,

Fig. 3 IFIP Groups and Committees

IFIP TC 1	Terminology	
	WG 1.1	Second Edition of Vocabulary
IFIP TC 2	Programming Languages	
	WG 2.1	ALGOL
	WG 2.2	Formal Definition
	WG 2.3	Programming Methodology
IFIP TC 3	Education	
	WG 3.1	Secondary School Education
	WG 3.2	Organization of Seminars
IFIP TC 4	Medical Information Processing	
	WG 4.1	Education of Medical Personnel
SIG	IFIP Administrative Data Processing Group (IAG)	

and with their work. So they can establish lists of people to be invited for participation and for submitting papers; and they usually also form the programme committee, while organization is resolved locally.

It is a strict rule that proceedings are published of both joint conferences and working conferences; their set of volumes ([5] to [11]) indicates the achievements and the lines of future plans.

The IFIP Vocabulary of Information Processing was compiled internationally and first issued in English [12]; other languages have followed and will follow. Each pair of volumes constitutes a dictionary for the two respective languages.

ALGOL is another example of IFIP work. The language had originally been designed by a joint ACM/GAMM[2] committee. In 1962, IFIP invited the 13 ALGOL authors to put the continuation of their work under the umbrella of IFIP, and the majority of the authors accepted. The revised report on ALGOL 60 was already published under IFIP auspices. WG 2.1, composed partly of the original ALGOL authors still interested and partly of further contributors, continued the work by preparing, on the request of ISO, an input/output document and a subset which was coordinated with the ECMA[3] subset. As a rule, IFIP does not do any standardization work, but an exception is made if a request comes in and if the subject supports it.

WG 2.1 turned to further developments. They established a plan to work on two concepts: on a successor language of ALGOL 60, which they called ALGOL X, and on a more general language, called ALGOL Y. This latter is still much more an idea than a ready structure. ALGOL X, however, has been carried through; many preliminary drafts have been distributed in WG 2.1. In the final draft, the let-

[2] Gesellschaft fur Angewandte Mathematik und Mechanik, Germany.
[3] European Computer Manufacturers Association. Their TC 5 had also designed a subset of ALGOL 60.

ter "X" was replaced by "68," which stands for the year of accomplishment, and eventually that version was submitted to the General Assembly of IFIP for approval to publish as ALGOL 68. It will appear soon in several scientific journals. It should be mentioned that the approval does not mean that IFIP considers the described language as official or even finished: it is submitted to the professional world for study, implementation, and subsequent application. The discussions in WG2.1 have not been without controversy; some of the members are in opposition to both the language and the method of description. Only the future can tell how ALGOL 68 will succeed. In any case, it will be—as ALGOL 60 had been—a source of ideas for language improvement, and a subject of academic study. For me, personally, the controversy on ALGOL 68 indicates that a new era of programming languages comes up in which the algorithmic aspect will be of less importance, and in which historic methods of design may have to be changed. But also in its negative aspects, if there are any, IFIP has done pioneer work and it can only be hoped that the members of WG 2.1 and WG 2.3 will be as successful in the future as they have been in the past.

WG 2.1 is issuing the ALGOL Bulletin. For this journal no subscription fee is being required (although the increasing interest may make it necessary to change this policy in the future; there is already a special edition for the U.S., and another for the USSR is planned); anyone who asks for the bulletin can get it. Still, there are no advertisements: IFIP and the Mathematisch Centrum in Amsterdam are covering the costs, and the editor, Mr. F. G. Duncan (U.K.), works without compensation. The ALGOL Bulletin is printed as a manuscript and it serves as a communication link between programming language scientists. WG 2.2 has just started editing another bulletin, for their internal purposes only.

Fig. 4 IFIP Joint Conferences

1964	IFAC/IFIP	Stockholm	Process Control	[5]
1965	IFAC/IFIP	Munich	Microminiaturization	[6]
1967	IFAC/IFIP	Menton	Process Control	[7]
	ICC/IPA/IFIP	Jerusalem	Population Registers	
	FID/IFIP	Rome	Information Retrieval	8]
1968	IFAC/IFIP	Toronto	Process Control	
1969	IFIP/IFAC	Rome	Prolamat	
1970	IFIP/AICA	Munich	Hybrid Computation	
	IFAC/IFIP	Versailles	Traffic Control	

IFIP Working Conferences

1964	TC 2	Vienna	Formal Languages	9]
1966	TC 2	Pisa	Symbol Manipulation	[10]
1967	TC 2	Oslo	Simulation Languages	[11]
1970	TC 4	Lyon	Medical Records	
	TC 2	Munich	ALGOL 68 Implementation	

The seminars organized by TC 3, frequently in cooperation with the International Computation Center (ICC) or IAG, try to complement the work of the historic educational institutions on subjects of information processing, where these institutions can not offer corresponding courses. Since IFIP can not hope to educate all the thousands of people who would like it, TC 3 aims at model seminars which can be repeated in any country by means of proper documentation.

TC 4 is an interesting attempt to bring medical doctors, medical administrators, and computer people together, so that they develop a common language (not a programming language, this time, but an English understanding) and computer tools for their problems.

The activities of the Special Interest Group (IAG) are manyfold; there are communications, a quarterly journal, and a literature service; there are meetings and conferences, seminars and workshops. A detailed description would require a separate article. And so far, this is only the beginning of the activity of the group which at present has some 250 partners (not very many in the U.S., unfortunately).

problems and tasks

IFIP has been criticized, and IFIP deserves criticism. It can not possibly be better than the people who run it, and these people are human beings. Improvement of IFIP is a question of improvement of its people.

The necessity of reconsidering all current activities and of changing part of IFIP's scope, methods, people, and aims has been recognized by IFIP, and an ad-hoc committee on the future policy was established under the chairmanship of vice-president D. Chevion (Israel). A second committee on activity planning, under the chairmanship of the author of this article, will prepare an IFIP six-year plan on the basis of the final report of the future policy committee. New SIG's and TC's will enlarge the field of active interest of IFIP and more care will be given to the regular replacement of officers in the different bodies. A draft for new statutes and bylaws is being designed and for many problems a new approach has been drawn up.

At present, no spectacular steps should be expected. The organic growth of the last 10 years will continue for the next 10 years. But there is one very weak point in IFIP, and that is its internal and external communication links. Oddly enough, some well-known scientists have reproached IFIP for being bureaucratic—while, in fact, it was its missing administrative quality which made IFIP appear clumsy and slow. After 10 years of existence, for instance, IFIP has not issued the planned newsletter which should indicate future IFIP events, announce publications, report on achieved work and list the people in IFIP's services. The booklet issued at the last congresses was a help, but not sufficient for the purpose.

The need for improved administrative service had been recognized a couple of years ago, but the adopted solution did not turn out to be successful. A new attempt must be made and IFIP has started to take action in this respect.

IFIP suffers from a crucial shortage of people to carry out

the established tasks. IFIP tried too long to manage with the 29 national representatives who were forming all the committees, except SIG, TC's and WG's. And even there we could avoid a repetition of names. This was certainly acceptable in the early history; now IFIP will have to find new ways.

Some development will be necessary on the national level. IFIP respects, of course, the principle of not interfering in the domestic problems of its member societies, so that impulses would have to come from other sources. Not all member societies have kept up with the dynamic expansion of information processing. The increasing number of non-scientific specialists and nonacademic staff has changed the professional distribution and the image of the computer community; information processing has become a multi-dimensional problem requiring multidimensional solutions. Time is necessary to get them elaborated.

With regard to the international character of IFIP, there are two further problems involving Europe and the United States. The U.S. as far as information processing is concerned, is a world of its own, and I will cover this aspect in the last section of this article. But Europe is also a world of its own, only in a different sense. With good arguments of economy, the Europeans in IFIP request to have the biggest share of the meeting places. And this disturbs the international equilibrium. It is not true that Americans have unlimited funds for trips to Europe (although a combination of several purposes for one trip to Europe may give the way out), and for other continents this argument does not apply at all. Countries like Australia, Japan, or Argentina are excluded from intensive participation in IFIP activities. Truly international activity is extremely expensive. It would not help very much to hold many meetings on other continents: small participation would be the consequence today. A solution might be found through "local" suborganizations in Africa, Asia, and Latin-America, but it is still too early to try it now.

ifip and the u.s.

Let me close with some remarks on the relationship between IFIP and the U.S. According to statistics, more than 75% of the existing computers are in the U.S. Since IFIP can not possibly be based on anything else than democratic rules, AFIPS has a share of 1/29, or less than 4% of the voting power in IFIP. This discrepancy can not be removed. It has a number of consequences which both AFIPS and IFIP must bear in mind.

Most of what IFIP can do is being done on a bigger scale in the U.S., by AFIPS and other organizations. Take the Joint Conferences as an example; they can be run in many American cities with the same rules and schedules, while IFIP has to start its conferences, in many respects, each time almost from scratch. Mentalities and organizations are so different in the different countries. In the U.S. everybody speaks English, there are no visa problems, there are no currency complications. But this shows also that IFIP is indispensable for the people who have those problems; it is not less urgent for them to have a large-scale professional life.

And there are a lot of good reasons for the U.S., too, to take an active part in the international promotion of information processing. The scientific contribution of the other countries and their economic importance speak in favor of a strong international professional federation. Greater American interest in IFIP and its activities would pay—both for IFIP and the U.S.

Now, there is of course a U.S. share bigger than 4% in the technical and administrative work within IFIP. Still, one could raise the question whether AFIPS has done everything in the past to take care of the American interests in IFIP. What could be done is not so much a problem of money (membership dues are not equal and the big countries have agreed to pay more), but a problem of moral and technical support, and of interested and experienced people. Take the secretarial and editorial tasks in IFIP; since English is the working language, such work is better done by English-speaking people.

I have no immediate propositions how AFIPS could help, but this is not the purpose of this article. It is intended to stimulate the American interest in IFIP and its problems in general.

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This article reflects the views and ideas of the author which may differ from the official IFIP view.

A FUTURE FOR ECMA?

and their eight-year past

by Don Crayford

In the field of computer hardware and software, standards have acquired some special problems of their own, possibly because of the youthfulness of the industry and certainly due to the rate of change. It is no exaggeration to state that the time it takes a typical proposal to move through its due processes to become an accepted standard is frequently longer than the gestation period of the next generation of the device or language level in the proposal. So why bother?

Possibly the greatest impetus to international standardization has been the European Computer Manufacturers Association (ECMA). Formed in 1960 as a result of an initiative by ICL (ICT as it then was), Bull and IBM Europe, exactly 20 companies came together to form what they believed to be a strong counterbalance to the growing threat from American companies in the domination of the European arena. Naturally, IBM hardly joined from these motives, but if such an organization was to be formed, it was hardly viable without IBM and, in any case, it was better to be inside the ramparts than outside.

The declared purpose of ECMA was "to study and develop, in co-operation with the appropriate national and international organizations, . . . methods and procedures in order to facilitate and standardize the use of data processing systems." Apart from IBM, only two other companies had any obvious linkage with U.S. parents—Standard Telephones and Cables and Standard Elektrik Lorenz, both subsidiaries in the ITT empire but, at the time, both with a fair degree of autonomy. Then there was also Elliott Brothers, who manufactured the computers sold by NCR at the time—the 405 which was designed by Elliotts and later the 315, built to Dayton drawings—which attempted to represent the interests of both companies.

By the time the association came into being in May, 1961, ITT Europe was the official nominee for their two subsidiaries even though both for a time made individual contributions.

ecma's influence

In the eight years since ECMA started work, it has undoubtedly made significant contributions in many fields of standardization. The so-called ASCII code really had its origins within ECMA, and IBM, which has fought hard with every weapon in its armory against its adoption, would have been successful had it not been for the strong influence ECMA had been able to exert internationally. As it is, the Memorandum from the Secretary of Commerce dated March 7, 1969, referring to the adoption of ASCII for all U.S. federal agencies, marked a watershed in the hitherto unchallenged philosophy that what IBM does is, ipso facto, the standard. And then along the way was the optical character standard—OCR-B, wholly conceived and developed within ECMA much to the chagrin of those manufacturers in the U.S. who had heavily invested in OCR-A. Today, this is made light of and most salesmen in the business will talk briskly of "multi-font capability," which is really making the best of an uncertain interregnum. All the available evidence suggests that it is only a matter of time before OCR-B is the only single-font capability which will endure for the majority of applications, leaving aside NOF for within-house cash register work and possibly a few genuine multi-font applications which can absorb the higher overheads.

Before this, we had a MICR situation with the U.S., particularly the banks, investing large sums in E13B, with the British banks, even today almost wholly committed to American equipment, following suit. But in Europe as a whole, another magnetic ink font, possibly largely unheard of in the U.S., has been adopted. This is CMC7, born in the laboratories of Compagnie de Machines Bull and subsequently developed within an ECMA committee. Although the advent of Britain's entry into the Common Market (EEC) could in the long run have an influence on British banks, it is likely that the U.S. market is sufficiently large to be insulated from this "other" standard. But it is not exactly the most convenient arrangement for U.S. manufacturers who need separate development and production lines.

Although a by-product of the work on ASCII, ECMA's contribution in the field of magnetic tape standardization was not insignificant, particularly on 9 track 800 bpi. The designers of the 360 took out insurance by building in an ASCII mode reputedly under operator control. Unfortunately, the relationship between the 7-bit code of ASCII and the 8-bit byte within the 360 left something to be desired. It was a beautiful arrangement for the users with Japanese Katakana in their repertoire but not a howling success

elsewhere except with those who had commitments to IBM equipment—but they wanted to use EBCDIC anyway, not ASCII. This was not by any stretch of the imagination a magnetic tape problem, but finished up as one because of the need to define the representation of 7-bit ASCII on tape with 8 data tracks. The delays arising from the infighting on this question might well have eliminated ASCII as a viable code, but the work within ECMA which demonstrated an alternative preferred relationship was compatible with the 360 representation of packed numerics on magnetic tape finally won international acceptance.

More recently, ECMA has, after several years work, produced a standard, or to be precise some compatible standards, on the thorny question of keyboards, while the U.S. equivalent committee drifts on in the doldrums. This itself is a remarkable achievement because different languages have different needs in keyboards and no one can deny that Europe has different languages. Of course, it remains to be seen if yet again ECMA is going to lead international opinion, but one thing is sure: it cannot fail to influence the USASI committee on the subject, which until now has been bedeviled by the vested interests to whom a break with historical developments is something to be avoided if possible.

then and now

There are many other illustrations of the influence ECMA has had in the past eight years, but it is worth making a comparison between the ECMA of 1961 and the ECMA of 1969 in order to hazard a guess as to what the next few years might bring.

The most notable change without doubt is the swallowing up by ICL of the digital computer interests of EMI, then Ferranti, and then English Electric which had itself recently swallowed Elliott Brothers. So where five men once sat down at a table, now sits one. In order to understand what this means, it is necessary to understand that Europeans are great innovators and when set to work in a technical committee with a certain freedom of action competent results can emerge, particularly when the expertise of a number of companies is available. One head is not as good as five.

But ECMA has undergone other notable changes. Compagnie des Machines Bull is now, except in name, General Electric, and what was the computer side of Olivetti in 1961 is also now General Electric. True, the other part of Olivetti not owned by GE is also represented, but no longer has the same interest in the digital computer field as hitherto. Because companies the size of GE must protect their investments, it is inevitable that their representatives on ECMA committees will promote a view largely, if not wholly, determined in Phoenix, Arizona. In 1969, one now finds Honeywell, NCR and Univac all active as full members with Burroughs and Friden as associate members, paying half the rate and having no voting powers in the general assembly, the supreme authority for ECMA.

So it is inevitable that many discussions with ECMA are mirrored by parallel discussions within USASI, although in some respects ECMA is more akin to BEMA—the U.S. trade association which has the responsibility for sponsoring the data processing activity within USASI. For although ECMA organizes itself through a series of technical committees, each with a precise subject, scope and program of work, it is clear that it is the identity of views between the manufacturers in ECMA and the manufacturers in BEMA that really counts.

There is a recognition that once BEMA and ECMA are in agreement, this virtually sets the seal on the standard, since carrying the discussion through the national standards bodies up to ISO follows an inevitable course. Within ISO Technical Committees, 97 for data processing and 95 for business machines, only the national standards bodies actually have a vote, and ECMA is one of a very few organizations invited to sit in as observers. Yet such is ECMA's influence that it frequently dominates the proceedings with detailed expositions of the arguments for and against possible solutions. In Europe, user groups do not have the same influence as in the U.S. It follows that if Britain, France, Germany, Italy, Switzerland, Sweden, etc. all vote the same way, any side-stepping by the users, including the military and federal agencies operating within USASI, can easily be negated.

the u.s. influence

But this is somewhat of an oversimplification. What in fact happens is that the voting line-up within ECMA is frequently different from that within BEMA. This is frequently used by the individual U.S. manufacturers within ECMA as a means of influencing opinion with USASI—the setting up of a Technical Committee on PL/I is a case in point. The converse is also true, since no standard can be viable unless the two are in step. IBM has always been ready at a moment's notice to fly their experts across to an ECMA meeting with news of USASI the week previously. And on occasions, the tide flows in the opposite direction. For instance, although CODASYL is usually credited with the existing standard on COBOL, several man-years of effort was spent within ECMA Technical Committee No. 6 on previous ambiguities. When negotiations by correspondence failed, an ECMA delegation flew to the U.S. and agreement was soon reached.

So it can be seen that even in 1969, at the cost of a few hundred dollars and a bit of effort, it is still worthwhile as an investment for the leading U.S. manufacturers to support the activities of ECMA; it's comparable to shuffling the cards and having a fresh deal. But what happens if they should decide the benefits are no longer there? There is little doubt that Burroughs, Honeywell, NCR and Univac would be willing to pull out now, but while IBM is in they are all in. There is something to be lost.

There is, however, another side to the coin. In May this year, the European technical press buzzed with news of a European consortium which would tie together ICL, Siemens, Telefunken, Philips (who now owns Electrologica, makers of several viable scientific computers) and CII (Compagnie Internationale pour l'Informatique—set up at the instigation of the French government after GE bought up Bull). All are members of ECMA and if they really did get together, the balance of forces—in terms of voting power anyway—could be drastically altered. But it looks as if this may be a political move tied up with Britain's fight to get into the Common Market and not a thing of substance. At the best, it would concern itself with the development of a large scale machine which would still leave unaltered the competition between the companies on other levels. While this remains the position, particularly with the Philips range being IBM compatible and Siemens marketing the Spectra 70 series, the key to the future of ECMA lies very much with the willingness of the U.S. manufacturers to continue their participation. There is likely to be a point where the diminishing returns, especially in respect of subject coverage, will lead to a withdrawal. But this as in so many other things will depend on what IBM does. When the day does come for a withdrawal, the result is as inevitable as the switching off by the surgeon of the device which keeps the heart beating in an otherwise dead patient. ■

COMPUTER USE IN THE NETHERLANDS

by W. K. de Bruijn

Though the first experimentally built computer in the Netherlands was ready in the middle of 1952 and the first foreign built scientific one was installed in the second half of 1954, it can be said that computer use started in this country at the beginning of 1957 when the first computer for commercial work was installed.

From that moment started an enormous expansion. Twenty-four different manufacturers, some of whom do not exist any more as independent organizations, have succeeded in selling one or more computers. Up till the end of 1967, 845 computers were installed; 103 of these have, in that period, been replaced and seven others have been rebuilt into more modern types so that at the end of 1967 there were 742 computers in use. At the same time, over 200 machines were on order, many of which were not meant to replace obsolete machines. The number of machines installed by the end of 1968 was about 900 and a further growth of that amount with at least 100 a year may be expected for the next decade.

The 845 computers installed during the last decade were of 101 different types. Ten of these, including some forerunners, have by now disappeared and about the same number will possibly disappear within two years. So the 742 machines in use at the end of 1967 are of 91 different types.

Of the 200 machines on order, about 5% belonged to 32 types already included in the 91. The last sixth consists of machines from 20 new types.

Of the 24 manufacturers, two have merged (Philips and Electrologica), one other (Eurocomp) does not operate in the country any more and four others from whom machines are still used are at the moment inactive, so that there are now 18 active manufacturers who together offer nearly 100 different types of computers.

In this article, data will be given concerning the Dutch computer market and its development. This will for the main part be done without comment so that the reader is free to come to his own conclusions. The computer market in the Netherlands may be considered to be reasonably representative of the Western European situation, so that it will be possible to use these data not only for comparison but also for market research in other countries. There are, of course, many differences between various countries such as the market share of the manufacturers, the importance of a home computer industry and the tendency to buy or rent, but insiders will be aware of such differences and will take them into account when extrapolating data from this article.

So far, the second-hand computer market is negligible in the Netherlands. Known installations of second-hand computers during the period covered come to 13. There are three others that were in use for a very short time and have probably been reinstalled elsewhere. Of these 16, only one came from abroad. It may be that in the future the second-hand market will gain in importance but so far there are no indications that such will be the case in any degree worth mentioning.

The number of machines installed at the end of each year is illustrated in Fig. 1.

All data in this article have been verified with the computer users concerned. In a very limited number of cases data were not available; this was generally when financial data were asked for. In these few cases the figures were estimated.

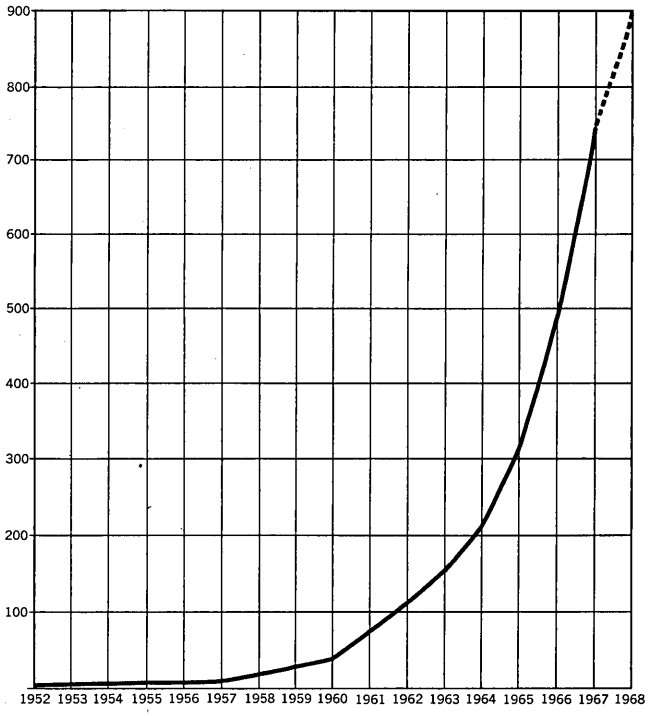

Fig. 1. Computers Installed in the Netherlands

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COMPUTER USE IN THE NETHERLANDS . . .

There are 26 groups of different importance and in Table 1 the number of computers is given that was installed at the end of each year in each general category.

Table 2 gives the number of computer centers that existed at the end of each year in each of the 26 groups. Here it is possible that there are two different centers within one firm; in such a case they are both included. The number of user firms is, as a result, a bit smaller than the number of centers.

A comparison of the figures given in these two tables shows that the average number of machines per center grows but slowly. Up till 1958 it was exactly 1, in the next two years it goes up by 6% to 1.06, in the following two years it goes up to 1.25 and from 1963 on it fluctuates around 1.4.

If these ratios are calculated per user group for the end of 1967 only eight groups show a higher than average figure. These are banks with 1.94; state government with 1.87; universities with 1.68; fuel with 1.56; service centers with 1:55; electric appliances with 1.54; metal and steel with 1.53 and mail-order houses and department stores with 1.50. These are all groups where computer use started at least five years ago.

Table 1 Computers by user group at end of each year

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
1. Universities	1	2	2	2	2	2	8	8	8	13	18	22	24	33	47	69
2. Fuel			1	1	1	1	3	6	6	10	8	8	8	8	17	25
3. Cars, etc.				1	1	1	1	1	2	3	5	8	7	9	11	21
4. Service centers						2	3	3	5	9	14	19	25	38	57	76
5. Insurance							2	5	7	9	12	14	19	28	44	65
6. Food, etc.							1	1	1	4	9	12	16	23	39	58
7. Bank & Giro								1	1	6	12	23	39	50	74	91
8. Electric appl.								2	3	6	10	11	20	28	34	57
9. State								1	2	4	6	9	12	18	24	28
10. Transportation								1	1	2	3	5	4	6	9	16
11. Metals, steel									1	4	5	8	9	18	28	49
12. Local government										1	3	5	8	13	23	48
13. Textiles										1	3	5	6	12	22	40
14. Mail order, etc.											1	1	4	6	7	9
15. Wood & paper												1	1	4	5	10
16. Glass & ceramics													1	1	1	2
17. Agriculture													1	2	3	8
18. Optical, etc.													1	2	3	4
19. Pharm. & chemical													2	2	13	17
20. Building														1	5	10
21. Publishing														5	10	19
22. Member org.														1	2	5
23. Leather															3	4
24. Rubber															2	4
25. Consultants															2	5
26. Miscellaneous																2
TOTALS	1	2	3	4	4	6	18	29	37	72	109	151	207	308	485	742

Table 2 Computer centers by user group at end of each year

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
1. Universities	1	2	2	2	2	2	8	8	8	13	17	19	21	27	34	41
2. Fuel			1	1	1	1	3	5	5	6	6	6	7	7	11	16
3. Cars, etc.				1	1	1	1	1	2	3	5	5	5	7	8	18
4. Service centers						2	3	3	5	6	11	14	18	27	38	49
5. Insurance							2	5	7	8	10	12	13	18	31	47
6. Food, etc.							1	1	1	3	8	11	14	21	35	54
7. Bank & Giro								1	1	5	10	12	19	26	35	47
8. Electric appl.								1	2	2	3	4	8	15	21	37
9. State								1	2	4	5	6	9	13	14	15
10. Transportation								1	1	2	2	3	3	5	8	12
11. Metal, steel									1	3	4	6	7	13	19	32
12. Local government										1	3	5	7	12	22	41
13. Textiles										1	2	3	4	9	19	34
14. Mail order, etc.											1	1	2	4	4	6
15. Wood & paper												1	1	4	5	9
16. Glass & ceramics													1	1	1	2
17. Agriculture													1	2	3	8
18. Optical, etc.													1	2	3	3
19. Pharm. & chemical													2	2	11	15
20. Building														1	4	9
21. Publishing														4	8	15
22. Member org.														1	2	4
23. Leather															3	4
24. Rubber															2	4
25. Consultants															2	5
26. Miscellaneous																2
TOTALS	1	2	3	4	4	6	18	27	35	57	87	108	143	221	343	529

Table 3 Computer installations by manufacturer and type

Manufacturer/ type		Installed		Discarded		Rebuilt	In use End of 1967	
Bull–GE	ET	9		8			1	
	300	8		5			3	
	G 30	11		1			10	
	G 10	99		1			98	
	M 40	1					1	
	G 55	7					7	
	G 115	6					6	
	415	4					4	
	425	1	146		15		1	131
Burroughs	200	6		1			5	
	500	2					2	
	E 4000	13	21		1		13	20
CDC	8090	2		1			1	
	160A	1					1	
	3600	2					2	
	3200	3					3	
	3300	4					4	
	1700	5	17		1		5	16
Electrologica	X1	19		6			13	
	X2	2					2	
	X4	1					1	
	X8	11	33		6		11	27
Honeywell	620	1					1	
	200	6		1			5	
	120	1					1	
	1200	4					4	
	DDP 116	4					4	
	DDP 516	1	17		1		1	16
IBM	650	12		9			3	
	305	4		4			—	
	704	1		1			—	
	705	1					1	
	1401	119		27			92	
	1410	14		2			12	
	1440	9		2			7	
	1460	1					1	
	1620	8		2			6	
	7070	1		1			—	
	7094	2					2	
	1130	20					20	
	1800	4		1			3	
	360/20	117					117	
	/30	47					47	
	/40	23				1	22	
	/50	7	390	49		1	7	340
ICT	1004	4					4	
	1301	1					1	
	1901	1					1	
	1903	1					1	
	1904	1					1	
	1905	1	9				1	9
NCR/Elliott	Arch	3					3	
	803	6		1			5	
	503	3					3	
	315	10					10	
	390	4		1			3	
	449	3					3	
	500	17	46		2		17	44
DEC	PDP 5	1					1	
	PDP 7	3					3	
	PDP 8	15		1			14	
	PDP 8s	4	23		1		4	22
Philips	8000	7					7	
	9201	4					4	
	9202	4					4	
	DS 714	2					2	
	Pascal	1					1	
	Stevin	1	19				1	19
Siemag	D 5000	8					8	
	D 2000	7					7	
	D 4000	1	16				1	16
Siemens	303	2					2	
	4004/15	1					1	
	/45	3	6				3	6
Stantec Zebra		9	9	3	3		6	6
Univac	SS	9		1			8	
	III	2					2	
	1004	29		1		6	22	
	1040	2					2	
	1005	14					14	
	1050	3					3	
	418	1					1	
	9200	2	62		2	6	2	54
Miscellaneous		23	23	7	7		16	16
Total			837		88	7		742

The 529 centers with a total of 742 computers at the end of 1967 may be divided as follows:

NUMBER OF COMPUTER CENTERS	NUMBER OF COMPUTERS AT EACH
429	1
53	2
25	3
8	4
6	5
3	6
3	8
1	12
1	16

Table 3 lists computers installed up till the end of 1967 by manufacturer and type. Machines installed twice (once second hand) are included only once in this table. Those

Table 4 Computers on order at the beginning of 1968

Manufacturer/ type	Installed	Discarded	Rebuilt	In use End of 1967
Bull/GE	G 10		6	
	G 55		17	
	G 115		20	
	G 265		1	
	415		3	
	425		2	
	Gepac 4000		2	51
Burroughs	500		2	
	2500		1	
	3500		3	
	E 4000		8	
	E 6000		2	16
CDC	3150		1	
	1700		1	2
Electrologica	X 8		1	1
Honeywell	120		4	
	DDP 516		2	6
IBM	1130		8	
	360/20		47	
	/30		18	
	/40		8	
	/50		3	
	/65		3	
	/75		1	88
ICT	1901		2	
	1902		1	3
NCR	315		3	
	500		2	5
DEC	PDP 8		4	
	PDP 8s		5	
	PDP 9		7	16
Philips	8000		4	
	9201		2	
	9202		3	
	DS 714		6	15
Siemens	302		2	
	304		1	
	305		1	
	4004/35		1	
	/45		2	7
Siemag	D 4000		4	4
Univac	418		1	
	1005		1	
	9200		13	
	9300		8	23
Minsk 23				1
Nairi				1
EA 640				1
CAE 9080				1
CAE 9040				1
SDS Sigma 7				1
Telefunken TRS 10				1
				244

that have been rebuilt are mentioned twice under installations and once under rebuilt: 6 Univac 1004's rebuilt to 1005's and one IBM 360/40 rebuilt to 360/50 (change of central processor). Under miscellaneous are 7 discarded machines and 16 that are still in use. The discarded ones are 1 Ferranti Mark I Star, 4 forerunner types, 1 Zuse 23 and 1 Eurocomp LGP 30. The machines still in use are 2 Zuse 25's, 2 Telefunken TR4's, 1 Telefunken TRS 10, 1 Sepsea Cab 500, 3 Monrobot IX's, 1 Minsk 2, 2 Ceti Pallas 250's, 1 CAE 9010, 1 CAE 510, 1 CAE 9040 and 1 EMI special-purpose computer.

Known to be on order at the beginning of 1968 are 244 computers, a substantial number of which have been installed since, most of them in 1968. A list of these machines is given in Table 4.

the dutch computer market

Although statistics concerning the number of computers installed give a reasonable insight into the market situation, they still leave something to be desired. The main problem is that a very big computer and a very small one have the same influence in these statistics; they each count for one. Therefore, it was considered desirable to gather data concerning the real value of the machines. Averages were considered to be of insufficient significance because many types of computers can be delivered in such a variety of configurations that fixing an average value per type is very hazardous.

As a result of this consideration an enquiry was made asking the Dutch computer users for data concerning configuration, value, exact date of installation (start of rent paying) and of discarding the machines. Nearly all users answered these questions so that it has been possible to calculate the value of the computers installed (including putting in extensions) quite exactly from month to month.

The following financial data are all related to rental value. When machines were wholly or partly bought the buying prices have been converted into rental value per month on a five-year base, this being considered a reasonable and average depreciation period. In practice it appeared that this period varied between three and eight years. In order to get a value comparable with normal rentals the monthly costs of maintenance were added to the calculated rent. Not included are the amounts paid for transport, import duties and such, generally known under the name of initial costs.

Table 5 shows—converted in this way—the yearly and the accumulated rental revenue of the computers installed in the Netherlands, in Dutch guilders. (Current conversion rate: one guilder equals 27½ cents.)

These figures are strictly limited to the computers and their on-line equipment. Off-line machinery such as punched-card units and converters are not included; neither are stocks of cards, tapes and disc packs, air-conditioning installations, etc.

Table 6 shows the rental value of all Dutch computers at the end of each year and the average monthly rental at the same time per machine.

The figures in Table 6 show that up till 1965 the average rental worth per machine was constantly growing, but that during the last three years a gradual decrease has started. The main reason for this is the large number of small computers brought on the market during these last years. Furthermore, there is a small number of second-hand machines with a very low rental value.

Table 5

	Yearly revenue	Accumulated Revenue
1952	Hfl. 12,000	Hfl. 12,000
1953	45,000	57,000
1954	169,000	226,000
1955	316,000	542,000
1956	391,000	933,000
1957	676,000	1,609,000
1958	1,680,000	3,289,000
1959	3,562,000	6,851,000
1960	6,078,000	12,929,000
1961	9,482,000	22,411,000
1962	21,108,000	43,519,000
1963	30,862,000	74,381,000
1964	46,652,000	121,033,000
1965	66,717,000	187,750,000
1966	96,413,000	284,163,000
1967	145,214,000	429,377,000

Table 6 shows the rental value of all Dutch computers at the end of each year and the average monthly rental at the same time per machine.

	Rental Value at End of Year	Machines	Average Monthly Rent
1952	Hfl. 36,000	1	Hfl. 3,000
1953	72,000	2	3,000
1954	288,000	3	8,000
1955	336,000	4	7,000
1956	444,000	4	9,250
1957	746,000	6	10,367
1958	2,393,000	18	11,078
1959	4,777,000	29	13,728
1960	6,759,000	37	15,222
1961	14,939,000	72	17,270
1962	24,485,000	109	18,756
1963	38,159,000	151	21,059
1964	55,919,000	207	22,512
1965	78,369,000	308	21,204
1966	116,807,000	485	20,069
1967	172,631,000	742	19,388

Table 7

Manufacturer	Market Share in Numbers Installed	Market Share in Rental Revenue
Bull/GE	17.8%	9.0%
Burroughs	2.7%	1.3%
CDC	2.2%	5.7%
DEC	3.0%	0.3%
Electrologica	3.6%	5.3%
Honeywell	2.2%	1.9%
IBM	45.7%	60.0%
ICT	1.2%	1.1%
NCR/Elliott	5.9%	4.0%
Philips	2.6%	1.5%
Siemag	2.2%	0.2%
Siemens	0.8%	0.7%
Standard Electric	0.8%	0.1%
Telefunken	0.4%	1.4%
Univac	7.4%	6.3%
Miscellaneous	1.6%	1.3%

Table 7 shows the market shares of the various manufacturers in the year 1967 in percentages: (a) by numbers of machines installed, and (b) by rental value of the same.

Table 7 clearly shows that machines of more than average value were installed by IBM, CDC, Electrologica and Telefunken and that machines far under this average were installed by DEC, Siemag and Standard Electric. ■

INFORMATION PROCESSING IN ISRAEL

bigger than oranges?

by Rowena M. Swanson

Beginning the third decade of its existence, the State of Israel pegs its hopes for economic independence on large automated plants, cheap nuclear electric power, desalinated water, and extensive applications of technological know-how. A vassal of the Ottoman Empire for four centuries and a British Mandate territory from World War I until 1948, the region has been bootstrapped by Israel from an agrarian economy administered with oppression and indifference to an economy similar to that of industrial countries of Western Europe. With an average GNP growth rate of 9% per year since 1950, industrial output now constitutes about 25% of the domestic product, agriculture 10%, commerce and services (public and private) 50%, and building 8%. Industrial exports have risen about 15.5% per year since 1961 to a $490 million gross in 1968, offsetting a 13% increase in imports and aiming toward the goal of overcoming trade deficits by 1978.[1] Electric power capacity exceeds 1000 megawatts, and a natural uranium facility in Dimona is rated at 24 thermal megawatts.

Israel is often called a "population laboratory." The Jewish inhabitants numbered 650,000 in 1948; most were immigrants from Eastern and Central Europe. Over a million Jews immigrated in the 1950's, many of them from Islamic countries (North Africa, Iraq, Syria, Egypt, and Yemen). These "Oriental" Jews constitute about 50% of

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1. Basic facts about Israel and concise descriptions of her scientific and technical institutions and facilities are given in: Shlomo Gonen, ed. *Scientific Research in Israel* (in English). Tel Aviv: Center of Scientific and Technological Information (P.O.B. 20125), 1969, $4.50.

today's 2,240,000 Jewish Israelis.[2] Before the Six Day War of June, 1967, approximately 205,000 Moslems, 56,000 Christians, and 30,000 Druze and other groups comprised the balance of the population. A million non-Jews, mostly Moslems and Druze, are under Israeli rule in the occupied territories; 65,000 inhabitants of the eastern part of Jerusalem became citizens when the eastern and western sectors of the city were united. Recent immigration from Western countries has been small but steady (e.g., 4500 from North America in 1968, 60% under 40).

Before the Six Day War, Israel occupied a land area of 7992 square miles, half of it desert (the Negev). Long (265 miles) and narrow, it stretched from the Hills of Galilee in the north to the Red Sea port of Eilat in the south. Today, Israel administers territories three times her former size. Her success in industrializing and urbanizing the Negev and other undeveloped areas depends in large measure on a national water conveyance system (completed in the early 1960's) and extensive arid zone research, energy resources research, water production research (desalination), and conservation. Major emphasis is also placed on education and acculturation of the heterogeneous population. The education program of ZAHAL, the Israel Defense Forces,[3] is an almost unparalleled undertaking in any country. In addition to the professional and junior leadership training provided by many armies, ZAHAL operates a pre-military technical training program that gives youngsters of 16 and 17 one to two years of service-specific (Air Force, Signal Corps, etc.) and general education. For many years, ZAHAL has had a regulation requiring every soldier who did not complete primary education to spend three months of military service in a school for this purpose. ZAHAL's intensive certificate-granting course is in great demand, particularly among new immigrants from Islamic countries.[4] ZAHAL also contributes to the economic infrastructure through special units that work part time on agricultural projects and in civilian schools.

Is there a mystique about the Israeli, about his emergence from second-class citizenship and worse to pioneer, nation builder, and modern-day warrior? One is tempted to think so. To this observer, the Israeli spirit is the product of a conscious awareness of millennia of national struggle blended with faith in a promise and a sense of identity and individuality coupled with humility and respect for the integrity of man. In many parts of the world, these are just words. For most Israelis, these words have living meaning.

computers and installations

Israel's first computer was home grown. The WEIZAC, modeled after the JOHNNIAC, was an 1800-tube machine capable of 250,000 arithmetic operations/sec. It was built in 1954 by the Applied Mathematics Dept. of the Weizmann Institute of Science in Rehovot under Smil Ruhman, a former associate of SDS's Max Palevsky. WEIZAC was retired in 1964.

The first import was ZAHAL's Philco-Transac, obtained in late 1960. The computer capability by the end of 1968 is summarized in Table 1. Israel's late start, stemming from an agreement between IBM and the British Tabulating Co. during the Mandate period, was discussed in Frank Moser's earlier DATAMATION paper.[5] IBM was the first U.S. firm to open offices in Israel, followed by NCR and CDC.[6] Hardware now in Israel includes CDC's 3200, 3400, 160A, 1604A, and 6400; NCR's 390, 500, 315, and Century 100; Philco's 2000 and 1000; and IBM's 1400's, 1800, 1620, 7040, and 360/20's, 30's, 40's, 50's, and a 65. There are orders for CDC's 3500, SDS's Sigma 2, and IBM's 1130 and 360/25, 44, and additional 30's and 50's.

Table 1. Statistics on Computers in Israel*

By Geographic District	
Tel Aviv	61
Jerusalem & Southern	17
Haifa & Northern	15
Central	9
By Type of Ownership	
Government	43
Private	36
Histadrut	12
National & Mixed Public	6
Local Authorities	5
By Monthly Rental ($U.S.)**	
Up to $999	11
$ 1,000 - $ 4,999	36
$ 5,000 - $ 9,999	15
$10,000 - $14,999	10
$15,000 - $19,999	7
$20,000 - $30,000	1
Self-built & Defense	22

*Statistics are forecasts for December, 1968, based on a June, 1968, survey.

**Rentals computed for the first shift only.

These data are excerpted from Table 4 in "Survey of Electronic Computers 1968" in *Supplements to the Statistical Bulletin of Israel*, No. 8, 1968.

The universities have, or will have, several of the large computer facilities. Weizmann, a research and graduate degree-granting institution, has continued its investment in computer development. Its workhorses are two advanced second-generation Golem[7] computers connected through a disc file (IBM 2302 Model 2 with a locally designed control unit). Each of the Golems, built respectively in 1962/63 and 1965/66, is roughly comparable to the 360/65. Based on ILLIAC II in over-all organization but incorporating Weizmann circuitry and packaging techniques, each has a 75-bit word (15 bits/address, 15 or 30 bits/instruction, 74 instruction set) 3D core memory with a 2.0 μsec. cycle time, an 8.0μsec. average execution time for multiplication (accuracy of nearly 20 decimal places), 1.9 μsec. average

2. People from Islamic countries are customarily referred to as "Oriental"; the term "Islamic" is not used, to avoid confusion with members of the Islam religion.

3. ZAHAL is an abridgement for Tsava Hagana L'Yisrael, literally Defense Army of Israel. The "z" is conventionally used for the sound "ts." Many proper names in the text of this paper (e.g., NATAM, ELNIV, ILTAM) are also abridgements.

4. Students attend school for 9 hours/day apart from extra-curricular activities in different fields of art and culture. Classes consist of 10 students; each class has two teachers. Subjects taught include Hebrew, arithmetic, general history, Jewish history, geography, citizenship, Bible, and basic science. The total course is 600 hours. ZAHAL also provides teachers for new settlements. The universal draft applies equally to both sexes. Many women view ZAHAL as an important source of experience and a major force in establishing the status of equality that exists in the social structure of Israel. Further information on ZAHAL's education systems can be found in a paper of ZAHAL's former Chief Education Officer, Col. Mordechai Bar-On, *Education Processes in the Israel Defence Forces* (in English). Tel Aviv: IDF, 1966.

5. Frank Moser. "EDP Progress in Israel." *Datamation*, vol. 13, no. 8 (Aug. 1967) 29-30.

6. The NCR agency preceded IBM's for accounting equipment. NCR and Powers-Samas (punched card) hardware were installed during the Mandate period.

7. "Golem" in Jewish folklore signifies an image endowed with life.

execution time for floating-point addition, and a 1.0 μsec. memory-access time that is effectively eliminated by look-ahead control with operand and instruction buffering. Peripheral devices include a CDC 405 card reader, and IBM 1442-5 card punch, an IBM 1403 Model 3 printer, and CDC 607 tape units. An eight-station time-sharing system was added to Golem A1 in 1967, and a real-time link is being established with a remote PDP-9 that operates a bubble-chamber photograph reader.

Weizmann's Golem B, scheduled for completion in 1970, is being designed to be 10 times faster than the A with 2-nanosec. integrated logic. The speed is being achieved partly by more advanced arithmetic and logical techniques, but mostly through faster hardware. The circuitry is still based on a diode-transistor logic element, but it can make over 500 million decisions/sec. Weizmann has been experimenting for several years with core, thin-film and multilayer printed circuit fabrication techniques. The core for Golem B, started in 1966, is expected to attain a rate of 2.5 million references/sec. in a 16,384 x 64-bit memory bank using 14- to 18-mil. cores in a 2½D structure. Four memory banks and appropriate buffering should give an over-all rate of 10 million references/sec.

Technion-Israel Institute of Technology installed an Elliot 803 eight years ago and replaced it in 1965 with an Elliot 503, subsequently adding an IBM 1401. A 360/50 is due by the end of 1969 that will operate with limited time-sharing (16 terminals). Hebrew U. replaced a 7040 in 1968 with a 32K CDC 6400 and a CDC 6638 disc; memory augmentation to 65K is expected in September this year. Tel Aviv U. acquired a 32K CDC 6400 with eight 604 tape transports in 1967 and is looking into a larger system. Bar-Ilan U. expects delivery of a 256K 360/50 with a 2314/1a disc and two 9-track tape drives by January, 1970. It is presently using IBM's 360/40 service bureau facilities and ZAHAL's 360/50.

government installations

The Office Mechanization Centre (OMC) in the Ministry of Finance, under the directorship of Dov Chevion, operates the largest nonmilitary government installation. A 1401, purchased in 1961, is still used for small jobs. OMC bought a 64K-byte 360/30 with eight tape drives and three disc drives for its main office in Jerusalem in 1965, and added a duplicate configuration in its Tel Aviv branch in 1966. A 256K-byte 360/50 is expected in September, 1969. OMC's staff of about 325 includes 20 systems analysts, 50 programmers, and 40 management and services personnel. It serves other government ministries in operating and consulting capacities.

Other government agencies are rapidly mechanizing. The Ministry of Posts installed its first computer, a CDC 3300, in 1968. The configuration includes six 604 tape transports, four 854 disc drives, and two line printers, a 501 (Hebrew) and a 505 (English). The Office of the Accountant General, Ministry of Finance, originally equipped with an NCR 390 and later with an NCR 500, expects delivery of the Century 100 in mid-1969. Other facilities include a 1401 in the Ministry of Transport, an NCR 315 in the Ministry of Finance Tax Office, and a 360/40 in the Ministry of Education. The Survey Dept. in the Ministry of Labor ordered an IBM 1130.

Examples from the private sector are Tahal Engineering Consultants, Ltd.'s two 1130 systems based on 8K and 16K cpu's, respectively, and Tadiran-Israel Electronics Industries, Ltd.'s recent order of a 360/25. Tahal, in Tel Aviv, is one of Israel's largest diversified consulting firms. Tadiran, also in Tel Aviv, is a leading manufacturer of communications equipment and systems. Israel's largest commercial bank, Bank Leumi L'Yisrael, also has the largest computer facility based on a 360/40. Other bank installations include NCR 315's at the Israel Discount Bank and Bank Hapoalim (Workers' Bank) and a 360/30 on order for the Tefahot Mortgage Bank.

Elbit Computers, one of the ELRON Electronic Industries, Ltd., group in Haifa, is Israel's only commercial computer manufacturer. It has produced a series of desk calculators—the Elbit 200's, 1200's, and K200's; a series of digital differential analyzers; an educational analog computer, the Elbit EAC-15; and a small general-purpose computer, the Elbit 100. EAC-15's can be connected together for increased capacity. The Elbit 100 is a 12-bit single-address fixed-word-length computer (1024, 2048, or 4096 words) with a typical add time of 7.2 μsec. It has a two-level memory system, one memory being a standard read-write core store with a 2-μsec. cycle time and the other a fixed microprogrammable read-only store with a 400-nanosec. cycle time. It has I/O bus connections for up to 256 channels and an optional 4-level priority interrupt. The sale price is under $5000 for a 1024-word machine; 45 were sold as of December, 1968, mostly in Europe. Elbit is bidding for American and European markets with a Validata system that uses the 100 with numeric keyboard display terminals and a magnetic tape enscriber for direct keyboard-to-magnetic-tape data entry and input validation on-line. The system can accommodate several Miniterminals (keyboards with 10 numeric and 19 control keys, and a display of 14 numeric positions and a sign position).

Immediately after the Six Day War, Israel began to reappraise taxation and other policies to accelerate economic growth. Planners suggest that Israel's manpower resources and technical know-how are particularly suited to the combination of design and engineering talent and manual assembly required to build special-purpose computers and peripheral devices.[8] One implementation of these suggestions is the Advanced Technology Centre in Haifa, a new industrial park begun in March, 1969, that is attracting electronics firms. One tenant is Scientific Data Systems, Israel, a joint undertaking of SDS and ELRON, initially for the manufacture of Rapid Access Disks. Another is Monsel Electronic Industries Co., a partnership of ELRON with the Monsanto Co., for the engineering and production of test and measuring instruments.

software and systems

About 15 firms engage in software production, systems design, and allied management consulting in Israel. Most have small staffs of about six to eight professionals. Four of the firms operate service bureaus. Some work is done by free-lance programmers, independently and under contract to firms.[9]

Several firms have been retained by various Ministries of the Israeli government to design or assist in developing national-scale information systems. One of the largest is Israel's National Population Register, produced by several groups collaboratively under the auspices of the Ministry of Interior. This is a central register with individual records for all inhabitants and is updated monthly from administrative notifications. A unique linguistic problem arose in establishing the data base. Many Israelis change their names, on immigration or thereafter, to Hebrew ones or Hebraicized

8. Industrialists and financiers met for a two-day International Economic Advisory Conference sponsored by the Prime Minister's Office in August, 1967. The First Economic Conference followed in April, 1968. A Second Economic Conference was held in June, 1969. Information and documents prepared for the conferences are available in the U.S. from the Government of Israel Investment Authority, 850 Third Avenue (Suite 604), New York 10022. An excellent reference text on the activities of Israel's government agencies is: *Israel Government Year Book 5729 (1968/69)* (in English). Jerusalem: Prime Minister's Office, 1969. $3.00.

9. *Newsletter for Information Technology in Israel* (in English) No. 1, Jan. 1969. The *Newsletter* is published by ILTAM Corp. for Planning and Research, Ltd. (P.O.B. 7170), Jerusalem.

forms. Some use two names concurrently, a Hebrew form and an Anglicized one. A by-product of the Register work was the construction of a Hebrew Soundex system that materially differs from the English Russell Soundex. Two models are being used for different purposes (keyed to the precision required in retrieval) for the phonetic characterization of family names. The system was implemented by the OMC on the 1401 and later transferred to the 360.

The Register data are being used by the National Insurance Institute in a claims processing program and by the Histadrut (General Federation of Labor) in membership and social welfare records-maintenance programs. [10] The register has been linked with Israel's 1961 Census of Population and Housing for a variety of surveys of individuals and households.[11]

A series of land registration programs was prepared by the Industries Development Corp., Ltd. (IDC), for the Israel Lands Authority. Intended for managing state lands and monitoring the activities associated with ownership and use of the land, the project needed the services of about 150 data collectors and codifiers and 15 programmers who produced data validation, file reorganization, updating, and retrieval programs for various tabular and statistical outputs. A novelty in the land transactions program is a coding scheme that disambiguates but preserves distinctions among the various methods of registering land practiced under the Turks, the British, and the present government that are all still concurrent. A unified representation was also devised for Western- and Eastern-structure names, the latter often consisting of a number of components including personal, father's, grandfather's, and clan's, and for proper names that can have diverse spellings.

IDC, with offices in Jersualem and Haifa, is another broad-based firm with experience in engineering, technological, and economic consulting in 25 countries. Its other software products include two proprietary packages: SPUR, an extension of the Critical Path Method for scheduling that has an inquiry routine to make update easy for the user, and TPG, a problem-oriented language for generating COBOL programs and providing a test environment for the programs.

Tahal (mentioned above) has specialized in software for state needs in water resources, water supply and sewage, and oil and industrial development. Its products include a dynamic programming model for pumping water from the Sea of Galilee, a series of programs for determining optimum aquifer operation, and a management-reporting system for the Eilat-Ashkelon 42-inch crude-oil pipeline construction that provides information at different levels of detail for the site manager and various office echelons. One of Tahal's commercial plotter applications is a multiprogramming system based on SPOOLING (Simultaneous Peripheral Operation On-Line) that gives the user the option of specifying on-line plotting or spooling by program or external switch control. The spooling mode reduces transmission time to about ⅙ that required for on-line plotting of data generated by standard 1130/1800 plotter subroutines.

In 1967, the local authorities formed a Corporation for Automation in Local Government to do collaborative systems development. The corporation is completing a financial administration system and is expanding an engineering administration system. It is also advising on the mechanization of urban planning and on systems for community services. In another do-it-yourself mode, the Israel Police Force developed in-house systems and programming capability and has automated the nation's traffic reports (vehicle and conviction records). It is working on extensions to crimes, criminals and *modus operandi*. With a view to a central health register and links to automated demographic files, several medical information systems have been developed. One originally a manual system, is a nation-wide Cancer Registry sponsored by the Ministry of Health and the Israel Cancer Association. Another, begun at the Hebrew U. Hadassah Medical School to analyze data on toxemia in pregnancy and congenital malformations, is being extended to permit cost/benefit studies and measures of efficiency of hospitals. The software for both medical systems is being done by a Tel Aviv firm, Yael Management Automation Co., Ltd., under Baruch Tsur.

software houses

Three of Israel's predominantly software firms are: NATAM System Analysis and Operations Research, Ltd., in Jerusalem and Tel Aviv, presently the largest, headed by Frank Moser (an American) and Ilan Amit; Mem-Aleph Electronic Computers, Ltd., in Ramat-Gan, with a 20-man all-Israeli staff headed by Shlomo Elinav and Jonathan Rosenne; and ELNIV in Haifa, the newest, headed by Paul Rogoway (a new arrival and ex-IBMer).

NATAM, formed in 1967, employs 30 professionals and specializes in software programming, systems analysis, operations research, and business data processing. It is presently developing a system and preparing the programs for the computerized typesetting of the *Encyclopedia Judaica*, a 14-volume English language reference text, so that future revisions need only involve the retyping of changes.

Mem-Aleph specializes in production planning, linear programming, numerical analysis, and commercial data processing. One of its systems is a 6000 COBOL, 2000 COMPASS, 11-part program for assembly production from raw materials and primary and intermediate parts. Originally implemented on a Philco 2000, it is now running on a CDC 3300. The firm has a proprietary package based on a new numerical method for linear programming that requires fewer iterations than the simplex method and has empirically shrunk problems to as much as one-fourth their original size. The program gives all alternate basic optimal solutions or all different basic solutions with the objective function value as near to optimum as specified by the user. The number of steps is proportional to the number of constraints and does not change when nearly optimum solutions are specified. Mem-Aleph, formed in 1964, has been exporting software and expects a staff expansion to 50 by the end of 1969.

ELNIV, the youngest member of the ELRON group and its programming arm, has been selectively recruiting an international (four U.S., two French, one British, one Polish, six Israeli) senior (over seven years' experience) staff. It advertises itself as neither merely a consulting firm nor a body shop, but plans to do tailored basic software, the design and implementation of large-scale information systems, and business applications programming. Recent work includes a linear programming model for constructing silos for the Ministry of Commerce and Industry, and input/output tables for a macroeconomics study for the Bank of Israel.

Software at the universities is principally for scientific applications and is thus similar to work at U.S. institutions.

10. The Histadrut is a monolithic organization with a membership of over 1 million; it essentially excludes only private employers. It operates economic enterprises including communal kibbutz and moshav settlements, the T'nuvah that markets farm produce, a culture and education center, and the largest medical insurance institution in Israel, the Kupat Cholim (Workers' Sick Fund) that encompasses members and their dependents (approximately 75% of Israel's population).

11. The cited systems and others are discussed in several papers in *International Symposium on Automation of Population Register Systems*, 25-28 Sept. 1967 (in English). Proceedings, vol. 1. Published by the IPA (P.O.B. 3009), Jerusalem, 1967.

Technion specializes in industrial and managerial problems, including engineering design, process control, and simulation. Hebrew U. has developed a series of efficient mathematical subroutines and programs in FORTRAN, ALGOL, and assembly languages for atomic energy research. Hebrew U. is also completing a computer-generated urban atlas of Jerusalem consisting of 50 maps showing land uses for various time periods and transportation and population patterns. The atlas will be used in urban planning. Tel Aviv U. has concentrated on numerical computations, principally partial differential equation solutions for applications in seismology, hydrodynamics, physical chemistry, and atomic energy, and on bubble-chamber data processing. An information retrieval program has been written for a portion of Judaic law known as the *responsa prudentium* at Bar-Ilan U. Weizmann is the exception among the academic institutions. It has implemented the Golem with paper tape, magnetic tape, and disc operating systems; assemblers; two FORTRAN IV compilers; compilers for IPL-V, LISP 1.5, and QUIKTRAN; and scientific subroutines. It is currently marshalling talents for the operating system for Golem B.

manpower and education

The academic enrollment in Israel reached 28,500 in 1968, 17% in engineering and agriculture, 17% in mathematics and natural sciences, 23% in social sciences, 32% in humanities, 7% in law, and 4% in medicine. About 27% of the students (7740) were freshmen.[12] Only one of Israel's six principal institutions of higher education offered a computer science curriculum and this, an MSc program, was in its second year.

Israel's computing personnel are mainly ZAHAL- or technical-course trained. The proportion with university educations is similar to that in the U.S.[13] A recent poll restricted to professionals in systems analysis, programming, and research drew responses from 645 people, estimated as 75 to 80% of the current population (excluding the defense sector).[14] Over 40% are university graduates, 80 in mathematics and physics, 79 in economics and statistics, 48 in engineering, and 41 in humanities and other social sciences. The rest are mainly high-school or technical-school graduates who have acquired experience on the job. The majority (377) have had three to five years' experience; 144 reported six years or more. Occupationally, they classified themselves in the following categories: 124 in management, 128 in systems design and analysis, 335 in programming, 19 in scientific research, and 39 "other." Organizationally, they are employed as follows: 225 in central government, 218 in private enterprise, 84 in government companies, 54 in the Histadrut, 45 in academic institutions, and 19 in local government. Their 1967 salaries were less than half those in the U.S. Monthly highs and lows of 1029 and 840 Israeli pounds ($1 U.S. = 3.50 IL today, 3.00 IL in 1967) were reported for the industrial and public health sectors, respectively.[15]

ZAHAL is the principal supplier of at least junior-level programmers, systems analysts, and technicians, and some senior staff because of its policy of training draftees for its technical requirements. The Office Mechanization Centre ranks second as the source of Israel-trained manpower. OMC's Education Dept., headed by Palo Stein, conducts courses in basic programming and systems analysis. Programmers receive 200 to 250 hours of classroom instruction; the remainder is on-the-job. Systems analysts receive 300 to 400 hours of formal instruction. Stein recently introduced a 12- to 15-month advanced systems analysis course that combines theory and practical applications.

Of the IBM, CDC, and NCR service bureaus, only IBM has an education unit that offers a variety of regular courses, oriented principally to the 360, 1130, and 1800. OMC and IBM occasionally work together on courses. CDC and NCR instruction is based principally on customer need. Short courses have been held by the Israel Institute of Productivity (see Organizations below) that have been attended by about 300 executives from public and private institutions and firms over the past two years. Of one week duration, they have been intensive (50 hours) and aim at acquainting managers with basic concepts and techniques of adp. For the second year, a two-week summer Seminar on Advanced Programming Systems is being sponsored by ILTAM (see Organizations below) and Hebrew U. in Jerusalem. Organized by Bernard Galler, it is modeled on a University of Michigan seminar with predominantly American lecturers. The tuition is a steep $350.

Technion offers the only academic computer sciences program currently in Israel. Often called Israel's MIT, Technion is scenically located on Mount Carmel overlooking the port of Haifa. Except for its offshoot, the Institute for Higher Education in the Negev in Beer-Sheva (cosponsored by Hebrew U. and Weizmann), Technion has the only engineering faculties. Its enrollment is about 6000, including 1700 graduate students. It has an academic staff (full and part time) or 900, including 120 full time at the rank of professor or associate professor. Technion's MSc in computer science was established in the Electrical Engineering Faculty in 1967 under Jacob Katznelson; a department headed by Abraham Ginzburg is slated for 1969/70. The curriculum intends to stress systems programming, programming languages, man-machine interaction, numerical analysis, and engineering applications, as well as automata and other theoretical aspects of computer science to produce both computer scientists and computer engineers. About 30 students are presently enrolled. A PhD program and undergraduate courses are planned for 1970/71.

A variety of nondegree courses are also taught. Most Technion students take a basic programming course. Use of the computer as a scientific and engineering problem-solving tool is incorporated into courses in the various faculties. Additionally, short courses are given for faculty and currently include instruction in PL/I and applications programming. Through Technion's Research and Development Foundation Extension Division, programming is available in night school. Some courses are offered in Tel Aviv, and short courses are held during summer months for people from industry and government agencies. Course development for high schools is planned.

courses planned

Programs are mostly in the planning stage at the other academic institutions. The Hebrew U. (Jerusalem) curriculum is being coordinated by Azriel Levy with the aid of Michael Rabin and Yehoshua Bar-Hillel. Three undergraduate courses were introduced for mathematics and physics students in 1968/69, and two courses were offered to social science students. The MSc program will start in 1969/70 with courses in programming languages, numerical computation, systems analysis, automata and algebraic linguistics. Tel Aviv U. in Ramat Aviv (a northern suburb of Tel Aviv) may begin a computer science program in late 1970. It has a FORTRAN course for nonmathematics students, a combined FORTRAN-numerical analysis course, and advanced numerical analysis and dynamic programming courses in its departments of applied mathematics and statistics. Saul Abarbanel, chairman of the Applied Mathematics Dept., heads Tel Aviv U.'s group. Bar-Ilan U. in

12. Shragga Irmay. "Higher Education in Israel." *Technion*, vol. 5, no. 3 (June 1969) 6-7.
13. See "EDP Salary Study—1968." *Business Automation*, vol. 15, no. 6 (June 1968) 40-49.
14. *Newsletter for Information Technology in Israel.* No. 2, March 1969.
15. "Survey of Electronic Computers 1968." *Supplements to the Statistical Bulletin of Israel*, No. 8, 1968.

Ramat-Gan (a southern suburb of Tel Aviv) has a FORTRAN course requirement in mathematics and offers courses in numerical analysis, computational linguistics, automata and algebraic languages. Special courses have been designed for students in economics and psychology. A SNOBOL course for humanities students and a course in non-numeric applications are being introduced in 1969/70. The curriculum group is headed by Aviezri Fraenkel, chairman of the Mathematics Dept., and Asa Kasher. Bar-Ilan is Israel's only religious institution of higher education. Weismann Institute is beginning a two-year MS program in computer science this fall. Headed by Shimon Even, it will include courses on computer organization, data structures, operating systems and formal languages that reflect needs for the Golems.

The tendency to proceed slowly (perhaps to the observer too slowly) may in part be based on how Israel's institutions regard themselves. They have stressed quality and have maintained high standards for faculty, student entrance, and student achievement. They are reluctant to permit hodgepodge development in the computer sciences. Programs may evolve as did Technion's, from an existing departmental base that draws during growth on resources of other departments until an institutional orientation becomes clear. However, the slow growth is also paced by insufficient academic staff in such critical areas as programming languages, systems analysis, operating systems, and file management. All institutions are making arrangements for visitor positions to recruit Western-trained experts for at least one to two year periods to fill current gaps.

Israel has not yet felt the pressure existing in other countries caused by a dearth of computing personnel. The country appears to be following the advice of economic planners who are emphasizing computer sciences as a prime development area. The implementation of some of their suggestions could have the effect of averting severe personnel shortages and accelerating curriculum growth.

professional organizations

Israel's two principal professional organizations are the Information Processing Association of Israel (IPA), a society analogous to the ACM, and the ILTAM Corp. for Planning and Research, Ltd., a trade association approximately analogous to the Association of Independent Software Companies formed in the U.S. in 1967.

IPA was established in 1956 as a business dp users group. It acquired its professional society character in 1960 in a merger with a group of scientists and mathematicians; logician Bar-Hillel was elected IPA president. IPA has grown from 15 institutional and 25 individual members in 1960 to 70 institutional and 550 individual members at the present time. Institutional members include universities, government offices, and commercial firms. During the past two years, special interest groups have formed in computational linguistics, inventory control, operating systems, COBOL, graphics, integrated systems, simulation, numerical analysis, and dp center management. Other groups are planned in medicine and engineering.

Since its inception, IPA has sponsored one- and two-day educational seminars and symposia on basic dp problems. In recent years, IPA advisory committees have been working on performance standards and education requirements for various occupational categories, curricula for teaching dp in secondary schools, and university-level curricula. A joint committee of IPA and the National Academy for the Hebrew Language is completing a Hebrew version of the IFIP-ICC vocabulary. IPA holds an annual National Conference on Data Processing; the fifth is this month, in Jerusalem. The programs feature tutorials and surveys as well as reports of current work. Philip (now Pinchas) Rabinowitz (formerly NBS, now Weizmann) won IPA's annual prize for his 1968 Conference paper, "Computers in Mathematics: Past, Present and Future."[16]

IPA publishes a monthly bulletin in Hebrew, a special monograph series, and the proceedings of its annual conferences.[17] It sponsors a recently instituted annual computer survey of Israel that is conducted by the Central Bureau of Statistics. IPA is Israel's representative to IFIP. As in other areas of technology, Israel has been sharing information-processing know-how with other developing countries. IPA, as the focal point for collaborative international activities, cosponsored, with IFIP and the International Computation Centre (Rome), an International Symposium on Automation of Population Register Systems held in Jerusalem in 1967.[18] IPA is making the arrangements for one of three IFIP Conferences on Computer Education to be held in Rehovot in December, 1969 (the others are in London and Budapest) to consider curricula for universities, secondary schools, vocational post-secondary training, and adult education. The incumbent IPA president is Joseph Gillis (Weizmann). Dov Chevion (OMC) is Chairman of IPA's Executive Council and an IFIP vice-president.

ILTAM is a government corporation whose formation emanates from Economic Conference discussions and whose major mission is promoting Israel's software industry abroad. Planners have emphasized an Israeli software industry for several reasons. Small- and medium-size software firms can be competitive on the world market. Israel's output, though dwarfed quantitatively by U.S. productivity, includes quality programs that do the jobs they were designed for. Also, information processing in general, and software in particular, have been increasingly attracting Israel's bright, imaginative minds in the comparatively brief period that computers have been in the country. Additionally, senior programmers and systems analysts with Western training have been immigrating and looking for jobs in Israel. Thus there is a build-up of talent and a reserve that could exceed national needs and be profitably advantageous to countries with shortages.

ILTAM must, however, strengthen Israel where she is weak. The software industry, as well as Israeli industry in general, have only recently begun to develop an export sense, principally because local demand previously oriented industry inward. Thus firms need assistance on what to market and how to market, as well as whom to market to. Whether computer software will surpass citrus as Israel's leading dollar earner, as predicted by Canadian millionaire Berco Devor, a new resident who is establishing a joint U.S.-Israel venture, [19] could depend on such intangibles as rapid adaptation by Israelis to American business practices and the achievement of harmonious interpersonal communication among people from various cultures, a goal that has been elusive at many international conference tables.

As in the U.S., the scopes of a number of professional groups in Israel overlap those of the information processing community. For example, the Israel Committee on Automatic Control is Israel's affiliate to the International Federation of Automatic Control (IFAC). Israel hosted an IFAC International Symposium on Automatic Control of Natural

16. P. Rabinowitz. "Computers in Mathematics: Past, Present and Future." In *Proceedings of the National Conference on Data Processing*. Jerusalem: IPA, 1968, pages E31-37.
17. The Fourth Conference, cited in ref. 16, commemorated Israel's twentieth anniversary, and was marked by invitational addresses of several guests, including the U.S.'s H.R.J. Grosch and L.A. Zadeh. The *Proceedings*, about one-third in English, are available from the IPA for $8 (sea mail).
18. See ref. 11.
19. Abraham Rabinovich. "Brainpower Can Earn Dollars." *Jerusalem Post Weekly*, No. 454 (7 July 1969) 11.

Resources and Public Services at the Technion in 1967. The Annual Colloquia of the Operations Research Society of Israel reflect increasing applications of this discipline in industry, transportation, economics, and the use and development of natural resources. Several binational meetings have been cosponsored with the Operational Research Society of Great Britain. The Israel Society of Special Libraries and Information Centres represents a growing number of people who are manning about 300 information center and service operations in industry and government as well as school and public libraries. The Israel Institute of Productivity, a government agency that conducts surveys and research, plays a supporting role through several of its units in automation, engineering, and management. It is affiliated with the International Council for Scientific Management. It publishes a bimonthly journal in Hebrew, *Organization and Administration,* that contains a section on automation, as well as survey and research reports.

projections

Israel's use of edp over the next five years can be expected to mirror the world-wide upward trend. Some uniquely Israeli contributions may be anticipated, since Israelis have "taken to" information processing, both in hardware and software, and they have a think-it-out-for-yourself point of view. Israel is beginning to experience a need for extensive automatic data processing. Her population is small and the skill level is rising. Machines will have to perform jobs that Israel will not have men to do. The question is rarely raised in Israel today (as it was a few years ago) as to whether the nation can support the education facilities that continue to mushroom. The will of the people is evident in their concentration on bigger and better schools at all levels for all of the inhabitants.

By necessity and inclination, therefore, Israel is likely to become a manufacturer of hardware and software that small- and medium-size groups can produce based on their talent irrespective of location. Her people are able to understand the needs of developing and advanced nations since she has the character of both. Her current research on new teaching methods and the use of new media make her a contender in the machine-aided instruction market. Her products are likely to be inventive, practical, and reasonably priced.

However, Israel's ability to realize her potential does not depend on Israel alone. Like the U.S., her information processing expertise grew from military need. Her goal of economic independence now provides additional impetus. But peace and cooperative working relationships with others are essential. These, hopefully, are in Israel's future, and the world's.

Acknowledgement. The author is indebted to many Israelis for books, papers, and personal communications that have enabled such familiarity with the Israeli scene as is presented here. Particular thanks are extended to Palo Stein (OMC and former IPA secretary), Paul Rogoway (ELNIV), Michael Rosner (IDC), and Chanan Rapaport (Henrietta Szold Institute for the Behavioral Sciences). ■

SOVIET COMPUTING, 1969: A LEAP INTO THE THIRD GENERATION?

software struggles and 360 orientation

by Wade B. Holland

Three years have passed since formal announcement of the BESM-6 computer, the last major hardware development in Soviet computing.[1] Since it has been traditional to evaluate the status of computing technology in the Soviet Union in terms of hardware achievements, one might easily conclude that progress has diminished considerably. Significant improvements in the design of peripheral devices have failed to materialize, and the Soviets do not yet have an operational disc memory unit.[2] Work under way for at least two years on third-generation machines, based largely on (and even compatible with) the IBM 360 series, has yet to result in any operational hardware or systems.

But a closer look at Soviet computing, triggered mainly by a significant conference held last November in Kiev, re-

[1]Holland, Wade B., "The BESM-6 Computer," *Datamation,* Vol. 13, No. 8, August, 1967, pp. 26-28.

[2]A Soviet disc has been noted, but the single reference to it is buried in tabular material in an obscure 1968 book on using computers in maritime transportation. No formal announcement of a disc has been made, and there are no indications of a disc store being used in an operational environment. See: *Soviet Cybernetics: Recent News Items,* Vol. 3, No. 5, The RAND Corporation, RM-6000/5-PR, May, 1969, pp. 10-12 (hereafter referred to as *SC:RNI).*

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veals that a quiet revolution has been taking place, resulting in a striking increase in software and programming language activity, especially the development of algorithmic languages and translators.

the software gap

Even well into the sixties, the programming or software gap between the U.S. and the USSR was a chasm: the concept of programming languages barely existed in Soviet applied computing. With the notable but limited exception of some use of FORTRAN in the field of atomic energy and a nascent interest in ALGOL, most programming was still being done in machine language, or in the so-called *avtokod* (autocode) assembly programs.

A hardware gap between the two countries has long been recognized and subject to comment. In a guest editorial in the August, 1967, issue of DATAMATION, Paul Armer viewed the gap from the vantage point of one who had visited the Soviet Union eight years earlier with an American computer delegation. He concluded that the gap had remained constant during the intervening eight years; we might add that it has probably changed little since his 1967 article. But, in contrast to our ability for many years to evaluate the hardware gap, we are just now beginning to gather enough information to make a similar evaluation of software and programming.

For historical perspective, the "software revolution" now becoming evident in the Soviet Union is somewhat comparable to the era introduced in U.S. computing by the development and widespread acceptance of FORTRAN II. Software developments in the two countries are not really on the same continuum, so that this kind of evaluation is difficult to make and can be used only in a very tenuous way for comparing development patterns.

The IBM 704 computer, first delivered in 1956, was the vehicle for the first FORTRAN compiler. During the period 1957-59, FORTRAN II was introduced and became widely accepted in many major 704 installations: "a revolution was taking place," according to one historical survey.[3]

We are now seeing the Soviet's entry into their own "software revolution," and, as in the United States 10 years ago, it has been noteworthy for the lack of attention it has drawn. In addition, the Soviet effort has its own character, influenced in part by the successes and failures of American and European experience over the past 10 years. Thus, while we might place the Soviet level of activity today at the same point where the West was a decade ago, it is important to realize that they are following a different course and at a different, probably much accelerated, rate of development.

The surge in programming languages that is now becoming evident in the Soviet Union has not yet been felt to any large extent outside scientific computing establishments, but at least the potential is now there, and we can begin to perceive the present limits of Soviet programming capabilities. And, to continue the analogy, the chasm is now only a gap. More than a dozen languages are operationally available in the USSR today, most of them locally developed. Many of the Soviet languages are ALGOL-based, and ALGOL itself remains the most widely used language. The use of FORTRAN, if not more widespread than in the past, is at least more widely acknowledged (one Soviet source rates FORTRAN as second only to ALGOL as the most common language). Considerable interest has been expressed in the Norwegian-developed SIMULA simulation language (which has been adapted for Soviet use) and in SIMSCRIPT. There are indications that local simulation languages are being written. COBOL has achieved a measure of respectability, and, most recently, the PL/I manual and description has been translated into Russian.

a new emphasis on programming

Several reasons can be postulated for the new attitude towards programming. They perhaps all reduce to the fact that the inevitable has (finally) occurred. The Soviets have realized that computers will never be efficiently used so long as there is no convenient facility for communicating with them.

It is possible that for a long time the importance of high level programming languages was obscured by the horrendous problems of inadequate and unreliable peripheral equipment, especially I/O gear. These hardware problems have been tediously noted for years by the Soviets themselves and by Americans surveying Soviet computing.

Perhaps the Soviets were too wrapped up in their hardware problems or in the bureaucracy of implementing solutions to appreciate the importance of software; or, it could be that the more immediate hardware issues were draining research and development resources that might otherwise have been devoted to software. There has also been a scarcity of programmers with other than mathematical interests. In any case, the situation is changing. Heavy emphasis was placed on software development for the BESM-6, and although the stated goals were missed by at least two years, the important point is that there were goals, and there was a plan for their realization.[4] (There is no gap between the two countries in underestimating software availability schedules.)

The first known ALGOL translators in the Soviet Union were operational in late 1963 on the M-20 computer. One of these, consisting of about 7000 instructions, was very limited (no strings, no numerical labels, no recursive calls, restrictions on procedure declarations and statements), and ran very slowly. The second, developed under Professor M. R. Shura-Bura at Moscow State University, handled full ALGOL except for dynamic arrays and numerical labels. It consisted of 13,000 instructions, and required 10-15 minutes to process 1000 object instructions.[5] These are believed to be the TA-1 and TA-2 translators, improved versions of which are still in wide use.

The successful development of the Alpha automatic programming system, which became fully operational in 1964,[6] must be considered an important milestone. Alpha is the work of Andrei P. Ershov at the Institute of Mathematics of the USSR Academy of Sciences' Siberian Department. Ershov is a leading Soviet expert in this field who gained world-wide recognition for Alpha and for his work on ALGOL international working groups. His successes have undoubtedly had a significant impact.

The Alpha translator converts programs written in Input Language, a language based on ALGOL-60, for the M-20

[3]Rosen, Saul, "Programming Systems and Languages—A Historical Survey," in *Programming Systems and Languages*, Saul Rosen (ed.), McGraw-Hill, New York, 1967, pp. 7-8.

[4]The operating system supplied on the prototype models of BESM-6 apparently proved wholly inadequate, and a completely new system was designed for the production model. This latter operating system, and a complete software package, only became available within the past year (according to a report at the March, 1969, Annual Meeting of the USSR Academy of Sciences; see SC:*RNI*, Vol. 3, No. 4, April, 1969, p. 1).

[5]Bemer, R. W., "A Politico-Social History of Algol," *Annual Review in Automatic Programming*, Vol. 5, M. I. Halpern and C. J. Shaw (eds.), Pergamon Press, New York, 1969, p. 210.

[6]"USSR's Ershov Speaks in L.A.," *Datamation*, Vol. 11, No. 7, August, 1967, p. 99.

computer. Alpha has also been described as the most popular language for BESM-6 programming; initially, at least, it compiled BESM-6 code on the M-20, and may still operate exclusively in this mode. Alpha appears to have had a demonstrable effect in easing programming for the M-20 and BESM-6 machines—the former an old but widely used workhorse of Soviet computing, and the latter the newest and most sophisticated of their large machines. This experience probably had a wide influence in convincing users and managers of the importance of programming languages.

The growing number of computers in the USSR and their widening spheres of application have undoubtedly also accelerated concern for software. The Minsk-22 computer is now in general use throughout Eastern Europe, and has been especially important in providing a computational capability in industry. Many Ural computers, especially the older models, are in use today, a number of the early ones now having been consigned to relatively small factory computing centers and to educational establishments. As more and more computers have been produced and installed, it has become obvious that their efficient utilization is an important national resource.

There is also a growing awareness that no industrial or commercial user can exist for very long on the basis of canned programs. Local changes are nearly always desirable, and a certain amount of on-going program maintenance is necessary. This requires programmers. The number of scientific computing centers is increasing sharply, also requiring programmers. Thus, a growing demand for programmers is also responsible for the emphasis on programming languages.

Despite the increasing number of programmers, the role of the programmer has never been fully appreciated in the Soviet Union. The use of the term "mathematician-programmer" is indicative of the problem. Programming has traditionally been considered a branch of applied mathematics, attracting people interested in solving difficult numerical analysis problems for scientific applications. There tends to be no middle ground between these senior, research-oriented people and very low-level coders. Even the current interest in programming contains only nascent recognition of the need to broaden the base of professional programming personnel. Nevertheless, the vastly increased number of people in the Soviet Union who do programming, and their collective frustrations at being subjected to machine-language coding, has surely had an effect and must be cited as a reason for the changing attitudes.

the man-machine problem

The two main trends in facilitating communication between man and machine in the Soviet Union, as in the West, have been the development of translators for large computers, and the design of time-sharing systems.[7] Both trends reflect a hardware orientation towards large (by Soviet standards) machines.

There is one area of exception to these trends, and that is in the work of Viktor Glushkov, director of the Institute of Cybernetics in Kiev. To Glushkov and his institute must also go a large measure of credit for the software revolution. Glushkov is one of the Soviet Union's best known cyberneticists. He is an Academician, the vice-president of the Ukrainian Academy of Sciences, and a winner of both the Lenin and the State Prizes. This year, he became a Hero of Socialist Labor and his institute received the Order of Lenin for work in automata theory, for development of an industrial management information system, and for the design of the Mir series of computers.

The Mir is a small machine, intended to provide a personalized computing capability for specialists not acquainted with programming. "The goal was to facilitate communication between man and machine," according to Glushkov.[8] Communication is via a typewriter console in the Mir's higher-level machine language, permitting the use of instructional notation close to the ordinary language of the mathematician, engineer, technician, and scientist. At an average speed of 250 opns/sec, it has traded speed for improved language interpretation. Glushkov's 1968 State Prize was awarded specifically for the Mir machine, which is currently in production.

The Mir's input alphabet consists of the Russian and Latin characters, a series of standard operation symbols, symbols for specifying integers and fractions, exponents, and delimiters. Functions are expressed by Russian words such as "CALCULATE", "LENGTH", "IF", "ARRAY", etc. A follow-on to the Mir-1 is being developed, which perhaps will operate in a time-shared mode.

The Mir series (which also includes the earlier Promin' computer) is important because it represents the first and, together with the Armenian-produced Nairi machines, the only serious attempt in the Soviet Union to bring the power of the computer down to the immediate user through the design of small but effective machines that require no knowledge of programming. But even Glushkov recognizes that the Mir does not yet constitute a trend in Soviet computer technology.

1968 conference on programming

Having successfully bucked the hardware trend with the Mir, Glushkov in November, 1968, struck out in a new direction, hosting the First All-Union Conference on Programming, a signal event in Soviet computer technology.

The proceedings of this conference and its ten sections have provided the first comprehensive view of current Soviet work in programming.[9] The nearly 100 papers cover a wide range of subjects, from automata theory to the specifications of a number of languages. The conference attracted 1500 participants from 700 organizations, according to press reports.

The various papers contain information on more than 40 programming languages, programming systems, and translators. It is difficult in many cases to determine the exact nature of the systems mentioned; this is partly a result of characteristic Soviet vagueness in technical descriptions, and of their lack of precision and uniformity in terminology. For example, the Soviet literature makes little distinction between compilers (or compiler languages) and assemblers (or assembly languages), and it is not always clear that Soviet authors know the differences.

The Soviets tend to consider all programming languages and systems in three categories: the traditional, simple, machine-language or assembly-language *avtokods*, simulation and modeling languages; and higher-level languages, often lumped together as "algorithmic languages" (thus, one paper presented at the programming conference identifies ALGOL, COBOL, FORTRAN, and PL/I as "algorithmic languages").

In addition to the *avtokod* languages and the early TA series of ALGOL translators, one of the first major Soviet interests in programming languages was the adoption of FORTRAN for use in atomic energy applications, particularly

[7] Glushkov, V., "Small Computers Take the Lead," *Pravda*, Feb. 24, 1969, p. 3; translated in *SC:RNI*, Vol. 3, No. 3, March, 1969, p. 6. (The title of this article is misleading; the trend is not towards small machines.)

[8] *Ibid.*

[9] An extensively annotated listing of the conference papers was published in *Soviet Cybernetics Review*, Vol. 3, No. 7, The RAND Corporation, RM-6000/7-PR, July, 1969.

at the Joint Institute of Nuclear Research at Dubna; however, significant use of FORTRAN in other applications has not been apparent.

The Soviets were early participants in the work of the international ALGOL-60 committees, and this orientation towards ALGOL has had a marked influence on subsequent language designs. The first notable domestic effort (apart from Alpha, mentioned above), was initiated in November, 1963, when the State Committee on the Coordination of Scientific Research Work commissioned the ALGEC language. ALGEC was intended to provide an ALGOL-based capability incorporating the Cyrillic alphabet and with facilities for handling textual data and for list processing. The primary area of need for such a language is in economics data processing, for which the Soviets do not feel ALGOL-60 is well suited.

Two versions of the ALGEC language were written,[10] but it does not appear to have been used very extensively. It is generally accepted now in the Soviet Union that ALGEC is too difficult. Another language for use in economics, ALGEM, was written at about the same time, but it also has been rejected because of limited capabilities.

During the writing of ALGEC, the Warsaw Pact countries established a commission to coordinate development of algorithmic languages. ALGEC was assigned to the Soviet Union, while the Poles accepted responsibility for a COBOL project. This commission seems to have passed into obscurity, along with ALGEC. However, the COBOL work has continued, and one of the new languages reported at the programming conference is called ALGOL-COBOL. It combines features of the two languages, making it suitable for economics applications (at least until ALGOL-68 becomes available). A language called A-COBOL has also been developed, intended for description of translators.

The basis for a number of languages in use today is the concern for industrial automation and for automating design techniques. Languages for describing models of digital computers include ALOS, SLANG, LYAPAS, and TSIMOD, none of which, interestingly, is mentioned in the conference proceedings. The OSS language, for describing structure and circuit algorithms, was the subject of one report. Several languages were mentioned that are intended for formulating process control algorithms and for implementing routines for program-controlled machines; these include SPALT, TEKHNOLOG-67, APROKS, and SAP. The DIS-68 language is intended for modeling discrete data processing systems.

Specific translators and the techniques of translator design received considerable attention at the conference. Much of this work centers around the BESM-6 and the Minsk-22 computers. Apart from implications for the design of specific machines and systems, covered below, this concern for translators was the most significant aspect of the conference. The lack of ALGOL compilers has probably been the largest single factor inhibiting use of the language. This problem is complicated by the fact that Soviet machine manufacturers take no responsibility for providing translators for the machines they produce, and most translators are written in scientific research institutes specifically for their machines, which usually have been modified. Thus, existing translators are often of no use to those outside the institutes where they were written. And the shortage of high-level programmers denies other installations the capability to write their own translators or even to modify the existing ones.

A number of Russians have suggested from time to time that Western practices be emulated, and that the manufacturers be assigned responsibility for providing appropriate software. Given the organization of Soviet industry, this is not too practical a solution; for one thing, the manufacturer often has had nothing to do with the machine's design. An approach attempted first with the BESM-6 appears to be meeting with a moderate amount of success. Different aspects of software development are assigned to various institutes and organizations. This has the advantage of splitting up the tasks, ostensibly making it easier to meet deadlines. It also involves a wider range of experts in the solution of complex problems, and permits each facet of software design to be handled by those most knowledgeable in that area. There is also a potential for involving a greater number of people and institutes in the techniques of hardware and system design.

The obvious major drawback to this approach is coordination. It is hardly conceivable that such a system will work smoothly, and it is questionable that it can be made to work at all. The problems of bureaucracy, the propensity of Soviet scientific establishments to avoid cooperative efforts, the inefficiency of communications media, the problems of coordinating a distributed effort—all can be cited as stumbling blocks that must be overcome. The Soviets have had little success in the past in effectively coordinating the manufacture of computer hardware; it would seem that coordinating a software development program would present an even greater challenge, even without considering the necessary interface with those responsible for ultimately manufacturing the machines.

Nevertheless, such an approach was attempted with respect to the BESM-6. However, it is important to recognize that the BESM-6 had already been designed and a prototype built before the major software effort got under way. And at that point it was discovered that the machine structure was not particularly appropriate for many of the things desired of the software package. Most important, it was determined that the basic operating system provided on the prototype machine was inadequate. A completely new operating system was written,[11] accounting for the delay in making BESM-6 available to users for production computing. A report on this new version of the operating system was presented at the conference.

In addition to the BESM-6 experience, or perhaps as a result of it, hardware models are being developed of a series of three new computers. These models are intended specifically to facilitate the problems of coordination and documentation in designing and producing modular hardware systems. This work is associated with the M-1000, M-2000, and M-3000 computers, a new line of development revealed for the first time at the First All-Union Conference on Programming.

the asvt project

Although the conference was not intended for the presentation of papers describing hardware, several reports dealt with aspects of system and software design for modular computer hardware. The new M-1000, M-2000, and M-3000 modular design computers were identified and de-

[10]See: *Soviet Cybernetics Technology: VII. ALGEC—Report on an Algorithmic Language for Economics Calculations (Preliminary Version)*, and *Soviet Cybernetics Technology: VIII. Report on the Algorithmic Language ALGEC (Final Version)*, The RAND Corporation, RM-5135-PR, September, 1966, and RM-5136-PR, December, 1966 (respectively).

[11]See footnote 4.

scribed to some extent.[12] The modular approach is designated by the acronym ASVT, which, loosely translated, stands for "modular computer hardware" (a literal translation would be "aggregated computer technology facilities").

The most interesting facet of the ASVT approach is that the machines are third generation, and have a common instruction repertoire, compatible with the IBM 360, RCA Spectra 70, English Electric System 4, Siemens 4004, etc.[13] It is well known that the Soviets were deeply concerned when IBM announced its System 360, and there have been persistent reports that a high-level decision had been made to adopt the 360 design philosophy.[14] ASVT appears to be the result of that decision.

What is not clear is how the M-1000, M-2000, and M-3000 machines fit into a 360-like series. They are intended basically for process control applications; furthermore, they are not large machines, even by Soviet standards. Thus, additional M machines may be forthcoming.

The ASVT work is under way at Severodonetsk in the Ukraine, presumably at the Scientific Research Institute of Control Computers; it was begun in 1965 under the jurisdiction of the USSR Ministry of Instrument Construction, Means of Automation, and Control Systems. An association with this institute immediately brings to mind the SOU-1 control system, displayed at the 1966 Interorgtekhnika Exhibit in Moscow. SOU-1 consisted of three computers, the MPPI-1, the UM-1, and the KVM-1. The curious thing about this system was that its three machines were intended to operate in a process control hierarchy (with the KVM-1 as the top-echelon computer), and yet the machines were not compatible; for instance, they had incommensurate word lengths.

The new M machines also exhibit inconsistencies. Their peripheral devices are not standardized, either for general ASVT compatibility or for compatibility among the three described machines. Also, the instruction repertoire of the M-1000 does not conform to the accepted standard for ASVT. Although it is difficult to match these three machines to the three computers of the SOU-1 system, it is conceivable that the M machines are to some extent redesigns of older machines, or at least incorporate components taken from other machines. A machine identified as the M-1000 was displayed in May at the Automation-69 Exhibit in Moscow. No information on this computer is yet available, but it seems strange that a machine first announced in November as a "model" could appear the following May ostensibly as a new production computer. A reasonable explanation, especially in view of the other inconsistencies, is that the M-1000 displayed is indeed a new machine, a version of which is being incorporated into the ASVT system.

Word lengths on the M machines reflect the ASVT adherence to 360 standards. Nominal word length is 32 bits, with 16-bit half words and 64-bit double words. Each 8-bit byte also includes a parity bit, so that full-word storage is in terms of blocks of 36-bit words.

The M-1000, M-2000, and M-3000 are based on logic elements designed for the Mir-1. This could indicate a design collaboration between Glushkov's Institute of Cybernetics and the Severodonetsk Institute, both of which are located in the Ukraine. It is also possible that the M machine models were built at the same Kiev factory that makes the Mir computers, thus accounting for the use of the same logic elements. A more intriguing, if less substantive, speculation is that these elements were originally designed for the ASVT machines, and that their use in the Mir came later. This interpretation appeals to those who feel that the Mir does not represent advances in the technology commensurate with the adulation and honors which have been bestowed on Glushkov and his institute for its design.

The M-3000 has also been identified as the intended main computer in the automatic ticketing and seat reservations system being designed for Aeroflot, the Soviet airline. This system is called "Sirena," and was the subject of two papers presented at the conference, one of them also originating at Severodonetsk. An article appearing in a technical journal published at the time of the conference identified the Institute of Automation and Remote Control in Moscow, among others, as being responsible for the Sirena system.[15] This article stated that Sirena's "computing units are all based on the M-3000 general-purpose processors," which operate at more than 100,000 opns/sec. Sirena will function only in the Moscow area, handling reservations and ticketing for passengers flying out of or returning to Moscow and for passengers changing planes at Moscow. It will be similar to systems in use in the West, except that the passenger ticket will be produced by a printer at the reservations counter.

One other paper presented at the conference is noteworthy in terms of signaling a shift towards more pragmatic approaches. Several years ago a three-tiered national network of computer centers was proposed. The system was to be geographically based, cutting across bureaucratic jurisdictional lines. It was immediately opposed by the ministries and government agencies, who feared the consequences of being dependent for their information needs on a super computing agency. More recently, the computer experts have expressed doubts about the efficacy of subsuming the bulk of the nation's computational capabilities under one gigantic system; moreover, there is a serious questioning of the ability of the technology to accomplish such an undertaking.

V. L. Grejsukh and G. S. Reznikov in their paper characterize such a system as an "unreal aspiration." They describe as "even more unreal in principle . . . the development of global centralized models and algorithms for national economic control." The authors maintain that the proper place to put emphasis in designing and building such a system is on its capability to transmit data from center to center—on the existence of common procedures for gathering, preparing, and processing data. This is an important shift, reflecting the attitude that the success of implementing such a system depends more on software and procedures than on theoretical algorithms or simple availability of equipment and communications links.

new directions

There are several conclusions to be derived from the work reported at the First All-Union Conference on Programming and from other recent events in Soviet computing. Most important is the admission that Soviet efforts in machine design are being directed in the System/360 pattern, that this work is definitely under way, and that an integrated approach to hardware and system design has been adopted.[16] Furthermore, much attention is being given to the availability of translators and to other means for facilitating programming and the problems of man-machine communication.

The implementing decisions, especially that concerning

[12] Report translated in *Soviet Cybernetics Review*, Vol. 3, No. 6, The RAND Corporation, RM-6000/6-PR, June, 1969.

[13] The English Electric and Siemens machines are the English and West German versions of the RCA Spectra 70.

[14] A series of such machines was mentioned by the Deputy Minister of the Radio Industry in late 1967. They would operate at speeds of 20K, 100K, 500K, and 2 million opns/sec. See: *SC:RNI*, No. 11, December, 1967, p. 3.

[15] See: *SC:RNI*, Vol. 3, No. 3, March, 1969, pp. 31-37.

[16] Another recent hardware development of potential significance was the announcement in May of the Nairi-3 computer, designed in Armenia. Nairi-3 is believed to be the first Soviet integrated circuit machine. The Soviet Union's first transistorized computer, the Razdan-2, was also designed in Armenia.

adoption of 360 standards, were reached only after a painful struggle between the pragmatists and the "patriots." The latter felt it degrading to the Soviets to so openly copy American work, and pressed for an independent Soviet approach. The experts in the field were arrayed against this attitude, and clearly have triumphed.[17] But it is questionable that they will succeed in their program, even to the degree that IBM was able to fulfill the promises of System/360. The problems of coordination experienced by IBM will be as nothing compared to those faced by the managers of the Soviet program.

Although the specialists appear to have been given the go-ahead for a 360-like system, there is no evidence that the fundamental reorganization of the planning, design, and production facilities that would be necessary to carry out such a tremendous effort has been forthcoming. Based on past experience, one must conclude that the current fragmentation of responsibility, the jealous guarding of jurisdictional prerogatives, the lack of motivation in industry, and the abysmal state of communications will prove to be the most serious problems to be overcome in order to bring to successful fruition the proposed series of computational capabilities.

Locating much of the work under the Ministry of Instrument Construction, Means of Automation, and Control Systems might mitigate the problems somewhat, inasmuch as this is probably the civilian ministry most capable of adjusting to new conditions (it is the first ministry to fully convert to the economic reforms). But the orientation of this ministry is more towards office equipment than large computer systems, towards production than systems design, towards overfulfilling plan quotas than solving technological problems. And, in any case, the ministry is dependent on the facilities of various academy institutes for system design and software preparation. The only jurisdictional change that might be indicative of an attempt to address these problems is the placement of the prestigious Institute of Automation and Remote Control jointly under this ministry and the Academy of Sciences.

It is important to understand that there have always in the history of Soviet computing been influential people in leadership positions in the concerned institutes and organizations who have understood the problems and clearly seen the outlines of their solutions. Increasingly, these people are winning the political arguments that permit them to attempt the proffered remedies. But, as yet, they are still restricted to operating on the problems within the existing organizational and jurisdictional structures; and this factor probably spells, if not outright failure, at least a serious impediment to successful and timely production of true third-generation machines.

However, much of the auxiliary work on writing and adapting new programming languages and on providing translators for production machines should considerably enhance the utilization factors of existing Soviet computers. This is especially important in view of the fact that 90% of the processors in computer centers and organizations are medium-sized machines which, it has been predicted by experts in Novosibirsk,[18] will be in use for at least another ten years. ■

[17] While there has been little serious consideration of simply buying computers in large quantity from the West (U.S. export restrictions and limited Soviet hard-currency reserves effectively preclude doing so), it has been proposed that Western-designed equipment be produced in the Soviet Union under licensing arrangements. See *SC:RNI*, Vol. 3, No. 4, April, 1969, p. 69.

[18] In the paper "Organizing the Collection of Statistics on the Structures of Jobs Using the Autooperator for the M-20 Computer," by I. V. Maksimej and S. P. Surzhikov, presented at the conference.

SOFTWARE PACKAGES IN EUROPE— WHAT DO USERS THINK?

by John J. Hampton

By most measurements, Europe has sufficient sophisticated computer systems to support a major marketing effort in the area of software packages. At the present time, over 15,000 computers of every make and model are operating in Western Europe, a rise from 7,000 at the end of 1965. These computers are widely distributed over a number of countries. One expert estimated in 1967 that Germany had 27% of Europe's computers, the United Kingdom 20%, France 18%, Italy 12%, and no other country more than 5%.[1]

Of even greater concern to prospective marketeers of software packages, the IBM 360 series is well-entrenched in Europe. Over 3,000 models had been installed by the end of 1968, making the 360 a market unto itself in Europe.[2] Since most current software packages can be used on the 360, Europe may have an existing market waiting to be tapped.

Even if Europe has the proper blend of hardware, a question remains. Are the prospective users—managers and analysts—ready for software packages as we know them today? This study attempts to offer some insight into this question.

the survey

In order to gain first-hand knowledge on the attitudes of Europeans towards packaged software, questionnaires were sent to 120 data processing installations in Europe. Included in the sample were businesses, government agencies, and universities in 14 countries. Twenty-seven replies from the United Kingdom, Italy, Germany, France, and the Benelux and Scandinavian countries provide the source material for this study.

The questionnaire was divided into three parts. The first section asked for information concerning the individual responding to the survey, his organization, and the kinds of software he was presently using. The second requested an evaluation of the packages presently known by the individual. The final part sought open-ended comments on present and future needs for packaged software.

The respondents to the survey varied in position titles, organizational size, and available hardware. Table 1 shows that most of the individuals were data processing managers or analysts working for organizations varying in size from 5 to 450 personnel. The IBM 360 was the dominant computer with 30 systems available, but 10 other systems were represented including Norway's NORD 1, the United Kingdom's ICL 1901 series, Germany's Siemens 4004 (actually the RCA Spectra 70), and Olivetti's ELEA.

Systems Software. The top portion of Table 2 shows the sources of systems software reported by the respondents. As might be expected, 85% reported that computer manufacturers provided substantial systems software. Over 50% also report important efforts at in-house development. Only a very small amount came from software service companies or packages.

Applications Software. The bottom portion of Table 2 shows the sources of applications software. The primary source is clearly in-house development. Computer manufacturers also provide a significant amount to some 40% of the respondents. An interesting finding here is that some 25% reported moderate use of software service companies and packages. This seems to support the claims of computer software companies that they are beginning to make inroads into the European data processing industry.

quality of present software packages

Table 3 shows the respondents' ratings of proprietary packages which were either in use in their organizations or considered for use. There was general agreement that the quality of the packages was at least adequate for their use. The other features received generally mixed ratings. Fifty to seventy per cent gave most of the features at least an adequate rating, but a large number of poor ratings were also given. Two-thirds felt that expandability was poor and over one-third felt that installation and maintenance support were poor.

Table 3 probably reflects different levels of experience and differing needs among the respondents. An individual's answer may have resulted from exposure to only a few packages. Or the needs of a particular organization may or

[1] W. K. de Bruijn, "Recent Developments in the European Market," *Datamation*, December, 1967, p. 26.

[2] "Diebold European Computer Census," *Automatic Data Processing Newsletter*, Dec. 30, 1968.

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may not have been fulfilled by the available packages. These variables could have affected the responses.

In spite of the wide range of ratings, it is significant that over half the respondents gave at least an adequate rating to every feature except expandability. This may indicate that they would be receptive to evaluating and purchasing the "right" packages if they were available.

needs at the present time

As a general rule, the respondents indicated cautiously that there may be a demand for packages in Europe. One respondent described the situation as follows:

"With edp problems getting larger and more complex (management information systems, for example), we recognize some deficiencies in programming capabilities and I think an experienced American software company—maybe together with a German representative—could open a tremendous market in Germany, or even in Europe" (Germany).

Another reinforced this feeling in slightly different terms:

"Manufacturers' packages have been only in low level languages with no means of making changes. Higher level languages and full documentation would be a boon to us" (United Kingdom).

Other responses noted some of the same deficiencies and

Table 1

CHARACTERISTICS OF RESPONDENTS
TO PROPRIETARY SOFTWARE PACKAGE SURVEY

1. *Job Titles of Respondents.*

a. Programmer or Analyst	35%
b. EDP Manager	47
c. Instructor or Consultant	18
TOTAL	100%

2. *Number of EDP Personnel in Respondent's Organization*

a. Lowest Number	5
b. Highest Number	450
c. Median	100
d. Mean	139

3. *Computer Systems Used by Respondents (Number of Computers)*

a. IBM 360/20-25 — 3	f. NORD 1 — 1	k. Siemens 4004 — 1
b. IBM 360/30-40 — 18	g. Univac 1107 — 1	l. GE 115 — 1
c. IBM 360/50-65 — 9	h. ICL 1901-03-04 — 4	m. ELEA (Olivetti) — 3
d. Other IBM — 6	i. Burroughs 283 — 1	
e. CDC 3300 — 1	j. Honeywell 1250 — 1	

Table 2

SOURCES OF SYSTEMS AND APPLICATIONS SOFTWARE
FOR COMPUTER USERS IN EUROPE, SPRING 1969
(By per cent of users responding)

Source of Systems Software	Substantial	Moderate	Rare	None
Computer Manufacturer	85%	5%	5%	5%
In-House Development	31	25	19	25
Software Services Company			48	52
Purchase of Software Package			48	52
Source of Applications Software				
Computer Manufacturer	6%	35%	41%	18%
In-House Development	88	6		6
Software Services Company		6	59	35
Purchase of Software Package		18	47	35

the need for improvements. Still, the survey uncovered two views of why Europe presently represents a small market for proprietary software. One is:

"The reason we use no packages is the lack of any serious attempt by a reputable software corporation to convince edp users of the help they would get with applications software packages. Thus we rely first on the free help from computer manufacturers and second on in-house developments."

The second viewpoint indicates that software marketing managers may be facing a major challenge in the stimulation of demand for packages.

"I would be surprised if you find that United Kingdom data processing users are prepared to pay for software. It is usually hard enough to get them to use manufacturer's software that they get for free!" (United Kingdom).

From these representative statements, and from the data in Table 2, it appears that very little external software is being used in Europe. This is in spite of an indicated need for higher quality and more sophisticated software than is presently available from sources other than in-house development.

expectations for the future

Some of the respondents to this survey expect to purchase software packages at some future time. One stated flatly:

"We expect to acquire software packages when and if relevant packages become available to us" (Norway).

Another supported this statement, but modified the circumstances as follows:

"We expect to depend on packages in the future, but would prefer to cooperatively develop them using hybrid techniques" (Sweden).

From this statement, it appears that this edp manager is expressing a common feeling in the data processing industry—the desire to understand and to be able to modify, if necessary, the software routines. This feeling indicates that European managers desire high-quality documentation, just as do their American counterparts.

In contrast to those who expect to buy in the future, one individual was hopeful of buying, but not too optimistic about the prospects. He reported:

"Since we are more or less sold to IBM, there is not much of a chance to ever use other programs. Let's hope the future will bring some change!"

Other managers did not indicate that their firms would purchase in the future, but expressed a belief that Europe would provide a market for proprietary packages. One expressed the view:

"Prospects are high for packages dealing with problems of a general nature, particularly with use of complicated algorithms" (Belgium).

Another felt:

"If sufficient expandibility and tailor-made facilities are available, the prospects are great."

The viewpoints of bright prospects for a future European market were balanced by some outlooks that saw poor prospects in individual firms. One manager revealed:

"Our intentions for the future are to utilize our own applications software. Our dp department develops special packages to support special applications."

Another expressed the belief that:

"Prospects are poor in our firm. It does not seem likely that we will be prepared to modify our needs to suit packages" (United Kingdom).

The summation of these views indicates a small positive consensus for the prospects of software packages in the near future. To some degree, the diversity of responses indicates the early stage of development of the European market. It is not possible to determine whether the bright or pessimistic viewpoints deserve the greater weight. It is significant, however, that several respondents indicated a bright future market for the "proper" packages while none felt that the market as a whole would not be responsive to proprietary software.

conclusion

The findings of this survey seem to support a position of cautious optimism with regard to the prospects for software packages in Europe. Present packages are either inadequate or not widely available to satisfy existing needs. Most users revealed that they would seriously consider purchasing packages if high quality, desired related features, and the appropriate programs were available.

Over-all, this study reaches the following conclusions:

1. European data processing users are interested in proprietary software.
2. Europe does not represent a homogeneous market for software since individual attitudes vary greatly.
3. Certain obstacles appear to exist in the attitudes of prospective users. These must be overcome in any successful marketing strategy.
4. The needs and expectations of potential users indicate that Europe may be a major market for proprietary software in the near future. ■

Table 3

USER RATINGS OF PROPRIETARY SOFTWARE PACKAGES, EITHER IN USE OR CONSIDERED FOR USE, SPRING 1969

(By per cent of users responding)

Feature	Excellent	Adequate	Poor	Not Applicable
a. Quality of Package	14%	79%	-	7%
b. Design Features	14	58	21%	7
c. Generality (not too specialized)	21	43	29	7
d. Expandability	-	25	67	8
e. Operational Status	-	79	14	7
f. Available Programming Languages	14	58	21	7
g. Supporting Documentation	14	58	21	7
h. Installation Support	7	50	36	7
i. Maintenance Support	7	50	36	7

PERIPHERAL EQUIPMENT IN EUROPE

by Donald W. Willis

Ten years ago the pattern of the computer industry in Europe was rather similar to that in the United States.

There were the computer companies that supplied the system to the customer and whose general objective was to manufacture it all themselves—main frame, peripherals and software—and a scrabble of smaller companies who lived on their wits and ability to produce peripherals ahead of the capability of the main frame manufacturers.

The number of computer manufacturers in Europe was large—in England alone there were more than in the U.S., but their output in comparison with their American counterparts was microscopic. Thus developments of peripherals, both inside and outside the computer companies, were costly enterprises, but the number of units manufactured was very small. When the main frame manufacturers did not develop their own peripherals, they were generally not willing to buy from each other. In addition, the general advancement of technology in the U.S. was ahead in time, to an extent as a result of the massive support from the government defense programs, and the general result was that the European companies, when they could not do it themselves, drew their supplies from the American peripheral industry.

Government contracts and support in Europe for peripherals were nonexistent, and their requirements, also almost nonexistent, were generally met from the U.S. Thus companies like Ampex, Anelex, Data Products and Potter, who were developing fast in the States, were able to have things largely their own way in Europe, while the problem of the peripheral specialists in Europe was largely one of survival.

Those who made some progress at this time were Atvidaberg in Sweden who produced the Facit paper tape punch and reader, which are still in demand today—a remarkable achievement over so many years—Companie des Compteurs in France in magnetic tape transports, and in the United Kingdom Decca in magnetic tape transports, Elliotts with a paper tape reader and the British Tabulating Machine Co. with card readers, punches and printers. The Samastronic printer of the Powers Samas Company, a stylus printer very much ahead of its time in development, was one of the few examples of trading between main manufacturers.

the merger wave

Since that time the pattern of the industry, while largely much as it was in the U.S., has changed significantly in Europe. Mergers and take-overs have led to a large reduction in the number of European suppliers of large data processing systems, other companies have been created or have entered the market almost as part of national policies, and new areas of business have opened up in small computers.

Thus in France, with the merger of Companie des Machines Bull into General Electric of America, the indigenous electronics companies have been formed under the government's Plan Calcul into a highly interwoven network, with Compagnie Internationale pour l'Informatique manufacturing and marketing computer systems, and Sperac providing the peripherals.

In Holland, Philips has at last entered the market in a serious way. Electrologica, at one time Holland's computer company, manufacturing substantially the main frame in house, has been merged into Philips and is now reorienting itself into becoming the peripheral supplier to Philips.

In England, the commercial and scientific data processing interests of British Tabulating Machine Co., Powers Samas, Ferranti, EMI Electronics, English Electric, Elliott and Leo Computers are now merged forming International Computers Ltd. with an almost complete capability in peripherals in house. Other companies engaged in industrial automation are General Electric Co., English Electric, Ferranti and Plessey.

Germany is marked by the emergence of two new companies in the small computer market—Nixdorf and Kienzle—which, in addition to Siemag, recently acquired by Philips of Holland, also produce accounting machines. Siemens continues by skillful use of its cross-license with RCA and Telefunken mainly by specialization in work for the German post office and air traffic control systems. Zuse, who started work in automatic digital computers at the same time as Aiken at Harvard University, operated a small independent company for a period but subsequently became a subsidiary of Braun Boveri of Switzerland and is now controlled by Siemens. Siemens has its own printer and card equipment. Telefunken is traditionally in magnetic tape (the recorders used by the German army in World War II were made by Telefunken) but has only met its own needs. The small computer firms make their own keyboards and small cassette tape, but buy the bigger peripherals. The Germans have had a predilection in the past for buying their peripherals from the U.S. and England rather than from each other.

Mr. Willis is engineering director of Data Recording Instrument Co., the subsidiary of International Computers Ltd. responsible for magnetic recording peripheral equipment.

In Italy the electronic computer activity of Olivetti was merged into GE, leaving Olivetti to pursue accounting machines and terminals as part of their office machine business.

In Sweden the big office machine company Atvidaberg, after a promising start technically with the Facit EDB computer, collaborated with Saab, the aircraft manufacturer, on the basis that Facit would be the peripheral supplier to Saab, who markets computer systems as an offshoot of its aircraft computer work. Atvidaberg's activity, after a splendid attempt in the early days to solve the random access store problem with the Carousel, has since been limited to paper tape equipment and magnetic tape data preparation equipment.

The Danish company, Regnecentralen, with a government interest, for a while worked closely with the Swedish industry. Regnecentralen buys out its peripherals except for a fast paper tape reader of its own design.

Norway has recently emerged with a small company, Norsk Data, who are producing small computers.

In Eastern Europe the pattern of industry appears to be set by Russia, which is looking to each of the smaller countries to specialize in individual peripherals. East Germany has an industry compatible magnetic tape handler; Czechoslovakia and Poland have developed paper tape readers and punches, which they are supplying to other Eastern European countries. Poland is building up its capability in printers and Czechoslovakia and Hungary, perhaps the most advanced industrially, are looking at some of the later developments in peripherals. Export of U.S. and Western European peripherals is of course limited by the regulations controlling the embargo on strategic supplies.

peripherals by type

Europe has been and is still a market for peripherals. American-based computer companies have set up manufacturing centers in Europe to supply their own needs, but their activities are omitted from this review, as are also those companies engaged in data terminals and data preparation. ICL is Europe's own largest producer of peripherals but, as will be seen below, some supplies are still drawn directly or indirectly from the United States.

Tape handlers. In tape handlers, Ampex TM2 and TM4, Potter MT75 and MT120 are still to be found. TM9 was selected in France, with C des C holding the lower end of the range in their own country with the PEN 5 and PEN 6. In England ICL's subsidiary, Data Recording Instrument Co., now Europe's largest manufacturer of magnetic recording peripherals, is producing tape handlers at the rate of 1500 per year for ICL's 1900 series computers, while System 4 requirements are met by the output from the factories of the former English Electric Computers, recently merged into ICL. Datamec has made some headway outside the field of big data processors, while the Ampex TMZ and the Peripheral Equipment Corp. Tape Handler are having to compete with the European-produced SC 1030 for the low cost end of the range, mainly with the manufacturers of small computers. Control Data tape handlers were used by Electrologica and have continued as part of the Philips range, but Philips' recent announcement of their own tape handler, of classical design, may be expected to terminate this situation.

Exchangeable disc stores. Following their limited sale of tape handlers to other computer manufacturers, Control Data set the pattern for OEM business in exchangeable disc drives by giving apparently almost equal attention to it as to their own in-house requirements. CDC was first after IBM and, almost simultaneously with their introduction in the U.S., CDC disc drives appeared in Europe. Data Recording Instrument Co. (DRI) simultaneously with the expansion of their supplies of exchangeable disc stores to their parent ICL, have been conducting a vigorous marketing operation on the continent and are supplying disc drives to a number of major computer manufacturers in Europe, including the equivalent of the IBM 2314.

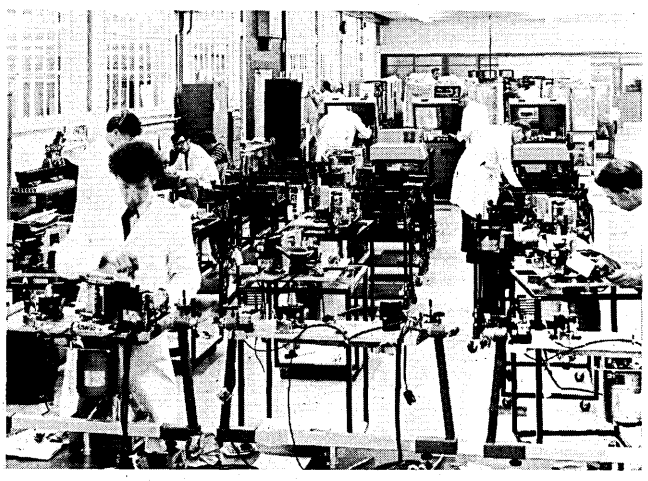
Fixed disc stores. There is no large fixed disc file of European design, though DRI is cross-licensed to Ex-Cell-O Corp. for the manufacture of the Bryant 4000 series for supply to ICL. Bryant supplies files to Siemens and Telefunken, and Control Data to ICL for use on System 4. Burroughs fixed head disc files are used in certain special online applications. Data Products, which once had a monopoly in fixed disc files, has not held its position with the introduction of the third generation of computers.

Magnetic drums. Most computer companies have had at some time their own facilities for manufacturing magnetic drums. With the introduction of disc files, the use of drums has declined and is now limited to a few special applications in scientific, navigational and message switching systems. The Bryant drum was selected for the ICL 1900 series, and General Instruments' for System 4. Drums by Sperry-Rand are used in some of the special applications.

Printers and card equipment. In printers and card equipment, continental computer manufacturers generally adopted IBM equipment, though Anelex made a significant inroad in printers, and Uptime to a limited extent in card equipment. ICL, of course, produces its own printers and card equipment, and has a significant OEM business in these classes of equipment in Europe, as it in fact also has in the United States.

Paper tape equipment. Paper tape equipment is the speciality of Facit of Sweden, which has made substantial sales in Eastern as well as Western Europe. ICL's requirements are now largely met in-house. The Regnecentralen paper tape reader has mainly interested other computer manufacturers as part of the paper tape to magnetic tape conversion equipment.

Displays. Visual display needs for commercial computer systems are in many cases met by the Raytheon tabular display produced by its subsidiary Cossor in the United Kingdom. ICL has other graphic displays produced in-house, and a number of other companies—including Ferranti, Plessey and GEC-Marconi—produce displays for radar and traffic handling systems and computer aided



Disc-pack drives (better known in the U.K. as exchangeable disc stores) being assembled at Data Recording Instrument Co., a peripheral equipment manufacturer absorbed by International Computers Ltd.

design.

New peripheral equipment companies in the U.S. often originate from break-away groups from the big companies, such as IBM. This has not been the pattern in Europe, partly because such action would often be regarded as unethical, indeed in some countries illegal, and in any case because risk capital is much harder to acquire in Europe than in the U.S. There are, however, a few new small companies which have been set up by experienced people, where developments are awaited with interest.

the future

What does the future hold in Europe in peripheral developments? The main centers of technology are in ICL at the Equipment Group Laboratories in Stevenage, specializing in classical peripherals and OCR; at the Data Recording Instrument Co. in Staines, specializing in magnetic recording peripherals, and in Kidsgrove; at Philips in Eindhoven, and at Siemens in Munich. The new companies set up to become the sources of peripherals—Sperac in France and Electrologica in Holland—will take some time to develop a full capability; meanwhile, their parents will be obliged to source peripherals on the OEM market. Some companies will find it hard to sustain a large number of peripheral projects unless they can considerably increase their revenue in these activities; Facit is clever to restrict its activities to a specialist market in which the investment is relatively modest.

Probably peripheral suppliers will find it more and more difficult to survive unless they align themselves with a main system supplier or attack the end user market direct with plug-to-plug compatible replacements. In Europe the major peripheral suppliers are already aligned and the plug-to-plug market is only just showing signs of developing. Europe is more and more becoming capable of producing its own peripherals, and indeed is making an increasing impression exporting into the United States. ■

COMPUTING IN CANADA

by G. S. Glinski

Four years have elapsed since my last review of Computing in Canada (DATAMATION, May, 1965). Let us see, first in broad outline, what has happened in this span of time.

For once, Canada can claim a real "first" in computing history. Last February the "activist" students of Sir George Williams University in Montreal shocked the usually well behaved Canadians by destroying the university computing center. I think this violent reaction is symptomatic of the mood of the next generation towards certain undesirable aspects of the forthcoming technological millenium.

Canada can also boast at having Marshall McLuhan, whose slogan "the medium is the message" has become a cliche of our times. This prophet of the dawn of the "post-Gutenberg" era, who, incidentally, is profiting quite well from the Gutenberg invention, appears to preach the complete surrender of individuals to the totalitarian dehumanizing effects of a big business controlled television-computer complex.

As those who have attempted to read and understand McLuhan well know, he is not the easiest author to understand.[1] As a matter of fact, some experts claim that McLuhan himself does not expect understanding, since it is his flow of written words (medium) that is important, not the meaning (message). Since McLuhan is against "old fashioned" lineal, or logical, thinking, it is hard to understand how he can reconcile the future role of computers in society with their basically sequential and logical functioning.

all quiet on the northern front

Another interesting aspect of Canadian computing is that "third-generation" computers are actually run by a second generation of information processing experts. The first generation of computer enthusiasts (including the author of this article) has achieved the status of "old statesmen," who are to be admired but not to be taken too seriously.

The final interesting aspect of Canadian computing development is the emergence of a multitude of private "computer utilities," which hope to provide computer service in the way electrical utilities supply electricity.

It is interesting that a Canadian, Douglas Parkhill, actually predicted this turn of events a few years ago.[2] It is

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1. Sidney Finkelstein, *Sense and Nonsense of McLuhan*, International Publishers, 1968.
2. D. F. Parkhill, *The Challenge of the Computer Utility*, Addison-Wesley, 1966.

obvious that there are already too many of these companies in existence. But the stock promoters have a marvellous time and, as usual, the final penalty will be borne by the gullible public.

After this general survey it is time to discuss specific areas of Canadian computing in more detail. We will begin with a summary of the present status of computing facilities.[3]

computer installations

The trend in computer installation growth may be seen from Fig. 1.

It can be assumed that we passed the linear part of the S-shaped growth curve and are approaching the region of saturation. This should give some sobering thoughts to computer manufacturers and those who hold their shares. As of this year, there will be another factor further slowing down the growth of the number of computer installations. This factor has already been mentioned. It is the emergence of private computer utilities and it will, of course, take some time to appreciate the importance of this factor.

Fig. 2 summarizes the economic sector distribution of computer installations. It should be noted that 25% of installations is in the manufacturing sector. The government sector contributes only 11.6%.

Fig. 3 pictures the geographical distribution of computer installations. Ontario accounts for 50% and Quebec for 25%.

Finally, Fig. 4 presents the manufacturer's share of computer installations. IBM, as usual, leads with 60%. It should be noted, however, that the IBM share is decreasing (it was 70% in 1964).

More detailed information on computer installations in Canada may be found in reference 3, which is updated annually.

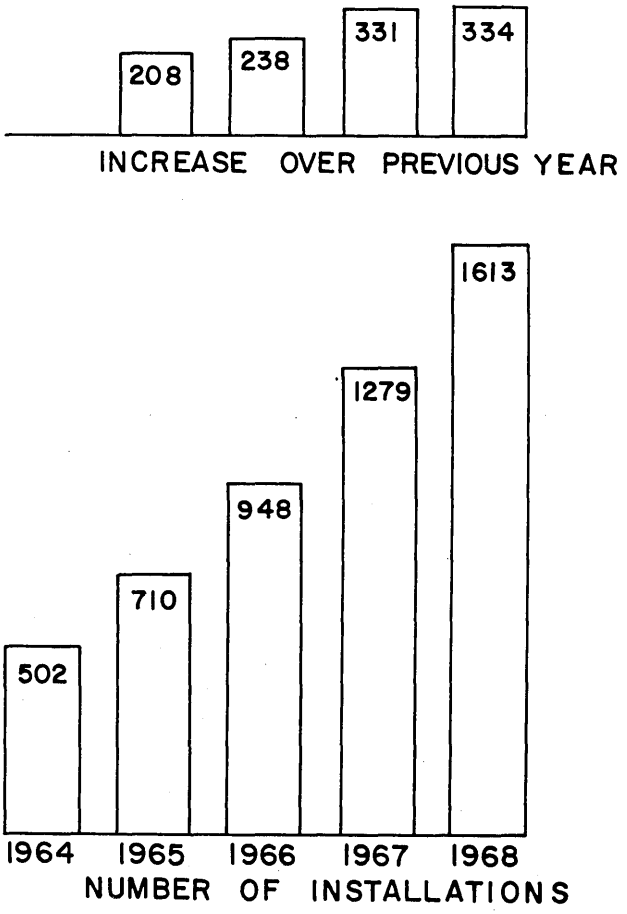


Fig. 1 Number of installations

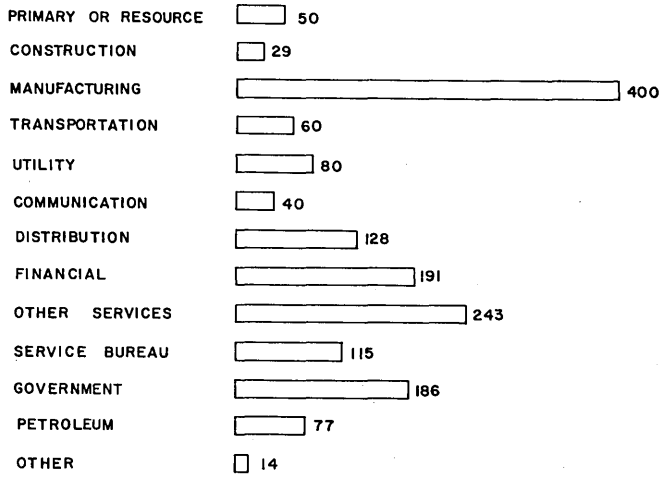


Fig. 2 Computers installed by sectors (1968)

computer manufacturing.

Although the Science Council of Canada[4] has stressed the importance of computer industry growth for growth in the national economy, there is no sign yet of any real activity. It may be significant, however, that IBM has increased its Canadian manufacturing facilities and Computing Devices of Canada has been sold by Bendix to CDC.

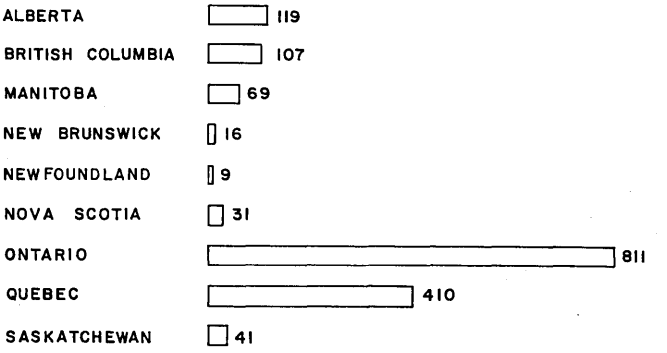


Fig. 3 Computers installed by province (1968)

With the obvious trend towards centralized computer utilities it already appears doubtful whether the recommendation of the Science Council technocrats was the right one. It seems that the Canadian economy can profit more from an emphasis on computer software expertise in finding new computer applications, rather than by plunging into computer hardware manufacturing.

To quote the Science Council report: "The present state of Canada's indigenous computer industry stands as a monument to the nation's lack of entrepreneural initiative and to the past failure to turn successful research into successful

3. *Census of Computers in Canada 1968*, Quarterly Bulletin of Canadian Information Processing Society, Vol. 8, No. 3, Summer 1968.
4. *Towards a National Science Policy For Canada*, Science Council of Canada, Rep. No. 4, Oct. 1968, Queen's Printer.

innovation. Canada has repeatedly demonstrated great competence in the design of digital computers but for every successful development there has been a corresponding failure to capitalize on the opportunity provided. Even today, large Canadian corporations still show no faith in Canada's ability to design and manufacture successive generations of general purpose digital computers. While the program might well lead to the development of some peripheral hardware needed for a particular application, or even to the development of specialized computers, the primary aim should be the promotion of the intelligent use and application of computers throughout Canada's economic framework."

consulting

One does not hear much these days of software or "systems" consultants. The first generation of these experts has either been taken over by computer utilities or become

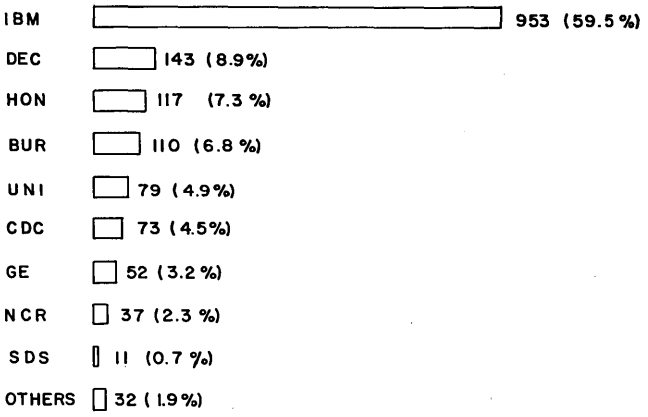


Fig. 4 Computers installed by manufacturer (1968)

more respectable by merging with management consultants. There is, of course, a great demand for computer science graduates, and the supply is slowly catching up with the demand.

use

Apart from some more exotic (and not very successful) uses of computers, such as, for example, the control of street traffic (in Toronto), computerized banking is, at present, probably the only application of some economic and sociological impact. The bankers may blame the present inconveniences and inefficiencies of centralized computer accounting on the difficulties related to the inevitable transition period of adjustment. The writer, as a customer directly involved, has grave doubts that the bankers have really spent sufficient time in training their personnel and if the analysts and programmers they are employing are not trying to oversimplify the problems at the expense of the customer's convenience. One wonders whether a few years hence some bank will not advertise as being the only one where services are "custom made" or "all done by hand."

There is, of course, the usual talk about the use of computers in medicine and education. As the Science Council report puts it: "The combination of computers and the techniques of systems science can be applied to many previously intractable problems. The provision of health care and of education have been two segments of the service industry where past pressure has always been directed towards upgrading the quality of the service being provided. The absence of the pressures of a competitive market has meant that there has been little attention paid to the efficiency with which these vital services have been provided. The spiralling costs of hospital care and the swelling numbers of students in our educational system both demand that serious effort be made to improve the productivity of these services. The attempts to improve the quality of these services will naturally continue and the application of computers to medical diagnostics and to the provision of educational aids both seem to be potentially rewarding." The only comment to be made is that more than one generation of computers (and computer experts) will be phased out before some really significant use in these two fields will become a reality. Of course some purely clerical and "calculating" functions could be computerized almost immediately.

education

By now there are about 12 computer science departments or programs in Canadian universities.[5] Some are closely tied in with the mathematics departments, some with the electrical engineering departments, some with both—and some are actually connected with the computer centers. In some places the programs are only on the undergraduate level, in some the level is only graduate and, finally, in some others a more balanced diet of both is provided.

It must be realized, of course, that because of the bilingual character of Canada some of these programs are in French.

societies

There is no substantial change in the structure of Canadian societies. The former Computer Society of Canada has now become the Canadian Information Processing Society, but this is simply a semantic change. There is also some talk of merging the Computer Science Association (mainly concerned with teaching and research in computer science) with the CIPS. Both societies have held several national meetings.

publications

There is not much to report here. The CIPS publishes the Quarterly Bulletin and the CSA the Newsletter. There is some talk about upgrading of the Quarterly Bulletin to the status of the Journal (with the financial assistance of the federal government).

It appears that only one book in computer science has been published by a Canadian academic. He is Dr. C. L. Sheng of the electrical engineering department of the University of Ottawa.[6]

In summary, Canada is yet far away from the so called "computer revolution." The social impact of computers is not yet noticeable. There is, of course, an expanding use for relatively routine business and industrial applications and also in the academic world of science and engineering. Economically, the Canadian computer industry accounts for less than 1% of the GNP.

It may be symptomatic that in Canadian advertising IBM has now changed the tune and, instead of extolling the limitless power of computers over man, is pleading for human understanding of computers and human help to do a better job. Coming from IBM it is quite a switch. ■

5. *Survey of Computer Science Courses at Canadian Institutions*, Quarterly Bulletin of Canadian Information Processing Society Vol. 8, No. 4.
6. C. L. Sheng, *Threshold Logic*, The Ryerson Press, Toronto and Academic Press, London and New York, 1969.

don't fire the director

THE MANAGEMENT SYSTEM—A NEW SPECIES OF SOFTWARE?

by M. V. Wilkes and D. F. Hartley

There was a time when the management of a computer system presented few problems since an individual was assigned the exclusive use of the computer for a period, and how he used it was his own concern. The need for higher operating efficiency led to the development of closed-shop operating methods and to the batching of jobs on magnetic tape for processing in sequence. This is the way in which most computer centers operate at the present time, although in many instances the use of random access disc files for the queuing of jobs has made it possible to escape, to some extent, from the limitations of strict batching.

It is certainly true that the highly organized closed-shop computing centers now in operation have led to the efficient use of computer resources; whether, from the point of view of a community of users, they have justified the high hopes that were built on them is another matter.

The difficulties are not so pronounced when a system is underloaded, but as soon as the load builds up users become dissatisfied. The situation is difficult to control. Directors of computing services are heard to complain that if they make heroic efforts to improve the turnaround time this merely generates increased activity on the part of the users, and the over-all situation is much as before. The result is that, sooner or later, a campaign builds up to fire the director and replace him—it is usually said—by a good administrator. However, we feel that the problem is not primarily an administrative one, but a technical one, and that new technical developments, along with increased understanding of the problem, are about to transform the situation.

Some five or six years ago, two lines of development, both of great importance by themselves, came together to produce a result that was truly revolutionary. One was the use of a central filing system within the computer for programs and data, and the other was remote access from a console of some kind. These together led to the various kinds of time-sharing, or multiple-access, systems with which we are now familiar. In the future it is likely that a major part of the load of any large computer center will come in along telephone lines, either from users sitting at consoles, such as Teletypes, or cathode-ray tubes, or from other kinds of input station.

It is now widely appreciated that on-line access to the computer makes rapid debugging possible. This gives ground for hope that, in the future, a well-managed center, giving console service, will survive the acid test of a centralized computing service, namely that people will prefer to use it rather than acquire a computer of their own. Certainly, the main sources of dissatisfaction with the impersonal batch-processing services of the present time are poor turnaround time on debugging runs and the loss of real time occasioned by trivial errors.

old methods inadequate

Once users are connected directly on line, however, old methods of management fail. It was once possible for the manager to have a personal influence on the running of the system and to control priorities by telling the operators which decks of cards to load; now the operators do not

Prof. Wilkes is professor of computer technology and director of the Mathematical Laboratory at the Univ. of Cambridge. He was a founder of IFIP and the British representative until 1963. He became a Fellow of the Royal Society in 1956, delivered the ACM Turing lecture in 1967, and in 1968 received the Harry Goode Memorial Award of AFIPS. With two colleagues, he published the first book on computer programming in 1951 and was responsible for the building of EDSAC 1, operating in May, 1949.

handle the work as it comes in. The answer, of course, lies in sufficiently developed software. Since the computer is operated by software—that is, by the operating system—the manager needs software tools in order to control it. It is the collection of packages that constitute these tools that we refer to by the name *management system.* A management system includes routines for logging console users in and out, for checking the credentials of all users, for controlling the rate at which they use the resources allocated to them, for keeping accounts of resources used, and for monitoring the operation of the system.

There is nothing new in this list (except perhaps the emphasis on controlling the rate at which resources are used) and many computer systems operating at the present time have features that cover some or all of these requirements. We suggest, however, that the management system can usefully be regarded as something separate from the operating system proper, and that, as time goes on, management systems will increase in complexity and comprehensiveness. They will take their place along with compilers and application packages as major pieces of software that work within the compass of an operating system.

the cambridge management system

We would like to illustrate the above remarks by describing some features of the management system that operates under the Cambridge multiple-access system.[1] This system provides an integrated foreground (console) and background (batch) service, and is tuned to serve the needs of a normal university computing community. The filing system is available both to the foreground and to the background, and background jobs may be generated from consoles.

In this description, we are primarily concerned with the foreground service. The system offers interactive working, but primarily in relation to file editing, and to the use of officially provided subsystems such as one for a JOSS-like interactive language. These facilities are available to a user working in what is known as *normal mode* and provide all the interactive working that is required by 90% of ordinary users. A normal mode user can give commands to activate programs and have the results come back directly to his console; he cannot, however, interact with a program that he has written while it is running. The user who needs to do this must work in *expensive mode,* and, since all such programs require a permanent partition of core for as long as they are being used, we cannot allow much expensive mode working. Since file creation and editing puts only a small load on the system, we recognize an *edit mode,* and users are sometimes allowed to log it in edit mode even when the system is otherwise full. There is also a *special mode* for use of systems programmers and the administration.

Although we would like a configuration in which expensive mode would be less expensive, we feel that the principle adopted in the development of the Cambridge multiple-access system has been the right one. This principle may be summarized as follows: "Give to each user everything that he wants, but do not waste money by giving him more than he wants."

The Cambridge management system recognizes projects and users. These all have identifiers assigned to them, but projects and users do not necessarily stand in a 1:1 relationship to each other. Projects may have more than one user associated with them, and users may have more than one project. When a user logs in, he identifies himself and confirms his identity with a password; he also states the project on which he wishes to work.

Allocations of computer time are made to projects. An allocation is in two parts, one called COMP, referring to processor time, and the other called EXEC. EXEC is the total time that the user is logged in from a console, less the amount of time that he spends waiting for a response from the system. An allocation may be made once for all, or it may be renewed automatically each month. An allocation is for a particular shift at a particular priority. There are three principal shifts—day, evening, and night—together with a shift covering the weekend when the computer does not operate on a regular basis. There are four priorities—top, high, medium, and low; of these little use has so far been made of top priority. For any particular shift, a project can have allocations at any or all of the four priorities. It is possible, for example, for a project to have a substantial allocation for a particular shift as medium priority, and a smaller allocation for the same shift at high priority. In the unlikely event that it were required to give a project an allocation at each priority for each shift, it would be necessary for 16 separate allocations to be made.

the controls

Associated with each allocation is a string of *controls* which limit the way in which the allocation may be used. These controls, which are not all equally important, are as follows:

1. List of users for which the allocation is valid. This is a basic control since it provides the way in which users are associated with projects.
2. List of modes in which the allocation is available. This is also basic.
3. Amount of time (COMP and EXEC) usable in a single shift. This is of great importance since it controls the rate at which resources may be used.
4. Amount of time (COMP and EXEC) usable in a single session.
5. Maximum number of sessions in a shift. This control and the preceding one have been little used.
6. Maximum number of simultaneous users of the allocation. This is very useful; it enables, for example, a project to be shared by a large number of students

Dr. Hartley is a lecturer at the Cambridge Mathematical Laboratory and a Fellow of Darwin College, Cambridge. He graduated from Clare College in mathematics and took a PhD in the design of programming languages at the Mathematical Laboratory. He has continued at the laboratory and has been involved in the design and implementation of the Cambridge Multiple-Access System on the ICL Atlas 2.

[1] Further information about this system is to be found in the User's Reference Manual, edited by D. F. Hartley, and issued by the University Mathematical Laboratory, Cambridge, England ($2.38 post free, $3.38 by airmail).

without the students being allowed to monopolize the system.

7. List of consoles at which the allocation can be used; if this control is absent, the allocation can be used from any console. It is useful for giving special facilities to a console situated adjacent to a satellite computer with a graphical display. It could also be used for giving special facilities to a console in the manager's office, although we have found it sufficient to rely on the ordinary password system for this purpose.
8. Dates between which the allocation may be used. This is very useful for setting up allocations in advance of the date on which they become valid; for example, it is often used for setting up a high priority allocation for the purpose of a demonstration planned for a particular day.

In addition to the above controls, which apply to particular allocations, there are over-all controls that are set by the computer operators on the instruction of the manager. These have the effect of restricting still further what users can do and are generally applied during periods of testing or at other times when the service is not regarded as being fully available. For example, expensive mode working may not be allowed, use of consoles in the computer room only may be permitted, the administrative staff only may be allowed to log in, no console working at all may be allowed, and so on. The operators may also set limits restricting, for example, the amount of memory space or COMP that may be used by a single job or in a single console session.

The controls that have just been described are there to be used by the management as it sees fit. They are not to be read as specifying a particular policy under which the system is to be used; rather they are to be regarded as a set of flexible tools by which the management can impose *its* policy. They enable the various users and projects to be given a planned share of the resources available. Use of control 3, in particular, enables one to avoid the difficulty that giving a really good response to logged-in users may lead to their generating more work than the system can handle.

When a user first switches on a console, and presses the carriage return key, he is greeted by the logging-in program that proceeds to interact with him. It asks for his user and project identifiers and for his password. It then types OPTIONS? in response to which he must either state what mode he wishes to work in, the amount of core space he will require, etc., or accept a default setting. If his requests can be met, the user is logged in. If, however, they cannot be met, either because the system is heavily loaded, or because the resources requested are not authorized, the system will either deny the user access, or make the best proposal that it can; for example, it may offer the user EDIT mode. Alternatively, if the user is entitled to HIGH priority, it may suggest that he should claim it. The system will then allow the user to log in and take steps to log out some other user of lower priority, choosing one who has used the most time. The user who is unfortunate enough to be logged out is given a few minutes in which to tidy up his affairs. For the purposes of the logging-out algorithm, users are divided into divisions. A high priority user entering the system is more likely to displace a low priority user in his own division than one in another division.

Users do not like to be forcibly logged out when their ration of time for the shift is exhausted if they know that there are no other users waiting to log in. Accordingly, in such circumstances, a user is put into what is known as OVERTIME; he can then continue to draw on the allocation of time available to him, but he is vulnerable in the sense that he is likely to be displaced by an incoming user of whatever priority. A user is always informed when he is put into OVERTIME status.

file space allocation

Filing space on a disc is expensive and any devices that help in its efficient use will reduce the cost of the computing service. Moreover, continued expansion to meet increasing demand is not always possible, at any rate in the short term. A main source of inefficiency is the tendency of users to leave on the disc files that they have either forgotten about or ceased to use actively. Means must therefore be found to encourage users to delete such files or to request the system to transfer them to magnetic tape for safekeeping. It must, at the same time, be recognized that while they are working users require file space for temporary working as well as for longer term storage. Experience has shown that automatic systems for removing from the disc files that have not been accessed for some time soon become ineffective as users develop countermeasures.

We are, in Cambridge, experimenting with a system of allocating disc space that appears to have some merit. A user is given an initial *disc credit* expressed in block-days, and he is also given a *daily income*. At the start of each day, the system updates his disc credit by deducting the amount that he has used during the preceding 24 hours and adding his daily income. The amount used is, however, calculated on the basis of the amount of filing space that he had in use at the end of the day, and no account is taken of the possibly greater amount that he was using during the course of the day. Credit can build up to a maximum *credit bound* B (allocated for each user) or it can fall to −B. During the day, a user with positive credit can go up to a fixed maximum disc usage known as his *disc limit*. A user with negative credit can continue with his work but is prevented from creating new files or updating old ones; in order to release himself from this situation, he must delete some files or cause them to be removed from the disc, and then wait until his credit becomes positive again.

Daily income, disc limit, and credit bound, are commonly allocated in the ratio 1:2:3, although the proportion can be adjusted to individual requirements. Within his threefold allocation, a user has a number of strategies open to him according to whether his requirement is primarily for long-term storage or primarily for temporary working space. If his use of disc space becomes temporarily reduced, he will build up a disc credit which will permit him to step up his usage to a higher than average level later on. A user thus has a direct incentive to delete files now in order to reap the benefit later. Experience with this system, which was inaugurated in November, 1968, has so far proved favorable.

concluding remarks

A management system is not intended to provide automated management; the role of active human management is on the contrary fully recognized. It does not matter whether such important questions as priorities and the allocation of time in the prime shift are settled by haggling over price or by directives handed down from a higher level in the organization concerned. In either case, the manager has the responsibility for seeing that the users get what they have been allocated or agreed to pay for, and that they get it with a minimum of frustration. Much importance is to be attached to a function of the management system that has not been discussed in detail here, namely the provision of a continuous stream of information about how the system is working and how it is being used. For example, information is provided about the amount of filing space that users are actually using, and the level of their filing activity. Action to be taken as a result of such information is entirely at the discretion of the management. The whole object of the management system is to enable the management to react in a flexible manner to changing circumstances and to ensure that system resources are used in an orderly and efficient manner. ■

TEACHING MIS AT A BRITISH UNIVERSITY

with a chair for it

by R. I. Tricker

In Britain, university life has probably seen as many changes in the last five years as in the previous 50. But still, only the holder of a new chair, in a new subject, in a new school of business, in a new university, would have the temerity to accept the editor's invitation to write about his work.

However, the opportunity has been seized to discuss developments in systems thinking, business practice and management education, that are taking place in Britain, in the context of the work at Warwick. The result may be contentious, but, hopefully, not pretentious.

universities and business schools

The University of Warwick is one of 9 new universities opened in Britain in recent years. Located in the heart of the country, the campus is close to both rural Warwickshire, including Stratford on Avon, and the industrial centers of the Midlands in Coventry and Birmingham. The site is the largest in Britain designated entirely for university development. In 1969/70 there are likely to be 1900 students, 250 of them postgraduate; there are short term plans to reach a total of 5,000 and ultimately of 15/20,000.

From the outset there has been marked emphasis on interdisciplinary cooperation. This is clearly demonstrated both in the work within the School of Industrial and Business Studies and in its interaction with others in the university.

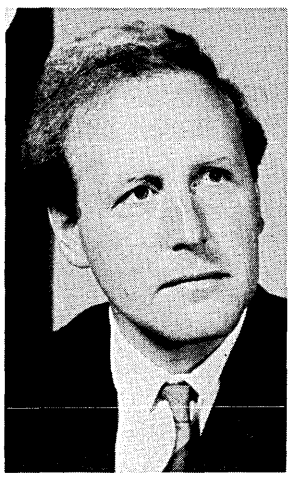
Business schools, as part of university life, are relatively new to Britain. Warwick has one of the three or four schools of note and probably the one most closely integrated in the life of a university. It manages, nevertheless, to have very real and growing links with industry and commerce, wherein lie its research needs, student opportunities and its ultimate validation.

There are four professorial appointments in the school—in industrial relations, marketing, operations research and management information systems. All have been funded from business sources, the chair in management information systems being sponsored by Barclays Bank. At the moment it is the only chair in the subject in Britain.

mis—a subject to teach

At the core of the school's work are two masters degree programs in "management science and operational research" and "management and business studies." On both of these programs students are required to take a course in management information and control systems.

There is a range of possible approaches to the teaching of management information systems. At one end of the scale lies the machine-oriented view of management information systems as the application of computers to the systems of the firm. At the other end lies the problem-oriented view,



Prof. Tricker holds the Barclays Bank Chair in Management Information Systems at the University of Warwick, Coventry, Warwickshire, England. He was until recently P. D. Leake Fellow at the Oxford Center for Management Studies and prior to that a member of the international teachers program at the Harvard Business School. The Institute of Chartered Accountants has just published his annotated bibliography on management information systems.

with systems analysis seen as a problem solving methodology, and the teaching aimed at developing a relevant attitude of mind.

We take the view that, in the practice of management information systems, computer assistance is increasingly essential; in the theory, however, computers are largely irrelevant. The teaching, therefore, lies in the middle of this range.

Students come to the course with a familiarity with computers and programming, having used the university's Elliott 4130 machine, and also knowledge in the quantitative areas and in business finance and accounting.

Broadly, the objectives of the course are to present organizations as a set of information and control systems, to study rigorously the information dimensions of decisions and the needs for control information, and to understand the alternative approaches to systems study, analysis, design and implementation of computer assisted systems.

The content of the course consists, briefly, of theoretical considerations of the nature of systems and of control, and detailed study of management control systems and computer-assisted information systems. A view of a business, or other organization such as a hospital, is taken as a hierarchically ordered decision structure, with varying information needs, as well as a laterally related set of functional data systems.

In studying management control systems, the emphasis is on the relevant practical problems—for example, setting objectives, multiple objectives, return on investment as a measure, suboptimization, transfer prices and so on. In reviewing computer-assisted systems, concentration falls on endeavors and achievements in practice, linked to work in systems study and related techniques. Consideration is also given to the information executive and organization of the system function.

The teaching methods employed include literature searches and class discussion, very participative lectures, case analysis and discussion, individual and small group projects, frequently with reports back to the class. The students also use a terminal, on-line to a machine in London, to familiarize themselves with the opportunities and problems of conversational computing.

Predominantly we are trying to create a course that is performance-oriented and related to the needs of business, while retaining the necessary rigorous, theoretical underpinnings. Such an approach can produce the system skeptic as well as the enthusiast: a situation we consider healthy, as the one tempers the other.

Students in the postgraduate programs also have the option of a further course in systems study in which the subject is taken to a greater depth. Typically this elective will be taken by those who expect to have responsibilities in the management information area, rather than a lesser managerial involvement with the subject.

Next year we start a three-year undergraduate honors degree in management science. The underlying philosophy is the development of graduates who can think analytically about management problems. Unlike some undergraduate programs within business schools, there will not be a vast exchange of information about business, which quickly becomes obsolete. Basically the degree will involve fundamental work in the quantitative areas, economics, and the behavioral sciences. However, in their final year, students will take a course on "the business as a system," in which the systems view will be developed, and can also elect to study systems analysis, financial analysis, market analysis or organizational analysis.

research on mis

So far, management information systems have tended to be the subject of speculative enthusiasm rather than research. Efforts have been guided more by faith than fact. But the discipline imposed by computer-based systems to define system objectives, boundaries and structure, has led to the greater awareness that there is a way of exploring and understanding more about the organization itself.

From the study of systems *in* the firm has come the study of the firm *as* a system. This development has exposed many inadequacies in understanding the decision structure, information needs and the use of data in an organization, and limitations in the knowledge of the interrelationships between systems within the firm.

Concurrently with the growing interest in systems in business, work in a number of other areas has adopted a systems viewpoint. The need to study interrelationships between parts, as well as the parts themselves, has been recognized and contributions have come from various disciplines and applications.

There now seems a confluence of ideas in the systems area, but the space remains ill defined and only partially illuminated.

We recognized a need for research in the area of system study in business and other organizations, which would include work at a number of levels, including methods and techniques in systems analysis, design and implementation, exploration of management information needs, depth studies of system behaviour, modeling system areas, and more abstract work in defining problems and developing relevant conceptual tools.

We also saw a need for literature monitoring, coordination of activities and the provision of a forum for the exchange of ideas and for publication of relevant material.

With the generous support of the Ford Foundation, a Center for Industrial and Business Research has been established, in which staff research projects, originating in any school or discipline, are sponsored and coordinated. Various areas are emerging in particular focus; one of these is in business system study.

The objectives of the business systems study group is to undertake, promote and coordinate research endeavours pertinent to the study of systems in business and other organizations, and to provide a means for the monitoring, exchange and publication of relevant information.

Some guide to the scope of the group can be found from the initial portfolio of projects:

1. A study of management decision making and information search. The use of business games, played through a computer terminal, as a research vehicle, including the design of an "open-ended" gaming situation with the opportunity to search a data bank.
2. Depth case research into system applications and behavior, including the development of information and control systems in a new business, the application of systems, and studies of computer based systems.
3. Literature search and abstracting. A pilot study has been published by the Institute of Chartered Accountants in England and Wales.* Coding of management information.
4. Systems methodology—a fundamental project on the concepts, methods and techniques of system study.

From the genesis of interest in management information systems founded in computer applications has come the realization that here is an alternative way of studying an organization itself, and thereby creating the computer assistance that is most relevant to the needs of that organization.

As happens so frequently in management information systems work, we have been discussing endeavors rather than achievements, in describing the work at Warwick. However, it is our hope that our work can make a contribution to the endeavors that are proceeding in many other centers—academic, commercial and professional. ■

* Management Information Systems: an annotated bibliography. (Published by the Institute of Chartered Accountants in England and Wales, 56/66 Goswell Road, London, England): 128 pages: price 10/-.

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A Churl's Garden of Verse

An ALGOL buff of St. Joe
While calling the square dance below
Said, "For i :=1
Step 1 until done
While doing the ole Dosey-doe."

A communicator of northern Fargo
While perusing the tomes of Baudot
Said, "All the bauds that I meet
Smoke on the street
And none of them ever says 'no'."

A cloistered kludge-maker of Grotte
Said, on viewing his newly-begot,
"Though the need is not clear,
The wherewithal's here
To solve problems nobody's got."

A corporate youth while quite tipsy
Was counselled by a palm-reading gypsy,
"If you took half the pains
Of those in White Plains,
You'd live in Armonk, not Poughkeepsie."

An acronym coiner of Lyme
Had a penchant for letters sublime,
Yet the ones he'd essay
Caused widespread dismay
Or spelled some abominable crime.

A harried young coder of Erse
Could never decide which was worse:
To blame the machine,
To stamp and to scream,
Or to endlessly loop and recurse.

An octally-minded young lass
Attracted each gentleman's pass
With 12 fingers and toes,
Odd furbelows,
And measurements none could surpass.

A dubious boat-builder McKnight
Was the author of maritime blight;
Though his FORTRAN's perverse,
His vessels are worse,
Thus his barque is much worse than his byte.

An expiring programmer of Devon
Exhorted his circle of seven,
"Forego all your fear
And be of good cheer,
I'll be assembled again up in heaven."

—WILLIAM J. WILSON


$(a+b)^2$
$=a^2+2ab$
$1 \times X$
O_2+2H_2O+4e
$=4OH$
1234
9012
7890
3456
1234
9012
hello
hello

machines that make data move

TELETYPE

phi data kappa set

Meet the data terminal of many letters. The versatile, heavy-duty Model 37. At the head of its class in complex data transmission and reception. Another exciting answer from Teletype R&D for moving data efficiently, at very low cost.

* * * *

Forms. Tabular material. Text. Equations. Charts. Formulae. Graphs. Teletype's Model 37 is equipped to handle your most complex business communications. Sends and receives 150 words per minute in print or on punched paper tape. And the line features ASR (automatic send-receive), KSR (keyboard send-receive), and RO (receive only) sets. With important options that give you completely integrated data moving capability.

A great computer tutor

Computer dialog has never been easier. The Model 37 generates all 128 ASCII (U.S.A. Standard Code for Information Interchange) code combinations. And its unique operating features simplify the ins and outs of problem solving.

Prints standard numerals, symbols, and upper and lower case characters.

Shift-out feature produces special symbols and characters you need in your particular data operation.

Control character generation puts all 32 ASCII control functions on-line.

Escape sequence offers a number of terminal functions. Two-color printing, for example.

And you get all of this flexibility from a sleek keyboard arrangement that is similar to the familiar keyboard you find on a typewriter.

Big faculty for tabbing

The Model 37 has a tab stop for every horizontal and vertical place on the page. An operator, computer, or any remote terminal that uses ASCII can set terminal tabs on-line. Enables you to produce multiple copy business forms with new speed and efficiency. Fill them in, in any number of remote locations. Or handle large volumes of tabular material on-line.

When it comes to printing equations or complex formulae, the Model 37 has no peer. Forward and reverse half and full line space help create the data configuration called for with no problem.

Graduate . . .

move up to the Model 37. One of many exciting moves being made by Teletype R&D *in moving data at very little cost.* That's all we're really concerned with. Providing equipment that keeps data moving quickly, reliably, economically . . . machines that can help you move data a mile, thousands of miles or just down the hall. If you would like more information on the Model 37, write Teletype Corporation, Dept. 81J, 5555 Touhy Avenue, Skokie, Illinois 60076.

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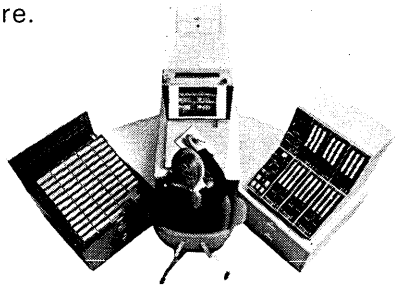


RECORDAK® Microfilm Systems by Kodak

TWO APPROACHES TO THE SEVENTIES

by R. A. McLaughlin

As evidenced by their product announcements, most mainframe manufacturers seem to agree that the computer systems of the 1970's will be biased toward on-line information systems with highly developed man/machine interfaces, good I/O and communications capabilities, fast response times, high speed main storage and large capacity secondary storage. This is not to say that their product lines do, or will, necessarily look alike.

These two computer systems are a case in point. One is from a west coast manufacturer; one from an east coast firm. One from a vendor with a background in scientific instrumentation systems; one from a house most well known for emulators. The systems, the Standard Computer Corp. IC 7000 and the Systems Engineering Laboratories 86, show tremendous differences in execution if not intent.

standard ic 7000

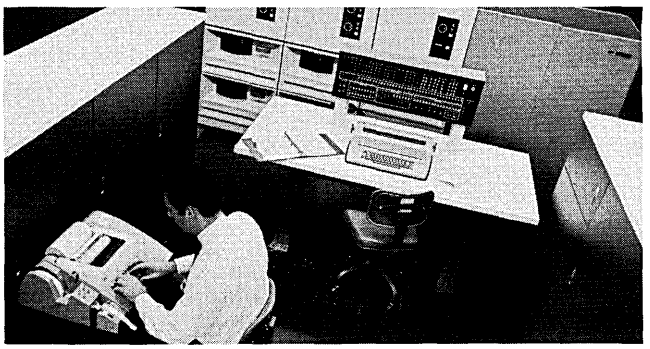
Standard Computer Corp. originated as a manufacturer of emulators for second generation hardware and, in fact, its newest system is an outgrowth of a project which was initiated to develop an emulator for the GE 265. Emulation, as implemented by Standard Computer, consists of fashioning a "target" computer built to resemble, say, the 265 and having the language and hardware for translating the original cpu's programs into instructions understood by the equipment at hand, conceptually labeled the "inner" computer.

The language that all Standard's machines understand is called MINIFLOW, and consists of ministeps, a few hardwired and most kept in fast control storage. MINIFLOW is assembled by a program called ICAP, Inner Computer Assembly Program.

Even the systems architects at Standard weren't too awfully quick to realize that by implementing microcode and "super instructions" in MINIFLOW that they could define, for the same machine, a supervisory language and a processing-oriented language that were different but executable on the same machine—rather than developing a compromise language to do both functions. Further, instead of developing just target computer languages, they could develop genuinely problem-adapted languages and execute first-, second-, or third-generation programs on the same machine, to boot. Given this realization, they came up with yet another language, a compiler compiler called IMPLAN, Implementation Language, to write those problem-adapted languages. Super instructions like SAVE STATUS, SCAN, FIXED-TO-FLOAT and other complicated time-sharing functions normally performed in computers by machine language subroutines have been microprogrammed into the instruction set of the IC 7000.

Of course, the hardware development program was moving along simultaneously. In fact, changes were made in the hardware which the software development made seem appropriate and, conversely, the hardware dictated the software design. For example, given that the same hardware could understand an I/O machine language and a gp processing machine language, why not split the cpu into two sections to do these specialized tasks?

The project yielded a multiprocessor machine with a Supervisory Processor (composed of 2K of 18-bit one-usec control store, one to four channels, and a 500 nsec/ministep "inner" computer) and an Arithmetic and Language Processor (with another 2K x 18 bit 500 nsec control store, a 270 nsec cycle time parallel arithmetic unit, crossbar interfaces to main memory and the control console). Both processors pull double instructions from their control stores on each cycle. The ALP handles compiling and program execution and can perform a *mixed mode* add in 27 usec; the



SPU handles scheduling, resource allocation, swapping and I/O functions. They share from 32K-256K of 36-bit plus parity two-usec main memory. The SPU has 16 registers; the ALP has multiple accumulators, seven index registers, and working locations in control memory.

The 7000 uses sign-magnitude fixed point arithmetic and a binary sign-characteristic-fraction floating point system that allows for 27-bit accuracy in single precision and 54-bit in double.

Since four channels do not seem like much for a communications-oriented machine, one channel with a communications multiplexor can be expanded by the addition of up to four communications concentrators (presently in the form of Digital Equip. Corp. PDP 8's with attachments for 24 terminals each). One is a unit record channel, another an "IBM" channel for hooking up IBM controllers. The fourth channel is open and, since they are all programmable, can be used to duplicate any of the others.

The result is a time-sharing system billed as being able to handle up to 80 simultaneous users, providing them with BASIC, FORTRAN IV, and all of the GE 265 library. (COBOL will come later.) Features include dynamic time-slicing for adapting to changing job mixes, dynamic core compaction, swapping, a sophisticated security and memory protect system, and an associative file system that takes much of the work out of file generation, data retrieval, and report writing. Also, since the PDP 8's are programmable, terminal flexibility is almost unlimited.

The software represents the ultimate in unbundling. Standard didn't even write it—Call-A-Computer did. There-

fore it is, by definition, user-oriented. A not-so-subtle effect of this cooperation is that a user, perhaps for the first time on a large system, has dictated, not just accepted, the programming, and hence very very strongly influenced the hardware design.

The cooperation has a big impact on other customers, too. Those who cannot afford an IC 7000 system for themselves can rent time on one—with no later software conversion problems—from CAC under a variety of contracts. Those who can afford their own system will find that a 32K version, with two IBM 2311 compatible disc units, an 800 cpm card reader, a 1250 lpm printer, and one 60KC tape drive, will cost them about $599,200 or $15,000 per month. For a 65K version with a five-drive IBM 2314 disc unit in place of the 2311-compatible gear and two tapes, the figures would be $947,400 and $22,450 per month. An expanded version, with two central processing units but only one SPU (the thing isn't really working very hard in a single-processor configuration) will be offered for big big t-s users.

CIRCLE 582 ON READER CARD

sel 86

One of Standard Computer's vp's had stated that the days of dedicated hardware systems are numbered, that a user might want to use a fourth generation system for controlling a wind tunnel experiment one moment and for processing FORTRAN jobs the next. Given basically the same starting premise, Systems Engineering Labs, known most for scientific instrumentation data acquisition systems, came up with an entirely different solution. SEL engineers set out to combine the best of two worlds, the merger of the general purpose processing power which already existed in third-generation medium-scale machines with the real-time capabilities found in data acquisition, communications, and control systems.

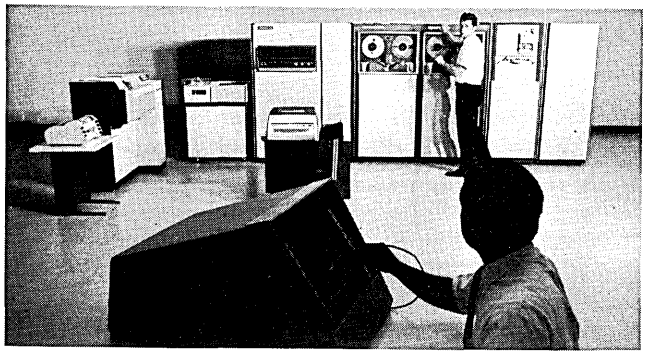
Contrary to Standard's direction (multi-parallel processing cpu's with few channels), the SEL 86 is predicated on a single-cpu base with 16 independent I/O channels. SEL worked to give the 86 a fast cycle time and to make every clock cycle count as much as possible. To do this they gave the cpu a 600 nsec clock rate and matched that with the memory cycle time so that most instructions can be executed in a single clock cycle. The resulting cpu handles the bread-and-butter memory reference instructions (LOAD, ADD, STORE, SUBTRACT, COMPARE) in 1.2 usec. Gauging an 86 with a scientific Gibson Mix, the system is rated at 1.5, a figure that SEL claims is about twice what its closest cousins can do. (The corresponding numbers are 2.86 for a 360/44 and 3.125 for a Sigma 5. In this game, the lower numbers mean higher performance.) If that isn't power enough, double and triple processor versions—the 86 is called the 88 in multi-cpu configurations—are available, too. The three-cpu version can be clocked at 2½ million instructions per second.

More than processor speed was built in, however. Additional flexibility, and indirectly speed, is gained from an unusual word structure and addressing scheme. A 36-bit memory word was chosen (four bytes plus one parity bit per byte). This yields 32 data bits, enough to directly access the entire core (up to 128K). The addressing/indexing scheme SEL worked out uses 20 bits of the 36-bit word, but allows for addressing core locations by byte, word, halfword and doubleword.

This flexibility was built in in response to the company's conception of the multifunction computers of the seventies. Bits are used for the two-level control and status signals present en masse in real-time systems. Bytes are the standard information unit in the world of communications and also in many peripheral devices. Halfwords are ideally suited for real-time measurements, which seldom require greater than 16-bit accuracy. The 32-bit word format provides adequate precision for a wide range of computations, and the doubleword fills in beyond those.

Another feature dedicated to speed is "fast task switching," an obvious requirement of multiprogramming or multitasking machines. Task switching requires from 1.8-5.4 usec on the 86, a speed made possible by making machine instructions longer than 6.6 usec interruptible and by creating a program status word capable of containing all necessary machine state information for restoring the machine to its pre-interrupt status.

The 86's 16 primary channels operate independently on block transfers and have a combined data rate of 1,666,666 words per sec.—a number that may be split up among all the channels or temporarily monopolized by a single channel. In addition to these, two types of subchannel multiplexors are offered. The communications multiplexor can add up to 16 subchannels per primary channel, each capable of most common terminal data rates—110, 2400, or 4800 baud, for instance. Faithful to their scientific background, however, the engineers put in a data acquisition and control subsystem which adds four high speed lines for attaching instruments and analog gear.



The entire I/O system can operate in a cycle-stealing mode sharing a memory port with the cpu or on a second port, depending upon the volume of I/O transfers expected. The "word packing" philosophy came into play in the I/O architecture too. Enough data is packed into one word to condition a device and initiate a block transfer in one command. The transfer is then completed without processor involvement.

As with the IC 7000, the SEL monitor was designed alongside the processor so that the development of one influenced the other. In addition, even the FORTRAN compiler was influenced by the machine's real-time bias. FORTRAN has handles for interrupt control in on-line real-time applications. It also has bit and byte handling capabilities.

Other software available includes a 16-terminal BASIC, an assembler, a macro assembler, and diagnostic, utility, and math routines. Batch, remote batch, time-sharing and process control can be handled concurrently.

Prices for the 86 range from about $150,000 to over $1 million. In a typical configuration—including 32K words, floating point hardware (an option!), a 24 megabyte moveable-head disc, two 60KC tape units, a card reader and line printer—the price would be $350,000. Fixed-head discs (from 0.5 to 2.0 Mbyte) and smaller moveable head units and a variety of other peripherals are also offered. ■

CIRCLE 580 ON READER CARD

AVTOMATIZATSIYA 69

The triennial automation exhibition of the Soviet Union, held in Moscow May 14-28, again lived up to its reputation as a major international trade show. Thousands queued up at the dozen or so pavilions in Sokolniki Park to see the computer-related equipment and other kinds of automation devices that were part of Avtomatizatsiya 69: "Modern Equipment for Automation of Production Processes."

East and West were represented, the major pavilions being occupied by such world powers as the Soviet Union, Great Britain, France, Germany, and, mostly through foreign affiliates, the United States. Among others exhibiting were Bulgaria, Hungary, Rumania, Poland, Czechoslovakia, Yugoslavia, Austria, Belgium, Denmark, Italy, Liechtenstein, the Netherlands, Finland, Switzerland, Sweden, Japan.

With much computer and peripheral equipment of the USSR and most East European nations on display, it was a rare opportunity for American computer professionals to obtain an overview of the state of the technology in the Communist countries. And for East-West trade observers, the wares of the nations of the West implied the extent of trade restrictions since only equipment marketable to the East could be shown.

The conclusion on Soviet bloc equipment, according to a few attendees, is generally well known: the technology and production of standard data processing systems are "way behind" that of the West, and there is "little likelihood" that it will catch up. But there were some concrete signs in the exhibits and a great deal of corridor discussion of the Soviet move into the third generation. (The Soviet's special purpose and supercomputer developments for space and defense systems have always been kept secret, so are not included in any comments.)

What follows are totally the observations of attendees (who do not wish to be named), on East European technology—where it is today, where it appears to be going, and what items "were obviously absent." Specific exhibits are noted later.

First, although most exhibits did not demonstrate it, the Soviet Union has a cooperative effort under way to develop a family of computers said to be compatible with System/360. (No schedule has been publicly announced.) Although it has been called by several names, it is now commonly referred to as Series RJAD, Joint Data Processing Program, and will involve 80,000 people and six countries in the Eastern bloc. The USSR will have the major responsibility as the central processing units will be designed and manufactured in Minsk and Yerevan. East Germany and Czechoslovakia will undertake the peripheral equipment, although Lithuania has devel-

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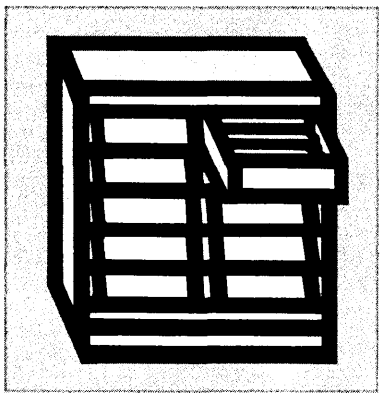
Honeywell
AUTOMATION

CIRCLE 23 ON READER CARD

TAME WILD CARDS



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CIRCLE 53 ON READER CARD

oped a disc unit, shown at the conference. The Bulgarians and Rumanians are said to be doing the component development, meaning integrated circuitry. And Hungary has initial responsibility for software.

The only significant demonstrations of this effort at the show were a removable disc pack drive and a strong accent on communications. The disc drive, made in Lithuania, is analogous to the IBM 1311. It was obvious they tried to make a carbon copy but as is typical in Soviet packaging, the machine when finished looked rather sloppy. It was not in operation.

At almost every pavilion, and particularly the Soviet and East German displays, there were communications devices and acoustic couplers. Most were arranged for transmitting from paper tape to paper tape using acoustic couplers and voice grade phone lines. A number of new telephones, including touchtone pads, were also exhibited, but the quality of all Soviet phone casings continues to be poor, the plastic cracking on the first fall. But, incidentally, the telephone acoustics in Moscow were said to be the best anywhere.)

All machines viewed at the exhibits, such as the Russian Minsk 32, BESM 4, and MIR-1 and the East German Robotron 300, contained discrete components. The back panels of most computers used solder pins (in fact, a workman with a soldering iron was stationed behind most systems). Nowhere was there evidence of wire-wrap technology; it's clear there is no such machine as a Gardner-Denver wire-wrap device. Some machines used a curious wiring philosophy; the printed circuitboards have been made to look exactly alike and, depending on a board's logic, interconnections are made via soldered jumpers on one side of the board. The result: "rat's nest" wiring.

Computer terminals, particularly keyboard units, looked rather "ancient." The Soviets have a wooden cabinet version of a Model 33 Teletype that seems to have been built a decade ago. Many people complained about its unreliability (although that's not unique to the Soviets). The East Germans had more modern versions.

The Russian tape units came in a wide variety, but most still use rocker arms and pinch rollers. No single-capstan vacuum tape drives were in view. The units also use many motors —one having a total of nine. And a U.S. concept discarded five years ago—the tape bin—is popular there. A packing density of 350 bpi was the highest found in the pavilions. Many machines used 1½ or 2-inch tape, because recording is being done in parallel with two heads, two equivalent sets of data. At readout time, heads on tracks 1 and 11, 2 and 12, etc. were ended together and checked for equivalent readout. Most Russians were ready to admit that it was difficult if not impossible to make tapes interchangeable between various tape transports.

In memories, core is used as main operating store. There was no evidence of thin-film or plated-wire memories. No machine there seemed to have a cycle time of less than five usec, although faster units are said to be in good design stage now. Except for the Lithuanian disc, backing store was almost exclusively magnetic drums—in evidence everywhere.

Printers shown were in the 400-600 lpm range and look roughly the same as American units mechanically, although they seem to have more manual adjustments. The printing was quite sloppy.

In addition to the disc and communications, other new technological developments were in plotters and calculators. The plotters, most of which had surface areas of more than 15 square feet, were apparently quite new, judging from the large crowds examining them. The Japanese, not surprisingly, had a wide variety of fully microcircuit calculators, either battery-powered or plug-in. But what was surprising was that the Soviets had three or four different calculators that looked like "Chinese copies" of the Japanese devices. Other East European countries had small calculators with the standard Nixie display readout. The Rumanians also exhibited some rather new designs in purely electromechanical and mechanical calculators.

In addition to the absence of integrated circuitry at the show, there was no evidence of time-sharing technology. Of course, there is the awareness of communications needs, but much of this seems to be in the process control area where data might be moved from one portion of the factory to a central computer.

A number of crt/keyboard units were shown, but no graphic terminals using a light pen or other wands. Optical character recognition units were missing, despite the fact that a significant number of technical papers have been published in the USSR on techniques for reading characters automatically, including handprinted characters.

Finally, there was no evidence of software or software business per se in East European pavilions. Soviet attendees noted that even at the more glamorous installations in the USSR, such as the High Energy Physics Institute, the machines which are available have quite unsophisticated software.

The USSR staged the biggest show, occupying two full pavilions and part of a third. Six full-scale computer systems were shown, including the Minsk 32, BESM 4, and MIR-1. With an emphasis on process control throughout its exhibit, there were many special process computers, electrical measuring instruments and associated electronic testing hardware. The crowning touch to the display was the full-scale models of a few Soviet satellites, including Proton 4, one of the largest vehicles launched to date by the Soviet Union.

The East Germans had an impressive exhibit of their new Robotron 300 (see accompanying printout), a com-

munications-oriented processor. With it were an acoustically coupled paper tape unit and a small peripheral processor, similar to the GE 55, which was said to communicate remotely with the 300. The system's tape units looked rather old and had rocker arms and pinch roller. Also shown were rather modern looking typewriter-like teletype terminals, supplying input data to the 300.

Czechoslovakia's primary exhibitor was Tesla, which showed a very interesting audio-visual educational terminal, Unitutor. It includes a digitally encoded photographic film unit containing educational material and a keyboard for accessing data. Voice data recorded on magnetic tape supplements visual information. (Interesting to note was the Unitutor brochure done completely in English.)

Also exhibited: the ZPA 600, a very small hybrid instrumentation computer with crt output display, digital plotter, and mag tape. The plotter was the largest at the show with an eight-foot bed.

The Rumanians showed a small computer called the Felix CE 30, which is about the size of a Friden desktop computer and includes a keyboard and crt output device. The Hungarians showed a similar device called the Hondr 158, a desk calculator including visual display, similar to the Olivetti Programma 101.

At the Polish exhibit: two numerically controlled hardware units utilizing paper tape for controlling lathes and vertical mills. The Yugoslavian exhibit featured a new series of low cost electromechanical calculators.

The attendance in the U.S. pavilion area was sparse, mostly because so little of interest was shown. None of the larger, advanced systems could be shown because of trade restrictions, but most of the smaller, slower units that U.S. firms have been marketing in the East were not shown either. IBM was not there. Honeywell was there but showed no computers. NCR did have the key-tape units it markets for Mohawk Data Systems, plus a series of cash registers. These were obviously not for use in the Soviet Union since most stores use an abacus. Daystrom Corp. showed the EMR 6020 process computer.

GE exhibited through its French affiliate, Bull GE, which had a GE 425, GE 55, and a GEDAC system, and through GE Information Systems Italia, which had a GE 130 with remote peripherals. An Olivetti TE-318 keyboard terminal was linked to the 130 from a booth 100 yards away. From French firms, like Benson, Comef, Semira, CSF, Schlumberger, and Sintra, there were crt/keyboard units, plotters up to 5 x 5 feet and a variety of instrumentation hardware. England's ICL linked a 1901-A to another system in the U.K.

From West Germany, Siemens demonstrated their 4004 system including 8 tapes and 6 disc units (from Control Data); also, a new disc of Siemens' design said to be like the IBM 2311 and a new single capstan tape transport recording 1600 bpi.

DATAMATION note: There were other exhibitors from around the world, but attendees did not mention any significantly large system demonstrated by firms outside the Eastern bloc. The guidelines for East-West trade are constantly being reviewed but exact restrictions are not generally made known to the public. While the more advanced systems by and large are prohibited in trade, each situation is taken on a case-by-case basis by the various governments and multinational organizations. One thing was clear after talking to the attendees however. The Moscow fair most significantly differed from its smaller U.S. counterparts in lack of time-sharing exhibits from East or West. But there *were* washing machines. ■

TRENDS & TANGENTS OF EAST-WEST TRADE

Computing in the Soviet Union has made great strides over the past 10 years, particularly in application to numerical methods for airframe design, rocketry, mathematical modeling and machine tool control. Business data processing has been slower to develop but it promises to be an area of opportunity for export of machines from the West. So far Europeans have been successful in making quantity sales to the Eastern Bloc. U.K. makers' good trading relations yielded the lion's share of $30 million going to European firms last year.

This is hardly surprizing since the U.K. had more firms trading in the Soviet countries than any other European country until last year. The bulk of the business goes to ICL, the U.K. monolith formed by merging English Electric Computers, Elliott Automation Computers and ICT last year. Until then the three firms had been trading separately. On the surface, the United States industry appears to have been having a thin time. However, fables travel further than facts. And the facts of the matter may show that the U.S. firms have been weighing up the opposition and biding their time before making an outright assault on the Eastern Bloc.

embargo rules

One indicator is evidence put to the State Department by a manufacturer earlier this year. He was referring to the strategic embargo list maintained by NATO countries but which is enforced more rigidly by American companies than some of the Western European ones. Known as the COCOM list, the set of rules lays out in great detail those products which NATO members should not export. The industry executive maintained that . . . "U.S. businessmen feel that other countries interpret the COCOM regulations relating to computer exports to Eastern Europe more generously than does the U.S." and "U.S. businessmen are also at a disadvantage in selling computers to Eastern Europe because their Western European competitors are able to obtain government support and assistance in working out balance-of-trade or shortage of hard currency problems."

This may not be an accurate description of West European-Soviet trading relations. The U.K. government has a 10% stake in ICL and a strict interpretation of the licensing of exports to the East is followed. And when a computer system includes any element of U.S. technology (as many do) the entire system has to be approved for export license purposes by the U.S. authorities.

This leads to some strange results. ICL, in their earlier guise of ICT, had received from the East requests for exchangeable disc stores, and had therefore put their requests for licenses through to the U.S. agency. There was some delay.

As it turned out, IBM had delivered equipment into the Eastern Bloc incorporating exchangeable discs a full year before ICL received the go-ahead. Such situations make the myth of the handicapped U.S. competitor look a little ragged to European eyes. But there are reasons for believing that IBM has adopted a special long term policy to developing the Eastern European market. Some of the evidence is historical.

In the '40s a U.S. agent dealing with a partisan movement in Yugoslavia became a personal friend of Tito. In 1946 he returned to his civilian employment —as it happened, with IBM. He picked up the threads of his previous acquaintance with the Yugoslav leaders. So perhaps not surprisingly, Yugoslavia has become IBM's springboard to the East with 180 staff in Yugoslavia. And there has been a 7090 in Belgrade for some time. The only barrier to trade

"I heard we were slowly becoming capitalistic but . . ."

with Yugoslavia is currency exchange. At the last Lepzig Fair IBM exhibited an 1130 system and was criticised for not putting a better busines data processor in front of the East German buyer. IBM pleaded export control policy reasons for the decision, but they must have been aware that machines as powerful as the CDC 3300 had been licensed for delivery to Czechoslovakia.

still no giants

The largest U.K. machine delivered so far is the ICL 1905F—rated somewhat below the 360/50. Although orders have been obtained for machines of the 1907 class, no license has yet been issued, nor do the prospects look good for requests to ship the upgraded microcircuit 1906A.

The theory about cheap money and long-term credits is strange. U.K. companies' sales have been made against a background of rising interest rates in Britain. Over the past two years the normal channels of the U.K. export credit guarantee service have been used to reduce the abnormally high cost of funding sales to the 5½% level which has only recently become the upper norm in Western Germany. Some of the U.S. firms are operating out of West German centers and thus appear to have started with an advantage. One competitor that might really make inroads into the U.K.'s share of the East European market is the West German house of Siemens. It is true, of course, that some U.S. firms have wanted dollars instead of Deutschemarks, but this can hardly be a consideration in the current currency climate.

On general Eastern trading policies the Italian government has certainly created special financial arrangements for its industries, e.g., a deal to build a Fiat factory in the East; but this has not affected the computer market. The French government certainly encouraged Bull to sell to the Czechs its computer design destined to be the TESLA 200. This was an advanced design based on somewhat obsolete technology. At the end of last year, the Czechs had none of the 16 machines planned for installation by then. Currently, the state of the offerings from CII (the French computer firm born out of Plan Calcul) does not encourage major commitments from Eastern Europe. And there is the problem of U.S. technological content. Bull-G.E., however, continues to make steady sales to the East.

the czech approach

The common-sense view of the East-West trading development is that the East is looking for stable long-term relationships. An example of this is the adoption by a Czech official agency of the Ferranti Argus process control computers for marketing to Czech industry.

This arrangement is unique in Eastern Europe. The Czechs have proved themselves avid trainees with high qualifications. The commercial implications of the deal have yet to be realized. All the East European countries are constantly offering Western suppliers vast quantities of PhD-level manpower in lieu of real money. However, Robotron 300 from East Germany is having its software contracted out to Leasco S & R in the U.K. in exchange for some genuine dollars. The product planning aspects of software appear quite unfamiliar to the East and the marketing factors involved in software specification are largely irrelevant to the Eastern economy.

The USSR itself has been placing about 90% of its business in computer hardware with ICL over the last couple of years. But they are now importing management skills from British consultants. Urwick Diebold Ltd.—a U.K. consulting firm with only a tenuous personal link with John Diebold—has carried out a number of assignments in the USSR. David Butler, a senior consultant at Urwick Diebold,

confirms the Soviet need for dealing with a stable supply of knowhow. He instances the ready acceptance by the Soviets of any policy which can be said to have a mathematical foundation. An LP solution is as good as gold to the Russians. On the other hand, he tells of problems encountered: "It is easy to talk about the difficulties of doing business over a barrier of cultural, social and political differences; the reality of such a barrier is hard to explain until one has actually met it. An example may help to illustrate the point. On a recent visit to Moscow, I was trying to explain to a senior Soviet official the vital necessity of gaining *genuine* acceptance for his computer project: top management, line managers and departmental heads must be induced to support the project, and all the changes in attitude it involved, actively and willingly rather than just being dragged along by the consultants and the systems team. He listened patiently and calmly and then explained that this was a specifically Western problem and did not apply in Russia. In Britain, since the managers owned the business, they could afford to obstruct, or only half-heartedly support, progress. In the USSR, in contrast, managers were simply paid employees of the corporation and would support the computer wholeheartedly, if they were instructed to do so.

"Such a view is bound to bring a wry smile to the face of anyone who has been involved in a computer project. But where does the truth lie? Probably Russian managers do respond more actively to central direction than their British counterparts. Our whole philosophy in Britain—socially and politically as well as commercially—favors devolution and decentralization. Until we have had much more experience of working in the very different climate of the USSR we cannot say for certain how far we must modify our own attitude and practices."

The fact that European attitudes in the West have undergone many modifications as they have learned to deal with the East seems to account for most of their success in a trade that even now amounts to less than $30 million a year. In general, the U.S. handicap appears to be its government's sensitivity to an emotional public opinion and IBM's specific handicap may well be that old friend of Tito's. —HEDLEY VOYSEY

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1069-2

off-line and real-time together

MICROFILM RETRIEVAL IN AN AIRLINE RESERVATION SYSTEM

by Robert B. Parsons

Major airlines are constantly working at the outer limits of computer technology. Eastern Airlines, with the largest concentration of computer horsepower in the airline world—six IBM 360/65 computers and three Univac 494 computers—is utilizing three of the 65's for a new reservations system called Passenger Name Record System (PNR). Installed in the Miami Computer Center, these real-time computers are connected to crt displays. (See Sept. '68, p. 98.) By August, 1969, when all ten regional reservations offices have been converted to the PNR system, there will be more than 2300 crt's on-line.

The new computerized reservations system was introduced in July, 1968, to relieve the telephone sales agents of routine clerical work and to enable them to provide faster and more personalized service. Most people do not realize that in the past more than half of airline reservation work was reference checking and paper work—clerical work that had nothing to do with talking to customers. Today, computer technology has virtually eliminated shelves of reference books and files of handwritten records.

But even though computers are capable of processing enormous volumes of data, we must allocate these resources wisely and constantly be alert for methods to reduce the load on the computer and the attendant communications system. Our reservations offices receive about 110,000 telephone calls a day. This means the computer system must process 3,000 inputs in a peak minute. Since it has to execute several thousand instructions every time an input comes in, we certainly want to use this computer capacity for productive work.

complementary systems

Eastern recently has found a way to accomplish this by combining computer and microfilm technology in a way which makes the computer and the microfilm complementary.

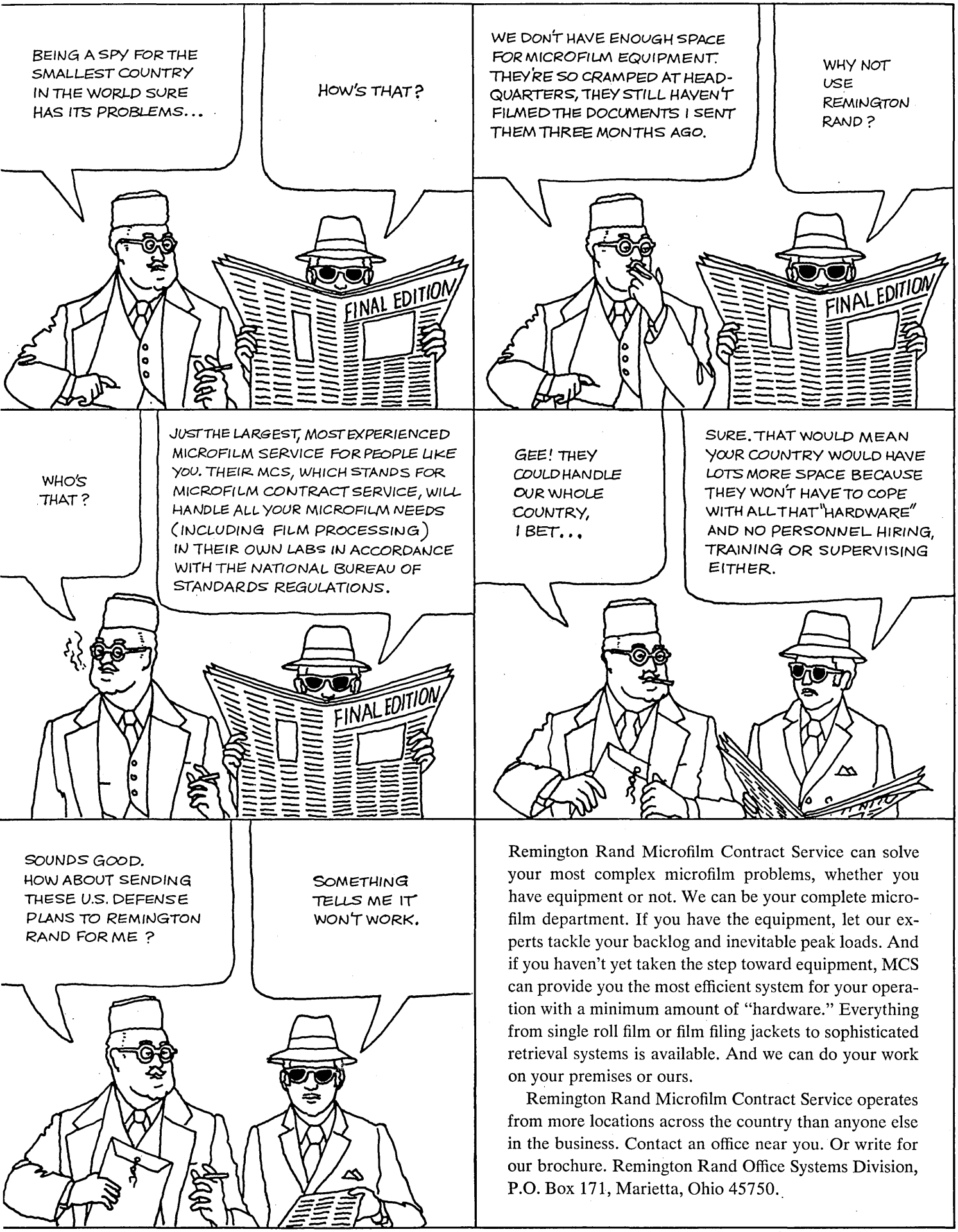
We are installing an off-line random-access advanced microfilm retrieval and display system which handles the relatively static information that we want to keep out of the real-time computer system but which must be manipulated in a manner that matches the computer's capability. Equally important is the load that this takes off the communications lines connecting the reservations offices to the computer.

The electro-mechanical microfilm device we employ is the Compact Automatic Retrieval Display (CARD™) system, developed by HF Image Systems, Inc., Culver City, Calif. Units have been in operation for more than six months at seven reservations offices, and Eastern has found them to be perfect mates for the crt's. There is a crt and a CARD system, each with its own keyboard, at each reservations station.

When the installation is completed, we will have 1,687 CARD units teamed with as many crt's at a cost of $3.3 million, a sum we feel is well worth the end result—getting the most out of our new $31.3 million computer system.

The crt is the device through which the passenger's

Mr. Parsons, vice president-computer sciences for Eastern Airlines, supervises all data processing activities of the company. Before joining Eastern, he was director of Delta Air Lines' electronic reservations system. He has a master's degree from Georgia Institute of Technology.



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CIRCLE 185 ON READER CARD

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OFFICE SYSTEMS DIVISION

name and itinerary record is created and retrieved, while the CARD unit displays information on fares, schedules for Eastern as well as for connecting airlines (updated twice a month), car rentals, taxi fares, tours, hotel facilities, custom regulations, documentation requirements, baggage regulations, instructions for accessing information in the computer, city maps (which would be difficult to place in a computer), etc. Previously, all of these data were contained in at least 22 reference manuals. This is information which should not be placed in a computer if we are to take advantage of its capability in the most practical manner.

Retrieving whole pages of information at a time, the reservations agent can give a customer a detailed rundown on the schedule applicable on a given day—time of departure and arrival, frequency of service, flight number, type of equipment, what classes of service are available, meals and number of stops involved.

relieving the computer

The CARD system saves computation time in the sense that it stores and retrieves information off-line, meaning we do not have to compute addresses in a computer and retrieve them in a real-time environment, which is a tortured process for a computer system.

In addition to storing and retrieving a great deal of relatively static information that is best kept out of the computer, the microfilm system also is used to access information necessary for a reservations agent to conduct many transactions in the computer.

CARD also has made the job of programming far simpler. Between it and the crt we have, in effect, eliminated the pencil from our reservations activity. The microfilm system completes the job that the crt began as far as eliminating the pencil is concerned. Formerly, the reservations office was a handwritten operation, even requiring the use of colored pencils for coding certain information.

About 600,000 lines of code are required to operate the computer reservation system. High-speed memory is 524K on each of three computers, plus three boxes of 2,000,000 bytes each of large core storage—4,000,000 on-line and 2,000,000 in reserve.

The CARD unit, a desk-top set positioned in Eastern's reservations offices beside the crt, can handle up to 73,500 "pages" of information, any one of which can be retrieved and displayed on the unit's own screen in less than four seconds by manual operation of push-buttons. This capacity is more than twice the number of pages in Encyclopedia Brittanica, and EAL is not using all of it yet since the information out of those 22 reference volumes occupies only 12,000 pages in the CARD unit. The unit stores 750 microfiche on a carousel, each 4" x 6" plastic film card containing 98 pages of information. The pages are projected in 8½" x 11" size on the CARD screen.

Although retrieval times of four seconds may not sound fast compared to a computer, whole pages of information are retrieved at a time, and the microfilm system is fast enough and relieves the reservations agent of so much work load (in addition to what it does for the computer) that it operates in perfect coordination with the crt display. We have never seen a pair of such different machines that are at the same time so consonant with each other. As it is, CARD saves about 20 seconds per phone call, which adds up to more than 500 *hours* of telephone time per day saved over the old method of having the agent look up information in books.

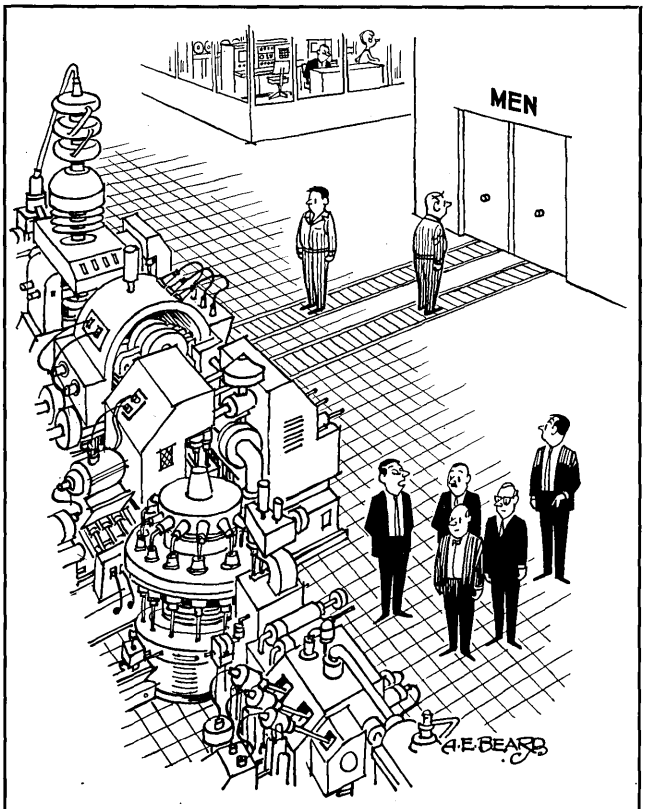
This use of microfilm storage and retrieval relieves our computer system in several ways:

1. It reduces computer programming time and manpower.
2. It reduces computer storage requirements.
3. It reduces computer processing time.
4. It gives a computer system either longer life in terms of capacity or the ability to handle more reservations.
5. It reduces communications time. Since the information and the ability to retrieve it can be placed literally at the agent's fingertips and does not have to be processed in the computer and then displayed on the crt, it's a big help in the information transfer problem, saving in-line time. EAL computer system lines are capable of 2400 baud. This is not an unalterable affair, but as far as practical technology available to the airline today is concerned—considering cost—it is a barrier. In time-sharing situations, some computer users may have to wait during peak periods. With much of the more static information quickly retrievable off-line, we avoid that.

computer access information

In making the computer and the CARD system complementary, our system is designed so that CARD instructs the agent how to access information in the computer in a manner that enables her to complete a reservation.

As an example of how this works, we have stored in the computer schedules and availability information on other airlines for selected cities and flights normally connecting from our own service. We have service only to Seattle on the West Coast, yet we book many customers to Los Angeles and San Francisco. If, for instance a customer wants a reservation from Nashville to San Francisco, we have in the computer the information on another airline serving from Chicago to San Francisco. Let's say that our reservations agent is in Atlanta. She could have access to



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Of course, Octoputer does more than just slay bugs.

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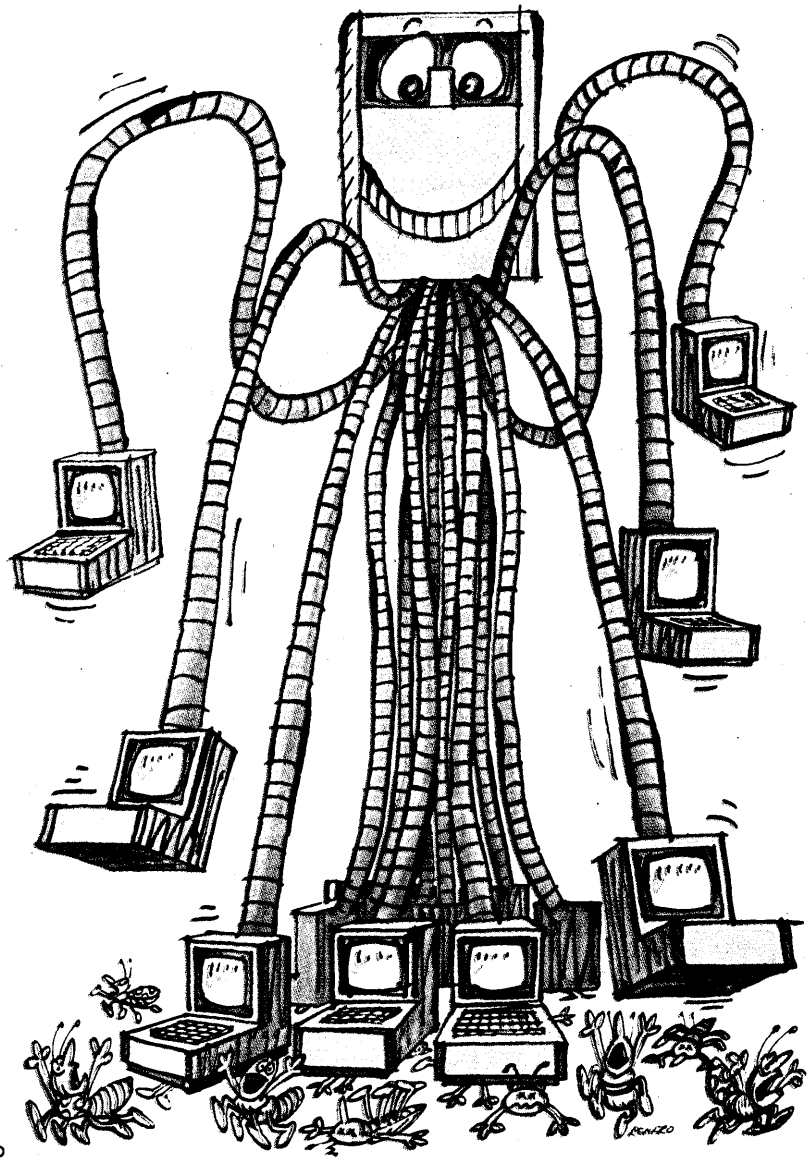
The Octoputer concentrates on remote computing because that's where the industry is going. We got there first, because communications is what RCA is famous for. It puts Octoputer a generation ahead of its major competitor. It can put you ahead of yours.

RCA COMPUTERS



CIRCLE 133 ON READER CARD

this Chicago-San Francisco segment information if she knew it was in the computer. If she retrieves the CARD page for San Francisco, it will tell her that such information is available via the crt, that she should build her connection on Chicago and that the minimum connecting time is 30 minutes. This enables her to make the correct input to the computer in order to obtain the information needed to complete the reservation.

In another example of how the microfilm is used to give computer access information, we have the manual for operating the computer on microfilm. There are many types of transactions that a reservation agent will make in the computer. Exact entries are required to obtain the desired computer response, and it would be difficult for an agent to commit all of this to memory, particularly the more infrequent transactions. So the agent goes to microfilm to access the instruction for that type of transaction. The display on the CARD screen tells the agent which buttons to press on the crt keyboard. The kinds of transactions involved include such things as selling a certain type

The CARD microfilm unit (left) is used along with the crt connected to EAL's computerized central reservation system.

of space, entering a name, entering ticket information, cancelling a reservation, adding a segment to an existing record, deleting a segment, changing a telephone number, changing or adding a name, etc. Each one requires specific inputs to the computer, and we can't expect reservations agents to remember all of them. And it is far easier and faster for an agent to retrieve this from the CARD system than to thumb through a thick manual.

rates and fares

Someday, we expect to have sophisticated means of putting all rate and fare information into the computer, but this is not yet available to us, though there are active efforts in this direction. Right now, the fare structure is such that most everyone agrees it would be impossible to put into the computer.

For example, there is the matter of joint fares, whereby two airlines agree on a fare over two segments, one on each airline, which will make it competitve with a direct service possibly served by a third carrier. Joint fares

normally are issued between fairly well-traveled cities. There is what we call a "hidden joint," wherein it is possible for the agent to construct a lower total fare from city A to city B, even though the customer might actually fly from A to C to B. At present, there is no way to put this type of information into a computer in such a manner as to enable the reservations agent to pick up this hidden joint fare. The possibilities involved with the joint fare situation are probably close to infinity.

Some approaches have been developed that will enable a high percentage of the fare requirement to be put on tables or otherwise put into the computer. But this is a very difficult problem. It has been worked on for several years, and probably still is one or more years away.

When this occurs, we still will have need for the automatic microfilm system. Fare information is just one of a number of items we have on microfilm, many of which are quite static and which we wouldn't consider putting in the computer. Removing the fare information from the CARD storage would free only 600 pages, and we are constantly expanding its use. There is a great deal of information that for a long time to come will be impractical for computer storage and retrieval.

reservations yes, publishing no

The airline schedule information in the CARD system is updated twice a month, while other information is updated monthly, quarterly, some less often. The updating operation is simple. Whereas we used to be heavily in the publishing business, producing a great deal of the reference material the reservations agent required in book form, we now give HF Image camera-ready copy. It in turn provides us with the necessary replacement microfiche on a 48 to 96-hour basis, and substituting the new microfiche in the CARD library is a matter of seconds.

The microfiche in the CARD unit are mounted on metal clips notched in binary code, permitting the unit to be computer-driven, with the computer, in effect, pushing the buttons; but in our system we have chosen not to do that. The CARD selection mechanism utilizes 12 bits to select a microfiche. When a CARD key is depressed, a pattern is established on 12 selector plates, which are positioned either up or down, corresponding to binary code. With this pattern established and the carousel rotating, only the microfiche with the notches matching the pattern will be caught by a pickup arm, and, in effect, threaded on that arm and carried to a point adjacent to the projection gate. The gate is opened, and the microfiche withdrawn into it by an X-Y mechanism to the first frame location to display the index page for that microfiche.

The index will show which page the agent wants on that microfiche by giving its X-Y coordinate location in alphanumeric code, whereupon the operator depresses two additional keys, resulting in display of the desired frame.

Much of the material going into the microfilm system is being developed as we go along; that is, we do not simply film a given page in a reference book. Because much of the material existing in reference books is not really adaptable to quick reference, we rewrite and reformat it for our specific use. For instance, it's difficult to read from a tariff in a standard format while you're on the telephone. We are putting much of the regulatory type of information in simple, easy-to-read charts and other forms. We may take one page from a reference work and break it into several pages in microfilm. HF Image reformats the airline schedule information for us, using its own computer. ■

A PRACTICAL APPROACH TO INFORMATION RETRIEVAL

by William H. Minor

Information retrieval of some form is important in the decision making process, but it is not always an easy task. The act may be an apparently instantaneous assessment of all recalled related facts in the decision maker's mind. It may be a tedious examination of all recorded data requiring years of research. Usually it is something in between these two extremes. In many cases computer applications afford the only reasonable alternative.

At the present time there is no universal retrieval system suitable for all applications. Several well conceived and beautifully designed systems have been made operational. These are matched by an equal or greater number not so well planned which merely alter the retrieval process without alleviating the problem. Analysts faced with system design or redesign realize early in the planning stages that a system which is not acceptable to management is simply not acceptable. Acceptance by management, however, is certainly no assurance that the system is either well conceived or even desirable.

During development stages there are several traps into which the designer may fall. These ease the design features but they impair the final product by complicating the application. Three of the more obvious ones are:

1. *Failure to specify and adhere to system constraints.* If the retrieval system—or any other system for that matter—is to be successful, the restraining features must be stated categorically. Changes in prespecified limitations may so alter operational details as to destroy the basic system structure.

2. *Including a specialist not related to the information field.* This is particularly appropriate if the system vehicle is to be a computer. Computer programmers and many system analysts have a penchant for designing themselves into the operational process.

3. *Playing the numbers game.* The great rush to develop numerical codes which started some 15 years ago makes medieval numerology seem like a child's game. On the pretext of making a computer application possible, a system of encyphering is provided. Although this fulfills the lay idea of what a computer can ingest, it certainly makes human consumption extremely difficult. It is well to bear in mind that information retrieval is recovery of facts collected by people for people.

veread system

The VEREAD* retrieval system was originally prepared for use by a group of value engineers. During the design it was apparent that the system could be adapted to any specific field merely by altering a dictionary. This can be done without reprogramming. Its principal purpose is that of reducing or eliminating duplication of engineering effort. One

*Value Engineering Retrieval of Esoteric Administrative Data

Mr. Minor is chief of the scientific systems section, Data Automation, Hq Warner Robins Air Materiel Area. He has also served as personnel officer, technical training officer, and more recently as general engineer. Mr. Minor has been active in the computer field since 1954 and has a BS in physics and math.

of the secondary purposes is to reduce clerical effort in report preparation summarizing actions and results. System details were predicated on characteristics of the using group, types of information required and system vehicle. One of the major requirements was to keep the total cost as low as possible.

The using group is composed of engineers and managers having a broad interest in a wide variety of subjects likely to appear in any documented form. The individuals are organized in relatively small groups functioning independently and from geographically scattered locations. After consideration of the requirements and constraints, a mechanized document retrieval system was selected.

Copies of documents are stored in microfilm cartridges compatible with readers already available in the engineering organizations. Each subscriber receives a copy of the master microfilm record with updating additions transmitted periodically. The subscribers to the system are the sources of all documents to be stored. No limitation as to type or number of documents is imposed.

A form of abstract called an *index page* is used to record information concerning each document. The data recorded concerns the document, its content and, as would be expected for value engineers, costs and savings. Index pages are stored in a separate file and used to recover the location in the microfilm file of documents which meet specified selection criteria. The conditions specifying search success and the associated actions are stated in a form of English, thus eliminating the need for codes and code books other than those which are an integral part of the user's environment. Contract numbers, for example, are a form of code used in procurement. They were not invented for VEREAD, but they are accepted as the user accepts them.

It should be very carefully noted that the search conditions were expressed in English and the answer returned in the same language. While English is not so concise as a cryptogram, it is just as logical. The English language contains all the elements necessary to present a logical search pattern whether directed to man or machine.

general system description

Fig. 1 is a block diagram of the VEREAD information retrieval system operation. Document sources are subscribers to the system. When a document is to be entered for storage, the source first prepares an index page describing the content and then submits the index page and the document. A central processing organization prepares a master microfilm reel photographing the documents in the order received without regard to source, content or date. A copy of the index page is entered in a master index file and the documents are returned to the source for permanent storage of the original if necessary. Periodically a new microfilm cartridge is transmitted to each subscriber. The added cartridge contains photographs of the documents entered during the updating period. The master index file is made available for search to all subscribers.

In operation, VEREAD provides a three-step recovery of a stored document. Certain management information can be recovered in two steps. In the original form it was intended that the system would begin operation with an empty or near empty file. This was to grow normally as new documents were generated. A minimum of engineering effort was to be expended in any file maintenance or updating activity.

The system accepts for storage any data form or document which can be reproduced on microfilm. The index page which accompanies each document contains information concerning:

1. Document characteristics
2. Document content characteristics
3. Content concepts
4. Quantitative data

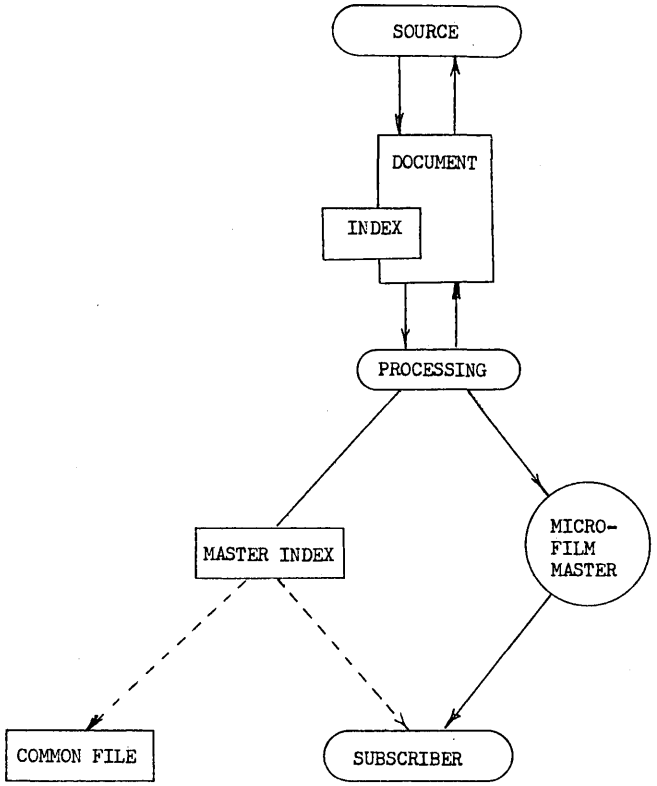


Fig. 1 VEREAD Information Retrieval System

Ordinarily the filing sequence of the index pages is the same as that of the related document, but it need not be. A brief consideration of the actions in a search for several unrelated documents during a single pass of the master index should explain the reason.

Retrieval of a document is similar to that of finding a book in the public library. First, the characteristics which distinguish the document or a class of documents from all others are specified. The master index file is then searched for matching characteristics, and the locations of all those meeting the specifications are extracted. Finally, a copy of the document is physically obtained from the known location.

A computer time-sharing system is used as repository for the index. The index is maintained, updated and searched automatically by calling the appropriate programs. Maintenance is performed by one specified group. All subscribers to the retrieval system have simultaneous access to the index file except for brief periods when the file is set aside for updating actions. Subscribers, using their terminal facilities, type in the desired search specifications in the form of an English statement. Once the statements have been accepted by the computer, search by the program is completely automatic.

system language

Although there is no doubt that English is a very complicated language, it is surprising to find how limited is the

average vocabulary when compared with that available. It is more surprising to find how small a written or spoken vocabulary is really required to communicate basic ideas and needs. The very fact that much can be done with a limited stock of words makes it possible to construct a mechanical retrieval system. Moreover, the language may be in a form as meaningful to the human as to the computer. Of course, it is most important that semantics and syntax be tailored to the available vehicle and to the required operation.

The VEREAD language consists of English text statements containing nouns, adjectives, conjunctions and verbs. Some commands may be complex and are sentences structured around the familiar IF . . . THEN . . . logic. Following are parts of speech permitted in forming search commands:

Nouns and adjectives. The system vocabulary is open to descriptive words and names. These are added to or deleted from the dictionary to satisfy the system needs. Additions are normally automatic entering the dictionary as they are encountered during the edit of file maintenance commands. An open vocabulary makes the system adaptable to a very wide variety of applications.

Conjunctions. Four conjunctions are permitted: IF . . . THEN. These two are used as a pair to permit establishing a set of conditions and a set of actions to follow if the conditions are met. AND OR. Any logical connection between two or more conditions is expressed by using AND and the inclusive OR.

Conditional operators. Six conditional operators are allowed. These contain the only symbols in the language and were included only to reduce the number of typed characters required in a command. From the programming point of view it is no more difficult to allow the word equivalent. These operators are:

IS
IS >
IS <
IS NOT
IS NOT >
IS NOT <

Verbs. Action to be taken under specified conditions is indicated by a set of verbs having very specific meanings. Five have been programmed in VEREAD:

LOCATE. This causes the program to extract from the index page a cartridge number, frame number and number of pages for each record having satisfied a set of given conditions. Extracted locations are typed as output after the entire index file has been searched.

COUNT. This causes the program to count the number of times any conditions have been met. The total is typed after the complete index file has been examined.

TOTAL. This verb must be followed by at least one noun specifying the names of the items in the master index which are to be summed. The totaling action can be invoked for a list of items by including the name for each. Of course, the total cannot be printed until the last index has been processed.

PRINT. As with the previous verb, the action may be called for one or more items in the index. The action is that of extracting and printing the value located in the item specified. As records are found which satisfy the search criteria, the content of the fields called after PRINT are typed.

COPY. If the COPY action is included in a command, the

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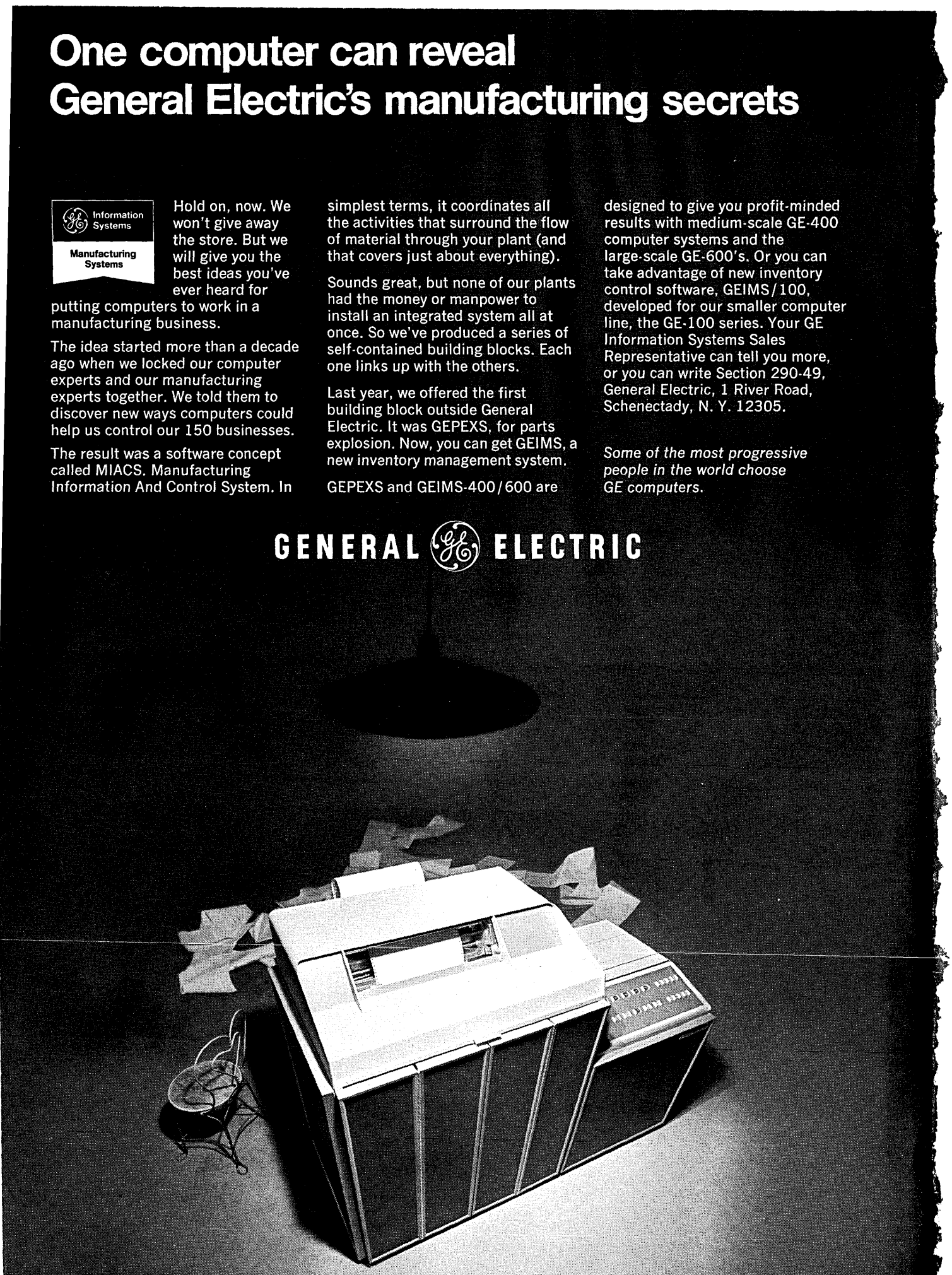


CIRCLE 88 ON READER CARD

entire index page is typed for each document having met the search criteria.

SOURCE _____ MATERIAL _____
TYPE DOC _____ VECP-NR _____
CONTRACT-NR _____ CONTRACTOR _____
ITEM _____ SYSTEM _____
FUNCTION-1 _____ FUNCTION-2 _____
PROCESS _____ OPERATION _____

DESCRIPTOR 1. _____ 2. _____ 3. _____
4. _____ 5. _____

DATE _____ COST BEFORE _____ COST AFTER _____
CONTRACT VALUE _____ SAVINGS ESTIMATED _____ SAVINGS ACTUAL _____
SAVINGS VALIDATED _____ CARTRIDGE _____ FRAME _____ PAGES____

Fig. 2 The Index Page

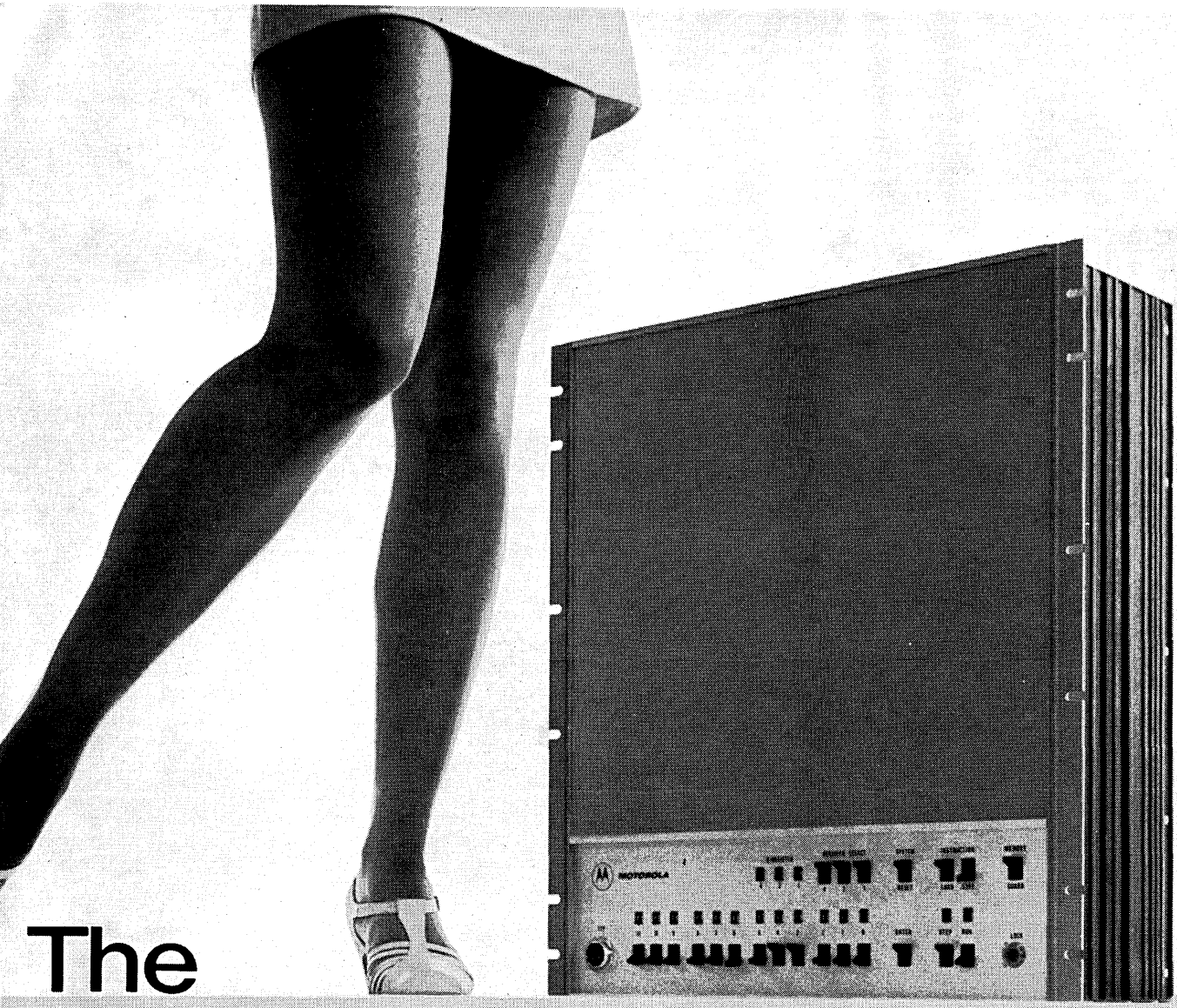
index page

Fig. 2 is an illustration of the index page which becomes the first page of each stored document. Three types of information are included in the index. Twelve entries allow for single word nouns or adjectives which indicate the nature of the document or the characteristics of its content. Up to five descriptors may be included as a means of describing the content in limited detail and offering something of concept coordination. The third type of information is numeric. These are data which can be manipulated algebraically. They include such items as values, costs or dates. The location of the stored document in the master file is included in this index page.

The VEREAD index page was designed for a specific group of individuals having value engineering as a common interest. The system reflects the group language just as a system for personnel would reflect the language of personnel administration or one for physicians would incorporate language of the medical profession. For the value engineers the descriptors were used in lieu of an abstract to eliminate engineering effort in preparation of abstracts from complex documents. Such a system can normally be handled by nontechnical personnel. VEREAD does, however, permit entry of an abstract consisting of 500 or fewer characters if desired. The abstract may be searched for key words, phrases or specific combinations of characters. The complex search logic to be described later applies equally to this abstract. A complex search can be centered on the index page, on the abstract, or on both simultaneously. Thus it is possible to locate all documents about AMERICAN*ism* while ignoring all documents about all other ISM's.

search statements

Commands which state the conditions for a successful search and which specify the action to be taken are phrases or sentences using the established vocabulary. There is a general syntactical form to be followed, but in general all entries are quite free in form. Statements are not punctuated, although this feature could be added if it were



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deemed necessary or desirable.

An action may be applied unconditionally to all index records. If, for example, a subscriber would like to find the total of all entries of savings validated this would be directed by the following statement:

TOTAL SAVINGS VALIDATED

Any action specified can be applied to two or more entry items at the same time, such as:

TOTAL SAVINGS ESTIMATED AND VALIDATED

During the search process two sums are carried. The sequence of these in the statement is not important.

Two or more actions can be ordered in the command, for example:

PRINT TYPE AND TOTAL COST BEFORE AFTER AND COUNT

As a result of this command the content of the item TYPE will be listed for all records; the records will be counted; and the COST BEFORE and COST AFTER fields will be totaled.

Most searches of the master file are conditional. An action is taken only for those documents which fulfill all stated search criteria. For conditional commands the IF (condition) THEN (action) structure must be used. As an example, the subscriber wishing to recover all documents originating in DEPT-A would type the command:

IF SOURCE IS DEPT-A THEN LOCATE

Should the subscriber choose to locate all documents except those having originated in DEPT-A, the NOT operator can be used in the command. The command would read:

IF SOURCE IS NOT DEPT-A THEN LOCATE

Multiple actions are permitted in conditional searches just as they are in the unconditional. To locate and count all documents except those from DEPT-A the following command would be entered:

IF SOURCE IS NOT DEPT-A THEN LOCATE AND COUNT

Multiple conditions are also acceptable and with them the power of associated logic. When AND and OR appear in the same phrase or sentence, there is need for some clarifying rules, however. Consider the statement:

IF A AND B OR C THEN . . .

Without some specific rule which establishes a precise meaning, this statement is ambiguous. It can be interpreted as meaning:

(A AND B) OR C or A AND (B OR C)

In voice communication this is handled by vocal inflection, subject, of course, to misinterpretation. In written communications the meaning can be conveyed by using parentheses to show the hierarchy of logical operation. This can be programmed and evaluated by the proper truth tables. As an alternative, the condition may be covered by a rule which states that the meaning (A AND B) OR C is implied even if the parentheses are omitted. In the VEREAD system this rule is used for the reason that this affords a very simple way to prepare and evaluate a truth table to determine if multiple conditions are met. The subscriber must know this rule and be well aware of its full consequence. This does not prevent searches having the meaning A AND (B OR C). To specify this logic the statement must be paraphrased as A AND B OR A AND C. Very complex search statements are possible, limited almost by the imagination of the user.

system operation

The operating procedure was designed to be as simple as possible. It can be learned by the engineer, technician or clerk in a matter of a few minutes. Communication with the computer is by means of a model 35 Teletype and the time-shared system is called in the customary manner. When communication has been established, the program is called

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and put into operation by two RUSH commands:

```
LOAD (VEREAD)
EXECUTE START
```

To these the program responds by typing:

```
TYPE IN NUMBER OF SEARCH STATEMENTS
NUM
```

As the master index is passed, one to five search statements can be processed for each index page. The user must respond to the above by indicating the number of search statements he intends to enter for processing. Fig. 3 is an example of the man-machine dialog for a simple search. The user has indicated by typing the number 1 that he intends to process only one statement to which the program again responded by directing the entrance of the first statement.

Every statement is completely edited by the program and must be found acceptable before the next command may be typed. It is examined for syntax and semantics. If an error is detected or the statement cannot be executed for any reason, it is rejected. The program types a note indicating the reason for rejection and the user is given an opportunity to re-enter the corrected version. This rejection-correction sequence continues until an acceptable statement is typed, at which time the program either asks for the next statement or starts processing, whichever is appropriate.

In Fig. 3 the user has asked for an unconditional search. All records are to be counted and the total number of pages stored in the master file found. The answer in this case shows a total of 23 documents for which there are 211 pages (frames of microfilm) recorded.

```
TYPE IN NUMBER OF SEARCH STATEMENTS
NUM
\1

TYPE IN SEARCH STATEMENT #  1.

\TOTAL PAGES AND COUNT



SEARCH STATEMENT # 1.
TOTAL    PAGES  =  211.
TOTAL FOUND =  23.
```

Fig. 3

Figs. 3 through 6 are copies of actual dialogs concerning a demonstration file. These illustrate several of the more important features of the VEREAD retrieval system. They show how very complex search conditions can be set up with the English structure.

Fig. 4 shows the action when a statement is rejected. The first statement was rejected with a note stating that copper is not a valid material. No document has been stored which identifies the material as being copper. The rejection during edit is really a notification that a file search for copper would be fruitless. When the material was changed to aluminum, the new statement was accepted. The two statements illustrate the selective nature of AND and OR conditions. Output results show that while there are two documents in the file which are about either aluminum or an etching process, there is none which contains both. The index page of the first document will be found at frame 133 of cartridge number 1. There are 13 pages, including the index.

```
TYPE IN NUMBER OF SEARCH STATEMENTS
NUM
\2

TYPE IN SEARCH STATEMENT #  1.

\IF MATERIAL IS COPPER OR PROCESS IS ETCHING THEN LOCATE
COPPER       NOT VALID MATERIAL

TYPE IN SEARCH STATEMENT #  1.

\IF MATERIAL IS ALUMINUM OR PROCESS IS ETCHING THEN LOCATE

TYPE IN SEARCH STATEMENT #  2.

\IF MATERIAL IS ALUMINUM AND PROCESS IS ETCHING THEN LOCATE



SEARCH STATEMENT # 1.

CARTRIDGE   =   1      FRAME      =  133      PAGES      =   13
CARTRIDGE   =   1      FRAME      =  146      PAGES      =    3

SEARCH STATEMENT # 2.

NO MATCHING RECORDS IN FILE
```

Fig. 4

```
TYPE IN NUMBER OF SEARCH STATEMENTS
NUM
\2

TYPE IN SEARCH STATEMENT #  1.

\IF COST AFTER IS < COST BEFORE AND AFTER IS NOT 0 AND BEFORE IS > 1000
__ THEN LOCATE AND PRINT COST BEFORE AFTER AND CONTRACT VALUE

TYPE IN SEARCH STATEMENT #  2.

\IF COST BEFORE IS > COST AFTER AND BEFORE IS NOT < 1000 AND AFTER IS >
__ 0 THEN PRINT CONTRACT VALUE COST AFTER BEFORE AND LOCATE



STATEMENT # 1.
BEFORE   =   17464.
AFTER    =   16206.
VALUE    =   17464.

STATEMENT # 2.
VALUE    =   17464.
AFTER    =   16206.
BEFORE   =   17464.

STATEMENT # 1.
BEFORE   =   1176000.
AFTER    =   1130520.
VALUE    =   1130520.

STATEMENT # 2.
VALUE    =   1130520.
AFTER    =   1130520.
BEFORE   =   1176000.

SEARCH STATEMENT # 1.

CARTRIDGE   =   1      FRAME      =   72      PAGES      =   10
CARTRIDGE   =   1      FRAME      =   85      PAGES      =   38

SEARCH STATEMENT # 2.

CARTRIDGE   =   1      FRAME      =   72      PAGES      =   10
CARTRIDGE   =   1      FRAME      =   85      PAGES      =   38
```

Fig. 5

When preparing a search statement, the logic and syntax are important, while the exact manner of presentation is a matter of personal choice. The same thing can be expressed in a variety of ways and still retain the desired search criteria. Fig. 5 is a dialog starting with two search statements. A

Tires are sold by *grades*. Some grades are recommended for superspeeds on superhighways. Others are adequate for city driving. Computer tape is *performance-graded*, too. Some tape grades are essential for *critical* operations, while others are completely acceptable for less demanding applications. The key is in the *application*. The table at the right takes all the guesswork out of computer tape selection.

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CRITICAL / Select High-activity files, and active master tapes.	D760	Yes	50	3
CRITICAL / General All applications except most critical.	D750 (Gov't Type II)	Yes	88	5
MASTER / General Money-saving tape for day-to-day use.	D740	Yes	188	5
MASTER / Normal Storage Low-cost tape for high activity, non-critical production runs.	D750 P G	No	Performance guaranteed	
JOURNAL / Record keeping Low-activity storage tape.	730	Yes	588	5
HISTORICAL Storage of data which rarely needs to be retrieved.	D720* J700*	Yes Yes	588 1088	5 10

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Reading, Berks, England

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close examination will reveal that except for two small details the statements have the same meaning. As would be expected if the statements were equivalent, both have selected the same records from the file. In the master file there are 23 records for which COST AFTER is less than COST BEFORE. Twenty-one of these fail to meet one or more of the remaining conditions.

As for the slight differences, it will be noted that equal conditions have not been defined. Had the COST BEFORE been equal to 1000, the record would have been rejected by statement 1 but accepted by statement 2—that is, of course, if the remaining conditions had been satisfied. Such pitfalls exist whether the search logic is given to a machine or to a human. The search will recover exactly what was requested, no more or less.

The statements of Fig. 6 express the logic contained in the form A AND (B OR C). The manner in which this must be expressed lengthens the sentence, but the correct selection depends upon proper logical structure. These were also included to demonstrate how the search can be made to be

```
TYPE IN NUMBER OF SEARCH STATEMENTS
NUM
\3

TYPE IN SEARCH STATEMENT #  1.

\IF SOURCE IS WRAMA AND TYPE IS NOT CONTRACT OR SOURCE IS WRAMA AND TYPE
__ IS NOT PHOTOGRAPH THEN COUNT AND TOTAL SAVINGS VALIDATED

TYPE IN SEARCH STATEMENT #  2.

\IF SOURCE IS NOT WRAMA AND TYPE IS NOT CONTRACT OR SOURCE IS NOT WRAMA
__ AND TYPE IS NOT PHOTOGRAPH THEN COUNT AND TOTAL SAVINGS VALIDATED

TYPE IN SEARCH STATEMENT #  3.

\IF TYPE IS NOT CONTRACT OR TYPE IS NOT PHOTOGRAPH THEN COUNT AND TOTAL
__ SAVINGS VALIDATED



SEARCH STATEMENT # 1.
TOTAL FOUND =  18.

TOTAL  SAVINGS VALIDATED  =  7209549.

SEARCH STATEMENT # 2.
TOTAL FOUND =  5.

TOTAL  SAVINGS VALIDATED  =  682800.

SEARCH STATEMENT # 3.
TOTAL FOUND =  23.

TOTAL  SAVINGS VALIDATED  =  7892349.
```

Fig. 6

isolate members and nonmembers of a class. The first statement will select only those documents originating at WRAMA, while the second will reject those documents from that source. The third is nonselective on the basis of origin. It should be expected that for a properly functioning system the output for statement number 3 will be the sum of the outputs for the first two statements. This is verified by the results of the dialog.

A very subtle but important feature of VEREAD logic is illustrated in the example of Fig. 5. It should be noted that the system is required to compare the content of one index item with the content of another. In the same sentence it is required to compare the content of an index item with a value given in the search statement. VEREAD is able to distinguish between an internal and external data source as a clerk would in a manual search.

index file maintenance

Maintenance of the master index file is primarily a matter of adding new index pages, although there may be some need for deletion or corrective procedure. These actions can be taken at any terminal if the controlling terminology is known, but normally they are assigned as the responsibility of one group. This may be the organization which prepares the master microfilm records, or it may be a separate operation to which copies of the index pages are transmitted for entry.

As with the search, updating actions are automatic and performed under program control. Options are available allowing the user to select the easier of two ways of entering data for the index page. Data may be entered free form or it may be program forced.

When several items in the index pages are blank, the free form option would normally be the better method. A statement such as the following would cause the appropriate data entries:

SOURCE IS DEPT-2 TYPE IS REPORT SYSTEM IS X227 DESCRIPTOR IS RADIO RECEIVER TRANSISTOR COMMUNICATION PAGES IS 21 CARTRIDGE IS 2 FRAME IS 973

Entry of data for index pages having most items filled is best done by a demand option. If this procedure is selected, the program requests an entry for each item starting with SOURCE and concluding with PAGES. In this case, if the item is to be blank, a blank must be typed for entry. The first few lines of the entry dialog would be similar to the following:

```
SOURCE
/DEPT-Z
TYPE
/REPORT
CONTRACT NUMBER
/b
ITEM
/b
  .
  .
  .
PAGES
/27
```

Before the record is finally posted to the stored file the user is given the opportunity to make any changes or corrections necessary. Regardless of the option selected, all changes or corrections are made in free form.

conclusion

VEREAD was written in PL/I and at the present time is operational in the ABC Time Sharing system.* As was previously stated, although prepared especially for value engineers, the system is adaptable to literally hundreds of other applications, large and small. Modification in most cases would be little more than changing the content of the dictionary. The index page itself can be changed by dictionary content. Drastic changes involving variations in structure, language or computer system do not present major problems providing basic concepts remain inviolate.

Such a retrieval system could easily offer an immediate solution for the manager who has a retrieval problem considered too small to warrant a dedicated computer yet too complicated to allow a reasonable manual system or one previously classified as a programming headache. The system offers at the very least a demonstration of technique which can be incorporated in future systems; else, as with a subjugated people, the common language and customs become those of the conqueror, a machine. ■

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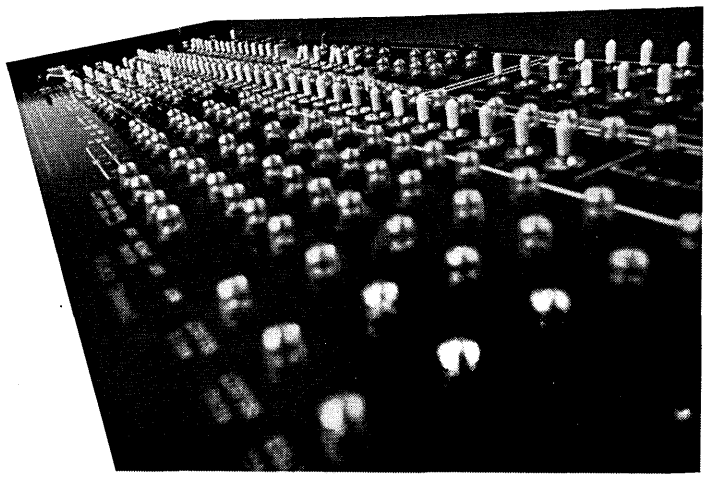
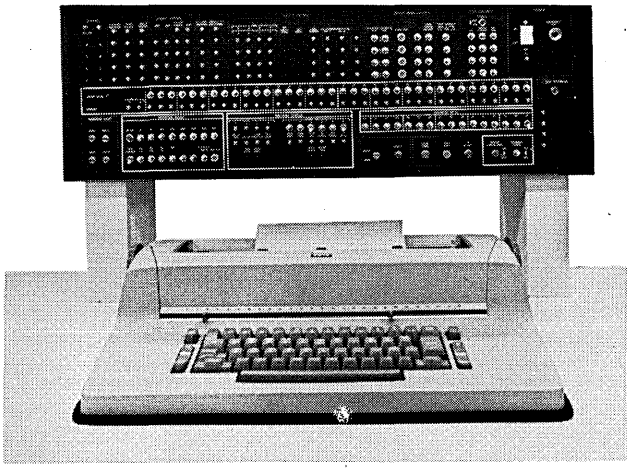


(turn the page)

A candid look at the incredible new



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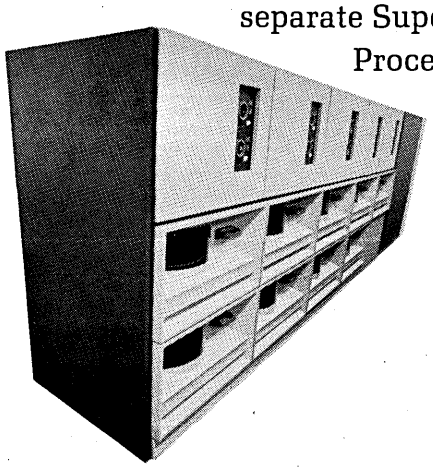

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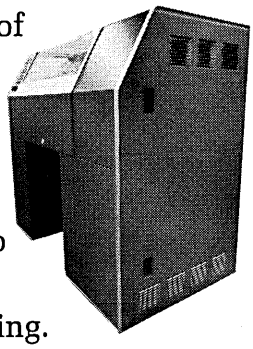
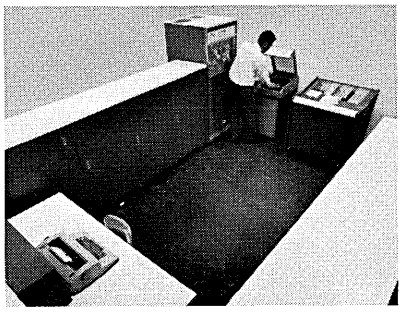
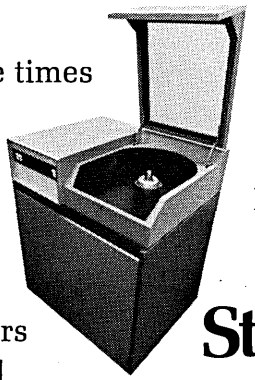


Associative file system. An exclusive retrieval system which allows the user to call into memory with relatively loose, associative addressing. "Get me everything with x, y and z."

Dynamic Time Slicing allows pro-

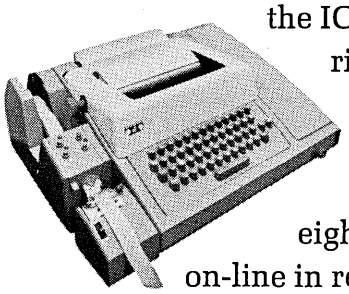


time machines.



grammed self modulation of queue times to predetermined optimums. And the IC-7000's terminal flexibility allows hook-ups to CRT, TTY, Selectric, Friden, concentrators and other computers.

With the compiler compiler, users can mix and match FORTRAN and BASIC subroutines within the same program or build their own program language. FORTRAN, BASIC, assembly language and COBOL on the way make the IC-7000 a language-rich machine.



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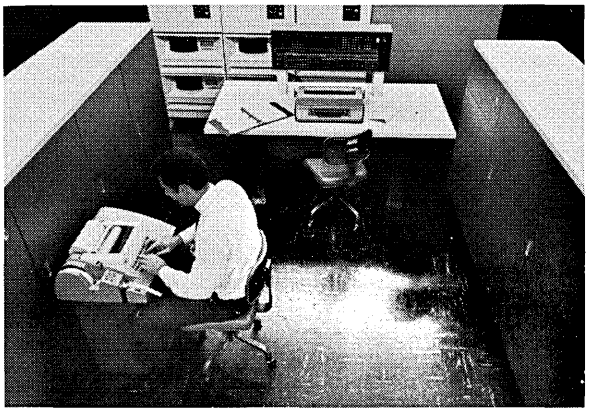

All software for the IC-7000 was developed in conjunction with Call-A-Computer, Inc.

Pick your time.

If you don't need all those lines into your own in-house computer, choose from two plans of time-sharing as offered by Call-A-Computer. Single-unit terminal usage, or on-site concentrators which offer substantial cost reductions to large volume users of remote time-sharing. These exclusive on-site concentrators provide extra economy to users with ten or more terminals installed in any location.

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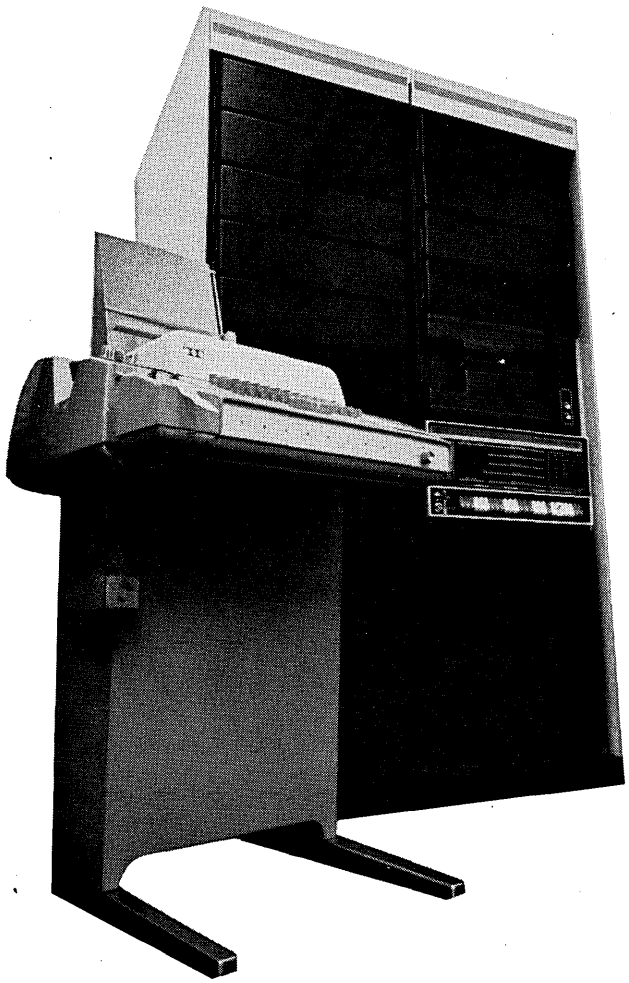

If it's a job which a computer could be doing better, now you can have a computer do it. Call-A-Computer time-sharing gives you the opportunity for efficiency and effectiveness in creative computer usage.

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CIRCLE 52 ON READER CARD

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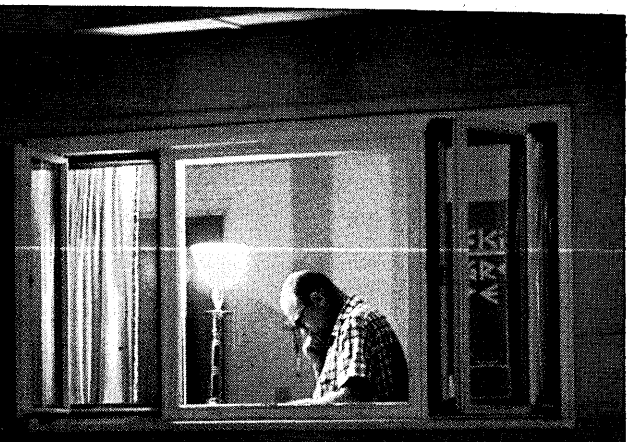
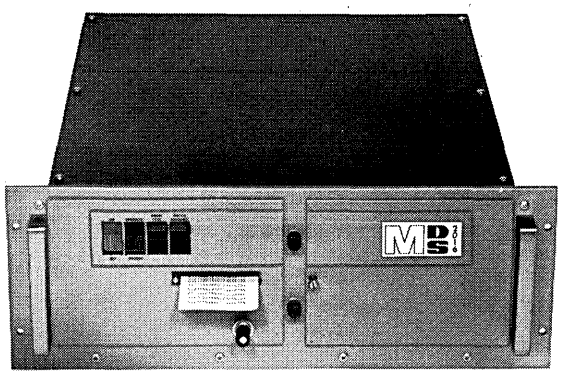
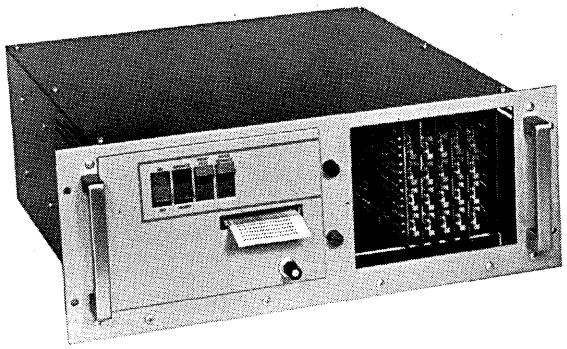




The MDS 2016 prints 8 to 20 columns. Size is 7"H x 19"W x 17"D



Printed circuit boards, with easily accessible switches permit unusual flexibility for Programmable Zero Suppress.

Specify the MDS 2016 Digital Lister Printer. It incorporates, as standard, most features you ordinarily order as extra-cost options.

If you're sweating out specifications for Digital Strip Printers . . . up to your neck in options, trying to get everything you need in a single unit . . . drop the whole business and call MDS.

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You'll get Full Buffering; Programmable Zero Suppress; Asynchronous Operation; 50 or 60 cycle, user-controlled; External Paper Advance; Out-of-Paper Status Line; Format Control; Positive Logic; Operate/Inhibit Switch.

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BUFFER provides control for lock-out, activated upon receipt of a print command. An instruction is stored, and printer is inhibited until the instruction is executed. Lock-out also is generated by out-of-paper signal, external paper feed, manual paper advance, print test and printer off-line status.

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news scene

an interpretive review of recent important developments in information processing

SDC WAS A NONPROFIT ORGANIZATION AND PLANNED IT THAT WAY — BUT NO LONGER

After several years of rumor, rife speculation, and resentment on the part of competitors, System Development Corporation, the nonprofit (formerly) software house spinoff from the RAND Corporation, has finally settled on the way it will enter the competitive commercial market and, hopefully, still satisfy those detractors who maintain it has always had a bidding edge in government contracts and is, in fact, government subsidized. The firm, long a haven for thinkers and, some say, idlers, will become profit-oriented through a procedure that involves the sale of a 25% interest in the company to an investment group of 13 purple-chip firms headed by Lehman Brothers, and including the Prudential Insurance Company of America, Goldman, Sachs & Co., Blyth & Co., Inc., and Lazard Freres & Co. This group also has an option to buy an additional 20% at public sale figures when the stock goes public, expected in 18 months to two years.

All stock (around four million shares) is now held by the newly formed System Development Foundation, a version of the former SDC board of trustees, which will sell the 25% (at a reported $6.50 a share for a million shares) to the investor group, plus the optioned 20% when the stock goes public. It also will sell 20% to SDC employees at an unspecified time. The foundation's remaining 35% will be sold after the stock goes public. The SDF will utilize the money received from these sales to finance scientific research, sociological and educational programs, and computer technological studies by firms and organizations not associated with the new SDC. The plan is to allocate these monies to such worthy enterprises and then, ultimately, to phase SDF out of existence. This largesse, it is presumed, will persuade those who contend that SDC hasn't the right to go public because of its previous governmental affiliations that the public, itself, is being served. The new SDC will operate on current reserves and income from its backlog of contracts.

One of the primary reasons for SDC's decision to go commercial is its desire to retain key employees, some of whom have defected in recent months to join other firms or establish their own. EDP Technology, Inc., was started by former SDC vp Dr. T. C. Rowan and 25 ex-SDCers after a flap that saw the new company in operation three days after Rowan left SDC (April '68, p. 17). And other departing passengers included Jules Schwartz, head of the technology directorate; John Ottina, vp and head of the military systems division; Bill Warren, vp of air operations; Lee Page, manager of engineering, Pacific systems; and F. A. Maresca, commercial systems marketing (June '69, p. 39).

With the move to go profit, SDC will allot a 20% interest through purchase of shares to an estimated 200 (probably more) employees of standing in the company's community. The price for these shares has not as yet been determined. These employees would, in effect, be investing in themselves, because SDC has little in the way of material assets to offer ... one assessment places those assets at around $5 million ... and the company considers its primary value to be in its people, their talents, the systems they have developed and the contracts those have engendered.

Current contracts with the old SDC are being transferred to the new SDC as the "successor in interest" under the same prices and conditions, with the exception that the profit on these contracts will no longer be required to be used for research or other nonprofit activities, but may be considered as return on performance.

Wesley S. Melahn, president of SDC, told DATAMATION that his firm has nearly always operated on a profit basis in contract bidding and negotiations in the past, but the motive was reinvestment in the company, not concern for the stockholder. This practice will be discontinued. Another practice that won't be continued is the kind of humanistic, sociological "freebie" characterized by SDC's performance of a study of New York City's problems for Mayor John Lindsay, after his first election and prior to his taking office, when he had no funds to budget for such a study. SDC did it at a cost to SDC of over $50K, with no return. Some criticize such a procedure as inimical to the interests of open competition, but one wonders where the competition in such a situation would have come from.

the pres

Melahn is a pleasant, careful, logical man, as befits a programmer who is said to be the only one who worked his way through the troops to become the president of a major corporation. He speaks quietly but determinedly through interruptions (by this reporter) to make his points and appears

to be cognizant not only of the strengths of his organization but of its possible weaknesses and the weaknesses implied by its critics. He exhibits no animosity toward those who cavil and have caviled with SDC, only a cheerful weariness as a result of the prolonged exploration of the various routes to profitability open to SDC ... most of which closed.

He began with the RAND Corp. in 1948 and contributed to the design of Johnniac, one of the first digital computers, and to applications for its use in RAND studies. When RAND's System Development Division was chartered as SDC in 1957, Melahn was head of the corporation's computer programming activity and participated in the development of the first programs for the U.S. Air Defense Command's SAGE system, and later became manager of all SAGE programming. He was elected

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CIRCLE 11 ON READER CARD

a vp in 1963 and became president and a member of the board of trustees in 1964.

It is certain that he also will be a member of the new, and heretofore nonexistent, board of directors of SDC, which will be named by Lehman Brothers and the other 12 firms of the investor group. Lehman and associates will have voting rights with their 25% (later to be 45%), as will the SDC employees' 20%, but the stock held by the Foundation will not. However, when all Foundation stock disposed of through public offer is sold, it too will be voting stock. No members of the present board of trustees will be on the new board of directors, except for Melahn.

Melahn made the point that if SDC had been sold for cash, not as much money would have been realized for the Foundation to dispense as he expects will result from the public sale of stock after SDC has had a chance to make its mark in the market place and enhance the value of the corporation. That value at present is difficult to determine, because as a nonprofit organization, SDC has no price/earnings ratio or profit picture to indicate its worth. Its FY 1969 revenues were around $61 million with a net income of $700-800K. This represents a gain of nearly 14% over the previous year. For comparison, Planning Research Corp., a similarly oriented software and systems house, expects a gross revenue of approximately $55 million for this fiscal year, and Computer Sciences Corp. will be in the $65 million range. A further indication of SDC's possible value: At presstime, PRC's stock was listed at around 32, with some 4,500,000 shares issued, giving it a market value of about $144 million. CSC's stock was listed at 22 or so, with over 12 million shares on the market for a value of over $264 million.

on the rail

In answer to critics who assert that SDC has always had an inside track on military contracts because of its long association with the Air Force and the special knowledge gained thereby, Melahn stated that SDC has been in an equal position with its competitors since the Air Force accepted a Congressional recommendation that SDC be treated as an independent contractor (June '66, p. 17). He said that the Air Defense Command contract was put up for bids three years ago and that SDC won it in competition. That contract is now in its third and final year, and he expects it once more to be open to competitive bidding.

It has been rumored that Philco and Lockheed are after SDC's up-till-now sole source contract as program integration contractor for a satellite support with the Space and Missile Systems Organization (SAMSO) of the Air Force. It's been sole source thus far, said Melahn, because "SDC had been doing such a good job, the Air Force saw no reason to change." He welcomed the competition.

In light of the profit move, the question was raised during the interview with Melahn as to the disposition of the government-owned computers currently in the possession of SDC. He pointed out that nearly all companies with government contracts have government-owned computers on the premises for those particular contracts. It is cheaper for the government to buy computers and provide them to the contractor than it is if the firm includes them in the bid price, which usually results in a profit percentage increase over the actual cost of the computers. SDC will continue to use those computers provided by the government for prescribed applications.

In the past, results of SDC's studies for various government agencies have been made available in the public domain after the agencies have seen the reports and given permission for release. SDC will now exercise proprietary rights in certain instances where disclosure would give aid and comfort to the competition.

SDC's Commercial Systems Division did $1.7 million worth of business last year and currently employs 140 people. The firm plans to add to this roster, and probably will bring in some talent experienced in the commercial bidding mystique, although Melahn considers his present force to be sufficiently able in that regard. SDC traditionally has received more than 80% of its revenue from Air Force contracts and when asked whether there are corporate goals to change this ratio, Melahn replied that the ratio was not the concern, that the firm would attempt to promote growth in both the military and commercial markets. SDC even hopes to make its work for the Job Corps and the Department of Housing and Urban Development a profitable enterprise.

SDC is currently offering courses in computer programming to the general public on a six-month, three times a week schedule for completion. Beginning in the fall, the fee for the course will be $1,500. The company also is giving programming training to the blind under an institutional tuition arrangement with the California Health and Welfare Agency. SDC

SDC: FORMATION AND DEVELOPMENT

Originally the System Development Division of The RAND Corporation (formed in 1955 to work on new training techniques and the Air Force's SAGE project), System Development Corporation was spun off in 1956 when RAND trustees decided that an independent organization should be established to conduct the system research and development demanded by new technologies in the information sciences. SDC, keeping the SAGE contract, became a separate, nonprofit corporation, with the stated purpose of providing information processing assistance to military, federal and other public and private organizations. However, until late 1966, Air Force business amounted to 82.5% of all SDC work, and the Defense Department as a whole for 94%.

Since 1956, SDC has grown from 1800 employees in one location to 3200 employees in eight facilities, and personnel based at 82 (primarily military) locations. Approximately 68% of this staff are professional people. In 1968, with 391 clients, SDC had $53.4 million in business volume. Preliminary figures for FY '69 indicate total billings of about $60.7 million.

Major programs: In addition to its work on the SAGE system, SDC developed — also for the Air Force — the BUIC (Back-Up Interceptor Control) system; the Strategic Air Command's Strategic Air Command Control System (SACCS); software for the NORAD Combat Operations Center (COC) in Cheyenne Mountain, Colorado; Desk Top I, II, III, IV and V system-wide training exercises for NORAD (North American Air Defense) Command. JOVIAL, a procedure-oriented programming language, was developed for the SACCS computer programs and later was adopted by both the Air Force and Navy as their official command control programming language.

Between 1962 and 1967, SDC also handled over 500 nonmilitary jobs. These included law enforcement studies for municipal governments, health systems investigations at both the federal and local levels, development of computer-assisted educational aids for use in elemen-

claims to have one of the most extensive programmer training courses in the U.S., having trained more than 2100 programmers.

SDC is now operating a time-sharing service at its Santa Monica facility on a 360/67, with software proprietary to SDC, and this will be expanded. A 360/65 will shortly be installed in the Falls Church, Va., facility for t-s service in that area, but the firm's old Q32/t-s computer will be phased out the early part of 1970 because of maintenance costs. Sentimentality seldom shows a profit.

what they think

Competitor reactions and the opinions of some former SDC employees did not vary greatly. Most were negative, critical, and nonattributable. One member of the competition thought it "was very handy" for a company to try making a profit for a year or so while being "subsidized by the government ... then decide to go the whole way." He said the "whole thing is worthy of a Congressional investigation." As for the future, "SDC will never make it unless it hires other kinds of people than what it has a surfeit of right now."

A former employee speaks: "SDC has been going through this metamorphosis syndrome for two and a half years. The only thing it has in-house that is commercial is its data center activities and a t-s system, developed partially out of government subsidy. Otherwise, all it has is its people and a backlog of contracts. It has never really wanted to be owned publicly, preferring to be bought out by one big strong mother-type. It has been through negotiations with one and another, always specifying that it keep its present personnel, or at least management. I heard a rumor that the chairman of the new board, whoever he is, will have an office in the building ... It's going to be rough for SDC to go out into the cold world ..."

— AUBREY DAHL

tary, secondary and higher education, information systems for the Appalachian Regional Commission, the Job Corps, Department of Housing and Urban Development, the Federal Council for Science and Technology and the National Council on Marine Resources, and work for the States of California, New York, New Jersey, Kentucky, and Illinois.

A time-sharing system (TSS), sponsored by ARPA, became operational on the Q-32 computer in 1963. It was one of the country's first general purpose time-shared systems, and has served more than 1,000 users to date.

Current SDC programs number more than 250 (active contracts) and range from major air defense systems to a study linking a computer to 30 electronic pianos. The latter contract, with the Wichita Kansas Public School System and the Wurlitzer Company, is to determine if third graders can learn music via a computer.

Major military work continues on updated versions of the SAGE and BUIC air defense systems, satellite control programs for the Air Force, development of software for the Airborne Warning and Control System (AWACS), navigation programming with MIT for NASA's Apollo space program, several major tasks in tactical air control system programming, development of programs for Navy strategic command systems and the Air Force's Space Defense Center.

In the public systems area, SDC continues to be heavily involved with federal, state and local government agencies in the fields of educational systems, hospital and biomedical information systems, telecommunications, law enforcement, transportation, and library and documentation retrieval systems.

In the commercial area, SDC is developing a major time-shared data management system which it expects to announce shortly. Meanwhile, a growing number of commercial users are being signed up for the company's time-sharing service offered on an IBM 360/67. In the research and technology areas of SDC, efforts are being devoted to development of data base systems and executive/operating systems, especially for time-shared executive systems, to development of programming languages and techniques, to development and application of the management sciences, and to urban problems.

FCC REGULATION OF ISAL MAY RESULT FROM BELL RATE INCREASE REQUESTS

The hydra-headed hassle over data communication tariffs sprouted another head last month when two Bell system affiliates applied for rate increases that would cost on-line service bureau operators up to 400% more per month.

GE and Com-Share reportedly have begun mobilizing a counterattack. One possible result is that the FCC will assume jurisdiction over key data communication services that are now controlled by state regulatory bodies. Such a change could make Ma Bell and its affiliates far more responsive to customer complaints.

The higher rates were proposed in Ohio and Colorado by Ohio and Mountain Bell, respectively. They would apply to "information service access lines" which span part of the distance between a service bureau's on-line computer and a customer in the same telephone exchange area. Specifically, the ISAL links the exchange switching center to the computer; it may also link the center to a concentrator or multiplexor tied to a service bureau computing facility in another state. Some non-commercial on-line systems also require ISAL's.

Ohio Bell asked permission to raise its rate from $9.05/line/month to $37.45. In Colorado, Mountain Bell asked for a sliding scale increase ranging 50-100% above the present charge. In both cases, the charge would be levied only on the computer operator, rather than the user—e.g., the service bureau, not its customer. But knowlegeable sources predict that if these increases are approved, rates will be raised subsequently for service bureau customers. It was also predicted that the two pending increases, if allowed, would generate similar proposals from all the telephone companies throughout the nation offering similar service. If that happens, says a spokesman for one nationwide service bureau, "our communication costs would go up a million dollars a year." Another source says he has "proof" that "this whole thing has been masterminded from 195 Broadway (AT&T's headquarters in New York)."

precedents for increases

Similar rate increases have been allowed or requested in a number of other territories served by Bell operating companies (see Oct. '68, p. 71, and Jan. '69, p. 75). These cases involved a "special assembly" section of the state tariffs, under which the carrier can negotiate higher rates separately with each customer. The new charges don't have to be specifically approved by the regulatory agency, nor do they have to be listed in the tariff.

In the past, special assembly service has been used to levy new charges on some customers, after which the carrier has gone back to the state commission and pointed to this customer acceptance as justification for adding

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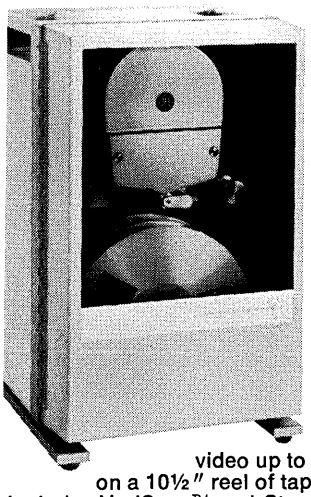

PI-7100
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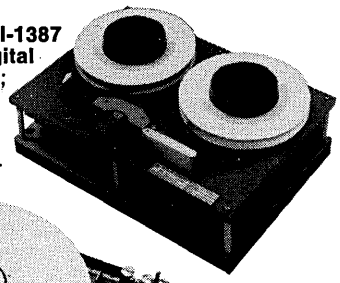

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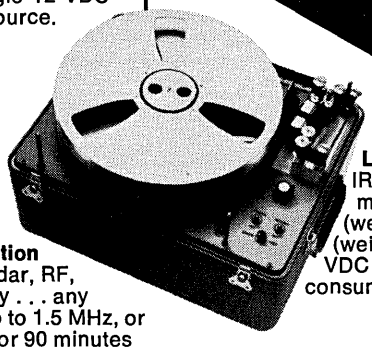
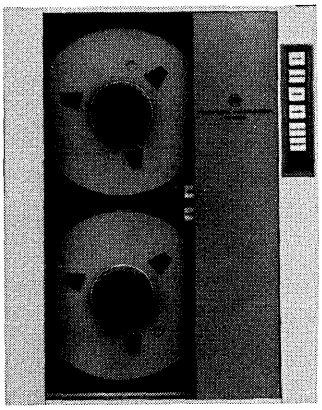
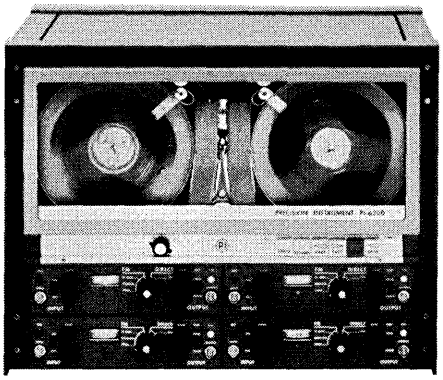


PI-5100
Long Term Monitor
IRIG formats. Two models—1″ tape (weighs 60#); ½″ tape (weighs 35#). Uses 12 VDC source; low power consumption.



PI-1200 Digital
Read/Write, IBM compatible: 7 or 9 track formats
Three modes: high speed, slew, and incremental



PI-6200 Portable Instrumentation
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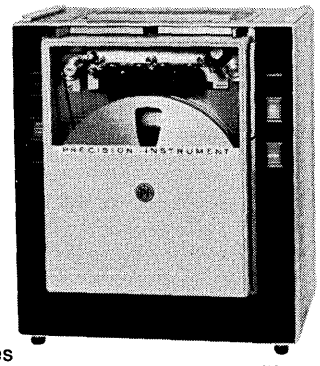

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CIRCLE 18 ON READER CARD

the new rates to the tariff and imposing them across the board. Apparently, that's what is happening now in Ohio and Colorado. Earlier, the regulatory commission in each state allowed higher special assembly rates for computer access lines.

If these increases are now added to the Ohio and Colorado tariffs, it seems clear that the other state regulatory commissions will be encouraged to approve similar rate hikes, particularly in those cases where higher charges for computer access line service have already been proposed on a special assembly basis.

protests prepared

Immediately after the tariff changes were filed in Ohio and Colorado, GE and Com-Share reportedly began preparing formal protests to the Ohio PUC. It appeared likely that the rate increases would also come up at the informal discussions on foreign attachments scheduled to start this month in Washington at the Federal Communications Commission.

Two basic lines of attack probably will be pursued. One will focus on the carriers' justification for the increase; the other, and probably more significant one, will argue that FCC, not the state commissions, really should have the final word on ISAL rates.

Basically, the carriers argue that higher ISAL rates are required because dial-up calls to and from a computer involve extra-long holding times, which impose an excessive load on central office switching equipment. Com-Share and GE, in their protests to the Ohio regulatory commission, plan to argue that this isn't always, or even usually, true. They'll ask Ohio Bell to prove its claim and then try to shoot holes in the evidence presented. The two dp firms will also insist that whenever ISAL service *does* impose excessive holding times, the problem can be eliminated by using high-speed, independently-manufactured modems. These are now legal, under many state tariffs, but the shortage of telephone-company-supplied interfaces, also required, puts independently made terminal equipment beyond the reach of many users of the switched telephone system.

fcc regulation

The attempt to give FCC more jurisdiction over data communication tariffs is particularly significant because service bureau operators, and others in the telecommunications business who now have to deal with intra-state tariffs, are extremely unhappy with the arrangement. Some of the reasons were spelled out by the Computer Time Sharing Section of ADAPSO, in a comment filed with the FCC during the computer inquiry.

"The telephone companies are not today providing the nationwide service necessary to support the communication needs of a time-sharing computer service firm serving a geographically diverse area," said CTSS. "... For example, the Model 37 Teletype ... has certain optional features which are required for reasonable operation with time-sharing hardware and software ... Currently, the question of the Teletype Model 37 being supplied by the telephone companies is under consideration by the public utilities commissions ... of the various states." Unless all the commissions accept the Mod 37, CTSS added, "the time-sharing vendor will be unable to provide a uniform service across the country ... Another situation ... is the 'direct access arrangement' ... This device is currently available in only two or three areas and is being considered by the ... commissions in most others."

If FCC takes jurisdiction over ISAL rates, this authority could probably be extended easily to cover the terminals and interfaces connected to these lines —i.e. to the availability of such devices as the Mod 37 Teletype and the direct access arrangement.

isal similar to catv

The chief obstacle to such a development is the Communications Act of 1934. It specifically denies FCC jurisdiction over "charges, classifications, practices, services, facilities, or regulations for or in connection with intrastate communication service by wire or radio of any carrier."

But last year, the U. S. Court of Appeals concluded that FCC, despite this language, *did* have jurisdiction over CATV facilties located wholly within a state. The basic reason, said the court, is that "the cable facilities furnished by the telephone companies are links in the continuous transmission of signals from the point of origin to the set of the viewer, and the intelligence received by the viewer is essentially the same as that transmitted by the broadcaster. *Irrespective of the location of its physical facilities, the common carrier which thus participates as a link in the relay of television signals is performing an interstate communications service* (italics in original text)."

The court added that FCC was right in insisting that its jurisdiction extended to intra-state CATV links because "any other determination would tend to fragment the regulation of a communications activity which cannot be regulated on any realistic basis except by a central authority; fifty states and myriad local authorities cannot effectively deal with bits and pieces of what is really a unified system of communications."

Like CATV signals, the data signals handled by information services access lines are transmitted over a continuous path and reach the computer essentially unchanged from the form in which they left the terminal, explains an FCC source. "If part of this communications path is interstate, then it seems to me that the CATV decision could justify FCC jurisdiction over the related ISAL rates."

— PHIL HIRSCH

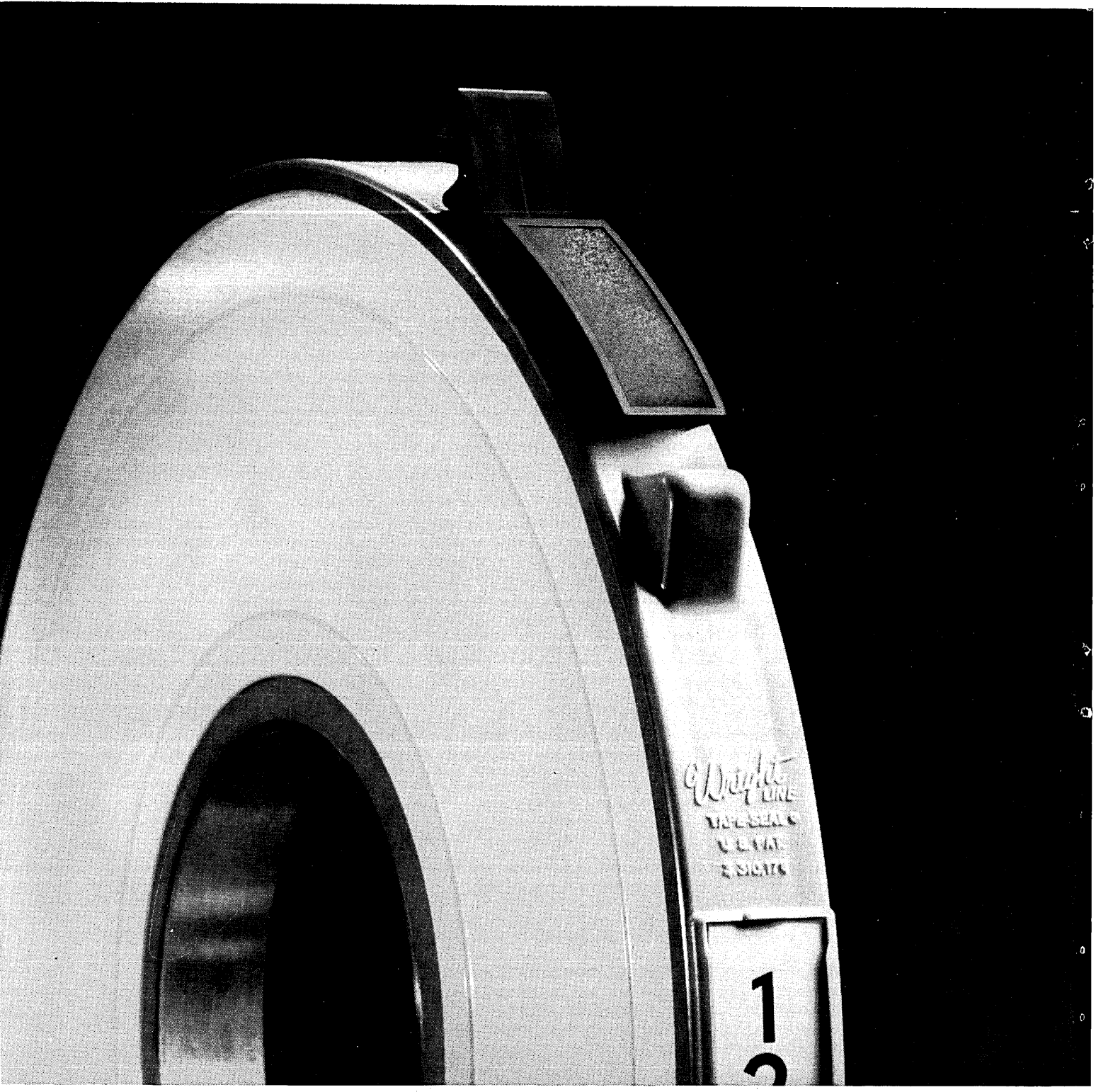
WHAT'S A 1401 LIKE YOU DOING IN A NICE PLACE LIKE THIS?

White sandy beaches, Caribbean breezes and Atlantic winds, tropical gardens, sugar plantations, a bunch of keypunches and a 1401 — Barbados.

During a sojourn to the magnificent little island nation, DATAMATION visited the data conversion facility of International Systems Associates, Ltd., a New York-based computer systems and services firm. It was an unusual opportunity to see a nation's first computer being installed — even if Barbados is only 21 by 15 miles big and has only 250,000 people. And just as rare: a chance to visit with a successful corporate manager who had "chucked it all" for the original "Island in the Sun."

This March, Morton Bramson, ISA's new managing director, abandoned his job as business manager of Union Carbide Corp.'s nationwide data processing operations for the branch office of a million-dollar firm — complete with 120 people, 70 keypunches and verifiers, and one 1401, slightly used. Bramson, after years in computer marketing, sales, and systems planning with GE, Philco, CBS, Union Carbide and other companies, had "tired of being frustrated by the internal politics inherent in large organizations." And a previous visit had shown Barbados to have a people of "high intelligence anxious to establish new industry and introduce advanced technology." In other words, Mr. Bramson had found himself an exciting new challenge in lovely surroundings.

ISA has been on Barbados for over two years. Its reasons are the same as



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CIRCLE 101 ON READER CARD

those of firms that have moved transportable operations away from the U.S. — to cut costs. This is becoming even more critical for data conversion services with keypunch operations like ISA's because of the growing competition from cheap key-to-tape and -disc and on-line entry devices. The annual income of $500,000 from this office has come from U.S. contracts, but the addition of a computer means that ISA will also have a market among Barbadian and other Caribbean firms, which primarily have tab installations.

the industrial climate

To Barbados, the existence of ISA and firms like it there means much more than that. It would like to add its name to the list of popular locations for "clean" industries like keypunching, core-stringing, and semiconductor manufacture. Hong Kong, Ireland, Nassau, Jamaica, Trinidad, and other Caribbean islands have been havens for budget-minded companies. The island has more to offer light industry than excellent climate: a three-year tax exemption for new foreign firms, inexpensive labor (partly a function of an 11% unemployment rate), a people with the highest literacy rate in the world — 98.7%, an honest government, and no gambling or Mafia interests.

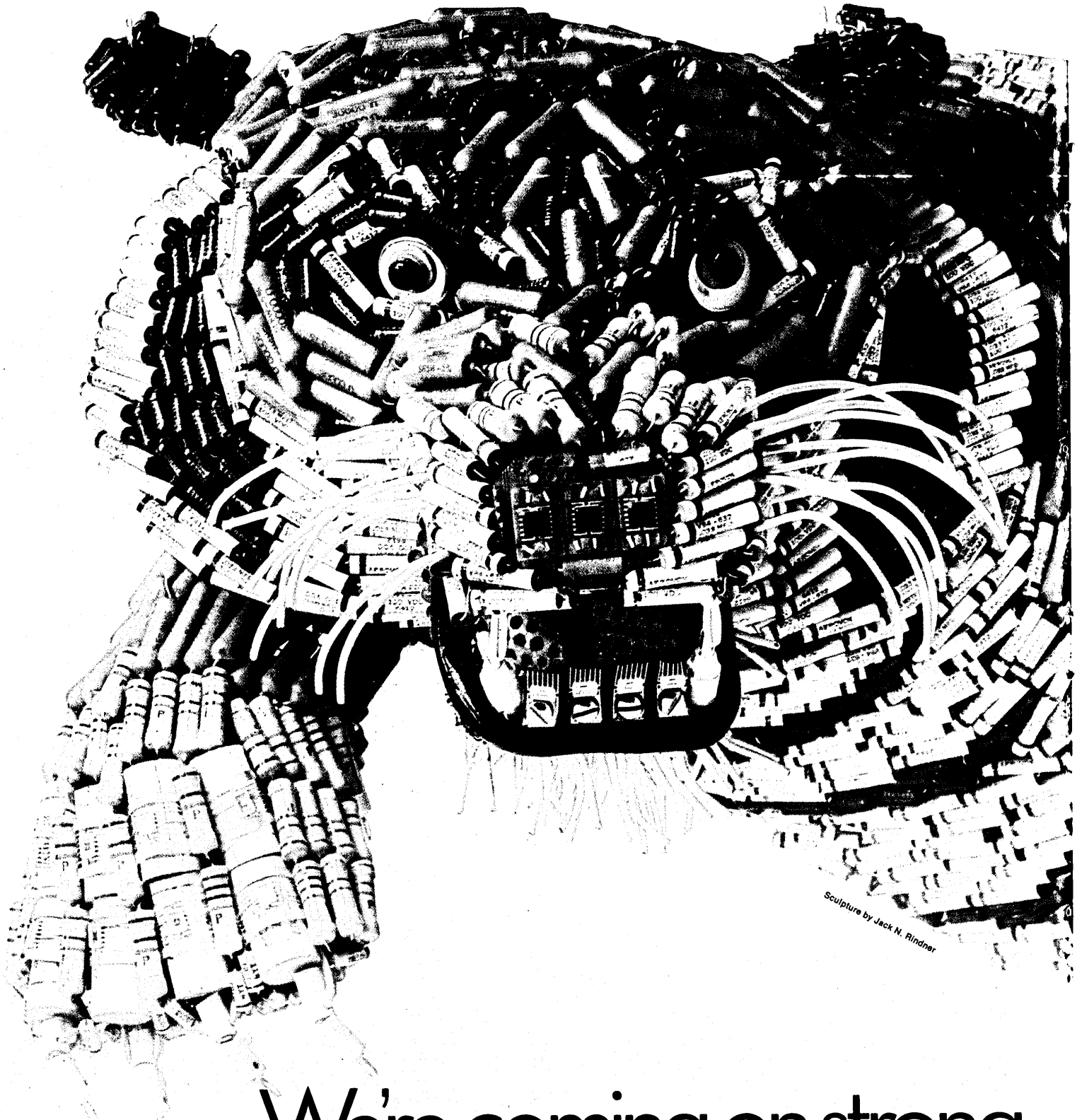
Barbados' legacy from its centuries as a British colony is an educational system that has fostered the high literacy rate. In fact, over 70% of the population have some secondary education. But the weakness in this system, as has been true of most British colonies, is that it has not in the past prepared its students in any industrial skills — inappropos to a plantation economy. (You teach them how to read and write, but nothing that will take most away from the cane fields.) The industry there is still minimal, and most of it foreign owned.

A shipping and mercantile firm controls one-third of the industry and product distribution. Indeed, 75% of the wealth is controlled by the less than 5% whites who are native Barbadians. The current government, headed by Errol Barrow and predominantly black, is anxious to bring the nation up to date industrially and to stem the emigration of its youth who are now flocking to Canada, England and the U.S.

keypunching to stay

ISA, in addition to making computer services locally available for the first time, has trained and employs 120 people in the keypunch operation. Most of these are female — that half of the population that suffers most from lack of employment opportunity on this high-unemployment island. ISA is also training seven Bajian programmers and operators for the 1401 system — naturally the first such training there too. In fact, Bramson is already discussing the idea of a computer curriculum with the University of West Indies and some hands-on computer training ISA might offer the students. He is also hoping to help the island government in conversion to their coming computer installation. New local contracts are from Esso Oil and the U.S. government project, Barbados Oceanographic and Meteorological Experiment, under way there.

Contracts from U.S. firms will continue to be the ISA moneymaker. The forte is in the overload and big conversion jobs of large companies that have their own keypunch operations. ISA offers a five-day average turnaround time and 99% guaranteed accuracy. Keypunch personnel average about $80/month, a far cry from the $500-600/month demanded in the U.S. Turnover rate is considerably less, too, although ISA loses its share of women to family-raising and emigration from the island. These factors, coupled with



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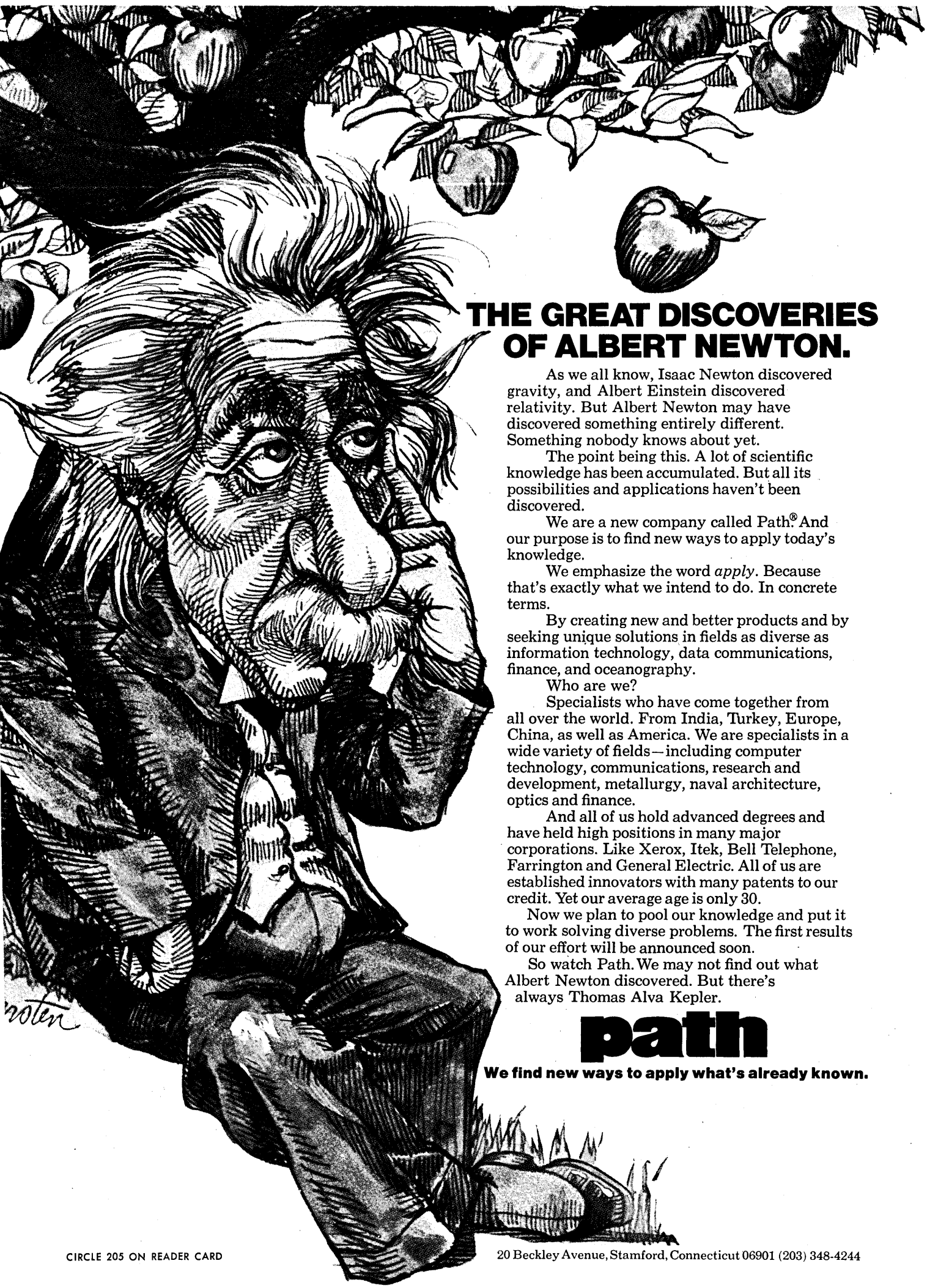
CIRCLE 27 ON READER CARD



THE GREAT DISCOVERIES OF ALBERT NEWTON.

As we all know, Isaac Newton discovered gravity, and Albert Einstein discovered relativity. But Albert Newton may have discovered something entirely different. Something nobody knows about yet.

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So watch Path. We may not find out what Albert Newton discovered. But there's always Thomas Alva Kepler.

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cheaper office quarters ($200/month), permit ISA to undercut U.S. rates by 25-50%, we're told.

Bramson notes that the "answer to data input for the next few years is not to experiment with new devices for on-line data input. Most organizations cannot justify a large bank of such devices and the training, conversion and other transition costs involved. The solution is to find a dependable source capable of meeting turnaround time requirements and of eliminating junk from keypunch output by doing preliminary editing and with an outside computer. This could greatly reduce their present cost to even below the projected benefits from on-line data entry." ISA's customer list includes ITT, Bank of New York, Longines Symphonette, Famous Schools, RCA, J.C. Penney, McGraw-Hill, and Consumers Union, among others.

Bramson expects that, with the 1401 and an IBM 360/25 that's planned, ISA revenues there will increase to $1.5 million by 1970-71. He also expects to get a lot of fishing in — and lots of sun on the sandy beach of his home, a beach club appropriately called the Paradise.

— ANGELINE PANTAGES

SHARP PRACTICES COMPANY SAVING DURING GRACE PERIOD OF TWO DAYS

About three months ago, a bright young entrepreneur with a Ph.D. in nuclear chemistry appeared magically on the Kearny Mesa near San Diego. He was driving a Porsche, not riding a stallion, and he wore a conservative suit instead of shining armor.

But Dr. Rodman A. Sharp did perform a heroic deed: he saved a struggling young disc drive manufacturing company from the distasteful fates of acquisition or dissolution. A member of the board, Sharp decided one Wednesday morning in mid-June that the decision to close the doors or sell out was wrong. By 5 p.m. Friday he had raised $750,000, by Monday another $250K.

The company, Computer Peripherals Corp., was formed in Aug. '67 in Hopkins, Minn., by Joe Costello (former Fabri-Tek exec. vp), but got underway in Jan. '68 in San Diego. But the company ran into technical problems — head design, primarily — got way behind schedule on its drives, and was running out of its original megabuck of financing when Sharp waved his magic money-raising sword.

In exchange for the new dollars, CPC gave up about 30% of the company to Small Business Enterprises Co., Becker Technological Assoc., and Paribas Corp. Sharp and some San Diego associates also kicked in.

people shifts

Financially refreshed, and well on its way to solving the head problem, CPC plans to use its money to push into production of its DSU-8100 series, head-per-track systems containing up to four 50-megabit discs with an average access time of 16.7 msec. Wayne King—veteran engineer who was one-time head of peripherals engineering at Scientific Data Systems—has moved over to become vp of advanced development, and Don Sampson—a key man in the development of the Telex disc later acquired by Data Products, and more recently a peripherals specialist at CDC—replaces him as vp of engineering. Dave Kramer, Western Electric veteran, heads up manufacturing. Dick Baker stays on as vp marketing. Sharp is president, and Costello moves up to Chairman of the Board.

Sharp, who is 39, has some rather specific and ambitious goals for CPC. By 1974 he expects the company to be producing most or all of the elements of a remote batch terminal system and to be grossing $50 million a year. He thinks the market for such systems will be a big one; he estimates general-purpose scientific time-sharing today to be about $100 million a year, spread among 140-150 companies. That should grow to $500 million in two-three years. If you figure each commercial t-s shop to have a potential for 50 high-speed remote batch terminals with a purchase price of around $20K, that adds up to $1 million per installation. But five years from now, he says, terminal values will be two to four times those of cpu's.

guess what

Sharp's guess on the number of remote batch terminals a system will need may be high; on the other hand, there will undoubtedly be more than 150 t-s systems in operation five years from now. But assuming the market is there, how does an itsy-bitsy disc drive firm make the heady jump to become a leading maker of terminal systems?

First of all, Sharp believes that for communications-oriented systems, head-per-track is *the* way to fly. He distinguishes between disc pack memories (for auxiliary data storage), and the units needed for program swapping and communications control. And, says Sharp, CPC is "at the head of the pack" in head-per-track technology, the toughest part of the remote system to make.

As for the other elements of the systems, CPC will build or acquire them after first doing a systems design job. Sharp categorized today's remote batch terminals as kludges — random collections of devices not really designed for on-line communications and batch transactions.

Although relatively new to computing, Sharp's experience includes the design of nuclear multichannel analyzers (basically similar to a minicomputer), and an on-line system using a time-shared computer to process raw data from instruments. He was also the inspiration for an on-line plotter using a modified Teletype and the formation of an on-line service to the construction industry.

terminal case

As for the role of the independent terminal maker in tomorrow's terminal-rich world, Sharp notes that today's on-line users select Teletype, Datel, IBM or other terminals, and will be even more independent in their selection five years from now. "IBM may have 70% of the computer market," he says, "but it doesn't — and won't — have 70% of the terminal market."

In the meantime, CPC will broaden its disc drive line — upward and downward — and continue for the short run to pursue the large market, avoiding the marketing and service costs of selling directly to the end user.

For a company just risen from its sick bed, CPC's goals may seem to be grandiose. But maybe not for the miracle worker of Kearny Mesa. Although Sharp has a sense of humor, he almost never smiles. When he speaks of $50 million/year in five years, one tends to believe him. Indeed, Dr. Sharp appears to be keener than most.

— R.B.F.

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news briefs

LUNAR LANDING HAD ITS EARTHBOUND HEROES

In spite of the immaculate perfection of the moon landing by those now-near- saints, Armstrong and Aldrin, there was one crucial moment of Apollo 11 when mere mortals showed they can still put the computer to shame. It came in the last critical 4000 feet of descent to the lunar surface. Suddenly the commander of Eagle called out in the continuous babble of exchange between Houston and the spacecraft, "12 alarm. 1201."

At mission control, the television and control monitors following every action of the Eagle saw the flashing light that told them the navigation and guidance computer on board was overloaded. The navigation and guidance instruments were simply pumping information into the Raytheon onboard computer faster than it could process it.

As Dr. Christopher Kraft, director of flight control operations put it later, "it was bad news. If it continued, the computer would give up the ghost."

The post-flight explanation of the event was straightforward enough. But the dispassionate descriptions bely the gravity of the situation when the men on the ground had only seconds in which to advise the astronauts what it all meant and what action to take.

The heroes of the moment were Stephen Bales, a guidance officer at ground control, and fellow astronaut Charlie Duke, who sat in the Capsule-Communicators chair at Houston and acted as the intermediary between the man on the ground and the men in space. Charlie Duke's gentle manner and boyish good looks tend to hide the fact that he has poured oil on troubled waters before (on Apollo 10 he instantly recognized the troubles that caused Tom Stafford and Gene Cernan to gyrate wildly in their spacecraft as it swept low over the moon).

In this case Stephen Bales recognized that too much data was pouring into the small on-board processor. Information displayed on his monitor told him that, among other things, the rendezvous radar to be used for meeting up with the command module Columbia was switched on. As Eagle weaved its path to the surface of the moon, the rendezvous radar was working overtime feeding navigation data about the position of Columbia into the guidance computer. It accounted for about 15% of data going into the processor. But at this point of descent it was redundant.

The issue was whether the flashing alarms should call for the landing approach to be aborted. It was Bales who realized that the system would cope if the astronauts kept the loading on the computer to a minimum by a simple procedural change of not interrogating the processor about the status of the landing radar unit and letting ground monitor take over the task. The information would be directed to the crew from ground control. From that moment, Stephen Bales called out the landing radar information, which was repeated almost before the words were out of his mouth by Charlie Duke to Eagle. And down Eagle went,

COMPUTER HARNESSED TO NAME NAMES

The U. S. Trotting Association USTA in Columbus, Ohio, is using a 360/20 to list the names of all harness horses, both trotters and pacers, in the modern era to help ease the troublesome problem of name selection. Hundreds of thousands of colts are foaled each year and the chances of duplication are high, considering the many bloodline names that are repeated over and over in various parts of the country. The name "Hanover" is only one of dozens to which other names are attached to become "Bret Hanover" or "Dancer Hanover," or "Hanover Yourdoe." USTA hopes to be able to use the system to help owners select a name. Nothing was mentioned about selecting winners.

There are several considerations involved in selecting a harness horse's name: There may be no more than three words in it nor can it be longer than 18 characters, including two spaces; there can be no similar sounding names (to protect against heart failure in photo finishes?); a name cannot be used again until five years after the death of the original horse or about 20 years after registration; names of famous dams and sires cannot be used unless the horse is a bloodline offspring.

The computer is programmed to check out all these requirements. When an owner wants to name his horse, he submits three choices and if none of them is suitable, the computer will rearrange them to determine if one of the combinations will unlock a name. It'll never come up with a Dan Patch.

news briefs guide . . .

to its landing site.

And the next piece of conversation went:

Eagle (Armstrong): Houston. Tranquility Base, Eagle has landed.

Capcomm (Duke): Tranquility, we copy you on the ground. You've got a bunch of guys about to turn blue. We're breathing again. Thanks a lot.

S/3: COMMENTS, REACTIONS, CONJECTURES

Reaction on IBM System/3 — or might conjecture be the better word: The big computer user finds gross incompatibility between it and the System/360, from source code to punched card. IBM said the machine could be used as an off-line complement to a centralized on-line system and doesn't appear to consider conversion a problem — or perhaps there are solutions in the works. The big people also wonder about the latent communication possibilities of S/3.

But the sophisticate isn't the market for the machine. IBM is after 25,000 first-time users. Few disagree that the computer giant will find them, and more. And they don't expect the tab equipment user to balk at conversion from the 80-column card to the new 3-column, 96-character, 2½ by 3¼ inch card. No one expects IBM to deadend the first major change in punched cards since Dr. Hollerith geared up for the 1890 census.

The other manufacturers have said little yet about the card beyond criticising IBM's irresponsibility in adding another incompatible medium for data recording. On the other hand, they encourage IBM's evangelism of computers. They welcome the new users and the use of IBM's money to bring them into the market. IBM won't lose money on the deal. The new user will be locked into the new and different System/3 and will have to buy everything at the company store for some time to come. The other manufacturers may get a crack at him by the time he's ready for his third system.

Conjecture is that the new card format may be rewarding. Although IBM is saying nothing about providing sort routines for existing machines (reacting like someone trapped when asked about this), it isn't unreasonable to say that the 80-column card's days are numbered. However it's too early to start counting.

Independent card manufacturers haven't gotten specs on the card yet, but they predict a brilliant future for it. They wonder what this means for the recently approved government specifications for Hollerith punches. Probably nothing. Is it too early to suggest a standards committee for .00060 (sixty thousandths) round hole punches?

Comments on the card indicate that standard could become an adjective for it. IBM, looking for a familiar description, said it was about the size of a credit card. Others have remarked on its similarity to the punched tags used in retailing. An observer of retail computerization pooh-poohed both these assumptions with the fact that the credit card uses only a 10-digit code and Kimball tags only 24 digits. Then he noted that Addressograph-Multigraph has a card, read by NCR cash registers, that is five columns of a regular 80-column card. He conceded there was a possibility the System/3 card could be used in this manner "if it gets wide use." Oh ye of little faith!

NAS TO HOLD CONFERENCES ON FOREIGN ATTACHMENTS

The National Academy of Sciences will help define the issues related to the foreign attachment controversy, and will recommend solutions, but the FCC will decide what tariff changes are necessary.

This is one of the guidelines that will control an upcoming series of informal conferences that seem likely to affect the quality and cost of telecommunications service for a long time to come.

The conferences are scheduled to begin "the third or fourth week of this month," according to the FCC's Common Carrier Bureau, which will manage them. They are the result of the commission's decision last December to accept Ma Bell's "foreign attachment" tariff.

This tariff, now in effect, allows customer-supplied terminals to be interconnected with the public telephone system if the linkage includes a carrier-supplied connecting arrangement. Many users, particularly data processors, as well as independent equipment makers, want the tariff amended to permit use of independently made interface equipment. What's really involved, though, is the cost and quality of telecommunications service. For, if independents are allowed to supply interfaces, and the tariff regulations are broad enough to permit a wide variety of speeds and capabilities, there will be far greater competition among terminal suppliers than if the carriers are the sole interface suppliers, retain their present monopoly over the switched-system terminal market, and keep their present control over interface specifications. This, at least, is the prevailing position within the dp industry. Ma Bell insists it must retain control over the interface to protect the quality of telephone service.

The question of who is to supply network control signal equipment — the main interface component — will be one of the big arguments to be thrashed out at the conferences, according to the Common Carrier Bureau. The others include interface requirements, transmission quality and protection.

The network control signalling discussion, said a bureau spokesman, will include the question of how to certify independently made interfaces to en-

what do you need to become a

computer

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PREVIOUS SALES, MARKETING OR OTHER EXPERIENCE

Company:_____ Location:_____
Dates: From:_____ To:_____
Duties:_____

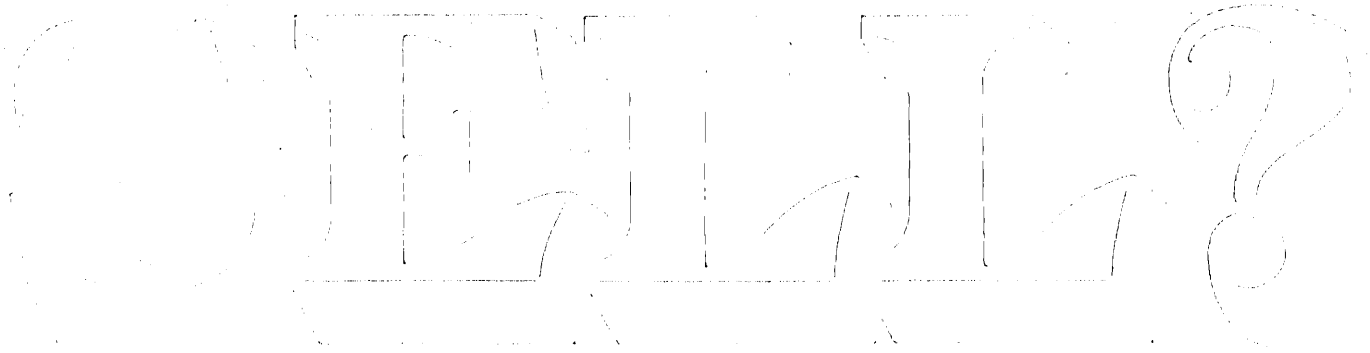
Company:_____ Location:_____
Dates: From:_____ To:_____
Duties:_____

Company:_____ Location:_____
Dates: From:_____ To:_____
Duties:_____

PREVIOUS COMPUTER EXPERIENCE (IF ANY)

Hardware:_____ Programming:_____ Systems Analysis:_____
Management of Electronic Data Processing System:_____
Computer Systems you are familiar with:_____

have anything else to



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sure that they don't endanger the integrity of the telephone network. A basic aim of the sessions on transmission quality will be to secure agreement regarding the limitations and constraints on terminals and interfaces imposed by the present and future telephone network.

The NAS panel, consisting of 10 to 12 members, and headed by Lewis S. Billig, of MITRE Corp., will conduct hearings in each of these areas, concurrently with the informal conferences, said the spokesman. Panel members will also chair the informal conferences. It addition, at least one member of the Common Carrier Bureau staff will attend each conference.

The common carrier industry will supply some members of the NAS panel, communications users and independent manufacturers will supply others, and the rest will come from government and "nonprofit" organizations. Each panel member will be expected to consider the controversial issues objectively, rather than in terms of any parochial interest his employer may have.

The studies to be undertaken by NAS, said the spokesman, will include social and economic issues as well as technical ones, related to the three major problems to be addressed by the informal conferences. The panel will have a great deal of latitude, the spokesman indicated, regarding the scope and depth of their research. It is "likely" they will ask various conference participants for assistance, some of which may take the form of separate discussions between NAS panel members and individual conference participants.

As this news brief was being written, conference procedure was still being ironed out. But it seemed likely that three sets of discussions would be organized, around the topics mentioned above. One discussion, lasting about three days, would be held each month on each topic. An agenda would be announced in advance, and participants would be asked to summarize their views and questions in writing, ahead of time. These would be circulated in advance so that when the participants got together they could spend all of their time discussing the conflicting points of view.

The bureau spokesman said he expects the discussions to last "five or six months." He doesn't believe FCC will obtain a consensus on all the issues, "but hopefully, will be able to crystalize the opposing positions so the commission will have an easier time making its decision." He added that it would "probably be necessary" for the FCC to hold a formal proceding, after the informal conferences end, to settle the unresolved issues.

WOODS HOLE SEMINAR LOOKS AT WEST TO EAST EXPORTS

The National Academy of Sciences recently conducted a week-long seminar at Woods Hole, Mass., on the subject of export of data processing goods and services to Soviet bloc countries. Specifically excluded from consideration were China, Albania, Cuba, North Korea and North Vietnam. A report generated by the seminar will be used as guidance by the various U.S. government agencies with policy questions regarding the export of edp equipment and software.

Attendees at the seminar devoted themselves to the difficult task of disregarding diplomatic and political considerations, concerning themselves only with the consequences of various potential policies in the technological realm. Much attention was paid to the state of development of data processing in the Soviet Union and the germane countries of Eastern Europe (Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and Yugoslavia), and several people familiar with the situation were on hand, including Ed David of Bell Labs, who had just completed a tour of Soviet computing centers on an IEEE exchange visit; Dick Judy of the Univ. of Toronto, who had been in Moscow as an exchange scholar, and such knowledgeable international marketing specialists as Sol Zasloff (SDS), Bill Lurie (GE), Hugh Donohughe (CDC), and Ralph Stafford (IBM).

One conclusion reached during the week was that Eastern European (non-Soviet) countries look toward the West for data processing support. In the Soviet Union, the trend is to resist Western ideas. It was generally agreed that the U.S. is two years ahead of Western Europe in a scale of accomplishment, Western Europe is two to three years ahead of Eastern Europe, with the Soviet Union another two years behind her bloc neighbors. The difference is not so much technical skill and knowledge as it is manufacturing capability. With certain minor exceptions, the East can construct a machine as large, sophisticated and capable as anything in the West. However, if they were required to make a thousand of these machinese, they'd be in trouble.

The panelists concluded that export of individual machines is not really very critical. Export of technology (mass production techniques), however, might be of considerable aid, potentially, to the USSR. But only potentially, because it is uncertain whether an explicit description of high quality electronics manufacturing would really help the Russians, whose industrial and economic system is sufficiently different from the West as to make direct transfer seem unlikely. The differences are not those of technology but of organization. Things that work here may not work there.

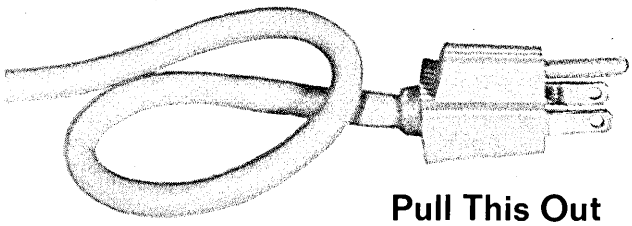
A critical question considered at the seminar was just how much transfer of equipment and technology has actually occurred. And a related question is how much of this transfer is desired by the East.

The answer to this latter question seems to be that Russia wants a minimum of transfer, preferring to invent for themselves, an attitude that appears to be more that of the politicians than the scientists. On the other hand, the rest of the Eastern bloc seems to realize the lead held by the West and wants to profit by it. Yugoslavia is treated by the Department of Commerce as simply another Western country and has one 360/50, several 360/40's and many /30's. GE has sold five 400 series machines to the Soviets, CDC has sold a 1604, and SDS recently sold a 910 and a 920 to the Moscow Academy of Sciences. IBM, while refusing to sell to the USSR (because it seems to them to cost more than it's worth), has sold over 100 360's in Eastern Europe. The consensus was that the next five years will see a $3 billion to $6 billion potential in Eastern European sales.

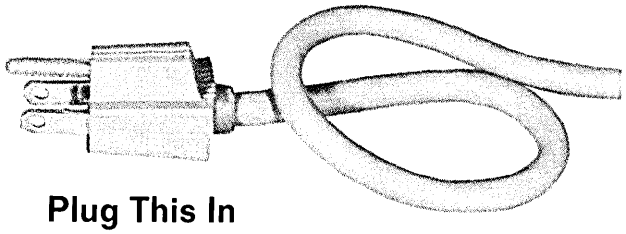
This does not include software sales. The general view of the seminar was that software technology was more easily transmitted than hardware technology. However, it was also recognized that turnkey software mailed to Eastern Europe wouldn't do them much good beyond the specific application. It seems likely that if the U.S. agencies concerned permit the export of software, there will be a substantial market for it, perhaps $1 billion over the next five years.

A persistent, and unanswered, question is the reality and meaning of Soviet reports of 360 compatible equipment. It was reported that the M-1000, M-2000, and M-3000 machines were exhibited at the Moscow data processing exhibition in May, 1969, and that the 2000 and 3000 were 360 compatible to the extent that, apparently, OS (or possible DOS) with PL/I(F) was running. It is clear that the USSR intends to produce this equipment (called ASVT), and to what extent this will lead to requests for Western supporting software is problematical. According to one observer,

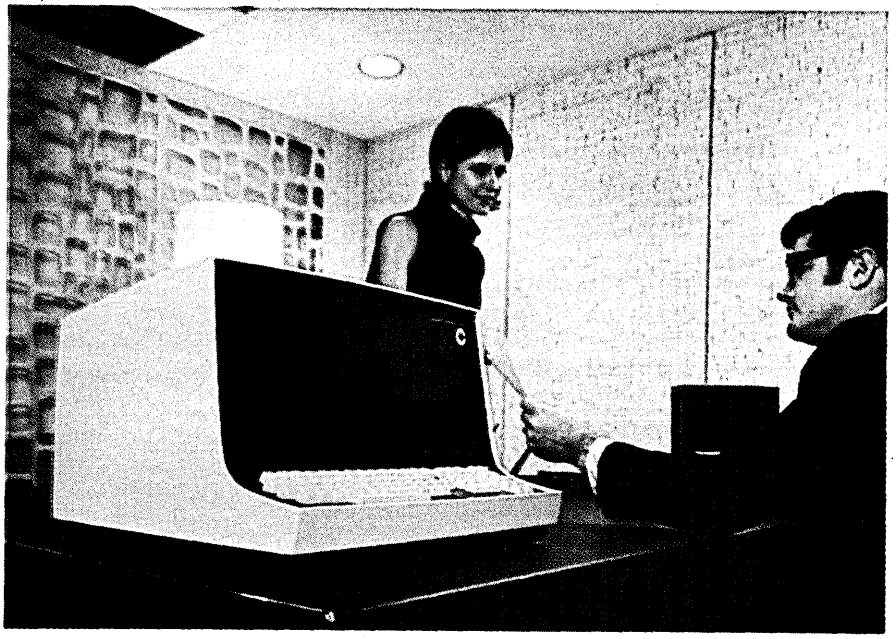
A Tip for Time Sharers
How to Reprogram for the Datapoint 3300



Pull This Out



Plug This In



It's that easy to substitute the Datapoint 3300 for your present data terminal. It's completely compatible with all time share services that now use teletypewriter terminals—no hardware or software modifications are required. And why would you want to change terminals? Read on.

The Datapoint 3300 is the first CRT data terminal designed expressly for the interactive time share computer user. We sat down and figured out what kind of low cost terminal device would enable the working professional and technical executive to communicate most effectively with a remote computer in the process of problem solution. Here's what we came up with.

The Datapoint 3300 utilizes a cathode ray tube screen to display program and file data you want to transmit to the computer — and to receive back the answers. It can accommodate 25 full lines, with 72 characters in each line, in a single display — 1800 characters in one viewing. With this screen, you can take in a complex problem situation at a single glance, make revisions, corrections or deletions for any combination of lines or characters via the keyboard; you can debug on-line; you can in effect make the computer an immediate and powerful extension of your own thought processes.

The Datapoint 3300 is engineered to cut out needless irritations and distractions. Display characters are easy to read, thanks to a high "refresh" rate, which renders each letter and figure totally stable and uniform. The machine is noiseless. No mechanical clatter to intrude upon your thoughts. You can transmit and receive problem and file data at up to 600 bps standard, and up to 2400 bps with optional speed buffer. Your productivity goes up, your "on line" time goes down. No longer are your thought processes shackled by the speed of a mechanical printer.

More: The Datapoint 3300 is styled for the modern office environment. It has the same base dimensions and weighs the same as an executive typewriter.

These are just a few of the reasons why we think you will want to pull the plug on your present data terminal. For further information on the Datapoint 3300, please write to: Computer Terminal Corporation, P.O. Box 6967, San Antonio, Texas, 78209.

Computer Terminal Corporation

though, they didn't build 360 compatible systems because the 360 is the world's ideal machine.

SBC WRITES OFF DATATEXT

Call/360 Datatext, the service that got Service Bureau Corp. into time-sharing, has been dropped. As of October subscribers will be cut off. SBC claims the service was too costly. Others claim that the Justice Dept. prompted the close-out. And still others claim it got in the way of marketing other services and equipment.

The Justice Dept. is credited with initiating the move of IBM's Information Marketing Department, which spawned Datatext and its companion Call/360 BASIC, to SBC in January. The JD came into the picture when Joan Van Horn of VIP Systems raised maidenly cries of foul. She charged that IBM should make the on-line text editing software available to its computer customers and that since it did not was an unfair competitor.

This caused questions to be raised concerning IBM's time-sharing services and the 1956 consent decree clause that denied it service bureau operations. It was thought that IBM might ignore the clause, claiming an on-line operation was outside the decree's interpretation of a service bureau, but in October, 1968, it announced that IMD would be transferred to SBC.

VIP Systems is one company that will benefit from the discontinuation of Call/360 Datatext. SBC has recommended that subscribers transfer to VIP's VIPcom, McDonnell Automation Center's Data Dialog, Autocomp Inc.'s Recomp or Marquardt's service. No one says how many subscribers to Datatext there are, but VIP is accelerating its expansion program to be ready for the added business. The company has spread to the West Coast and now has offices in San Francisco, Los Angeles, as well as Chicago, Cleveland, Boston, New York, Philadelphia, and Washington, D.C.

Autocomp, in Bethesda, Md., provides off-line text manipulation primarily to big users such as the U.S. Bureau of Patents and Prentice-Hall Co. The company will be assisted by Alphanumeric in marketing its services to the Datatext people.

McDonnell Automation's Dialog service is based in Los Angeles and marketing man Robert Parker says the initial effort to pick up Datatext people will be directed to large users on the West Coast, primarily in the greater L.A. area. He describes Data Dialog as being more a file management service than Datatext and indicated that McDonnell is interest in the "full service" subscriber. It currently has 90 terminals in operation and expects to have between 120 and 130 within the next 90 days. Eight or nine of these may be from among the "bigger users of Datatext," said Parker.

Marguardt is in the time-sharing service business through its APL Computing Services division. Formed in January, it began offering ATS (Administrative Terminal System) in June. ATS is said to be very close to Datatext and the company is now testing its system to see how the increased use of it will affect APL subscribers.

Why is SBC discontinuing Call/360 Datatext? We may as well accept the company's reason. It may have cost too much in equipment sales (one response to the question was that it got in the way of equipment sales), or brought Justice Dept. attention, or acted as a drag on Call/360 BASIC and PL/I operations. SBC's answers to the claim that the service was profitable are that it wasn't and/or it was so far as current operations were concerned but development costs were way out of line. The story that the Justice Dept. encouraged SBC to end Call/360 Datatext is answered with a report that the rumor is widespread.

Some support for the company's reasoning can be seen in the fact that SBC has not pushed the on-line Datatext, whereas PL/I and two centers in Cleveland and Boston have been added to the Call/360 time-share services. The question then asked is if SBC had handled the project a little more aggressively, would it need to be discontinued? There are a lot of ifs considered in every move that involves IBM today.

MISSING BIT DELAYS MARS PICTURES A BIT

There were some red faces among the programmers at the Jet Propulsion Lab of Caltech after the Mariner 6 and 7 spacecraft gave man his first telephoto lens closeups of the Martian surface. They were not unnaturally flushed with their success in getting a stream of pcm data from 60 million pieced together to form a television picture made up from more than one million bits. It was a feat to make those operators of time-sharing and real-time envious when they tear their hair out over losing a Ma Bell connection between points a mere two or three miles apart.

But there was also a pinking of the cheeks among the Caltech men over the "hunt for the missing bit." It occurred when the pictures of Mars had been coded out in space and safely transmitted back to California via the Goldstone tracking station. The Univac 1219 had processed the signals and dumped them with meticulous care on the big Data Disc store. Boggle-eyed news and television men from throughout the world waited for pictures through the digital-to-analog converter to be flashed on the screen. They waited, and waited, and waited — 35 minutes to be precise. At the 10 minute mark of their vigil Dr. Robert Leighton, JPL's principal investigator on Mariner, tempered their growing impatience. The reason for the delay, he explained, was a lost bit which should have given the command for the write-out from the data disc into the analog converter. As an astrophysicist trained to grapple with the mysteries of the cosmos, Bob Leighton was obviously more philosophical than his audience. "We've waited five years to get these pictures, so I guess another five minutes doesn't matter," he quipped. Judging by the ovation when the first pictures flashed on tv screens at the center, he must have been right.

NBS WILL OFFER PROGRAMS AT BARGAIN DAY PRICES

By the end of this year, the National Bureau of Standards expects to offer the public the following computer programs at prices of $100 to $200 each:

Two general purpose typesetting routines, labeled "TYPSET" and "KWIND;" a "very fast" information retrieval system for accessing large data files, and a general purpose calculation program, "OMNITAB." Each package will be fully tested and debugged, and will be accompanied by detailed documentation. Each will be written in a machine-independent version of FORTRAN. Distribution will be managed by the Federal Clearinghouse for Scientific and Technical Information, Springfield, Va.

The programs were developed by the Data Systems Design Group of the National Standard Reference Data System, which compiles and disseminates data to the U.S. technical community on the properties of substances.

The decision to make NSRDS computer programs generally available through the Federal Clearinghouse was taken early this summer. The first offerings consisted of six programs: EDPAC, a set of five utility routines for computer-assisted editing, copy production, and data retrieval, plus REFORM, a general-purpose program for

manipulating formatted data files. One tape, containing all six programs, was offered for $100. By August, it had been sold to "about 10 customers," reports Joseph Hilsenrath, head of the NSRDS Data Systems Design Group.

He added that several more programs are under development. They may be written in ALGOL as well as FORTRAN, and will be released by the Clearinghouse after OMNITAB, TYPSET, KWIND, and the information retireval package become available.

Hilsenrath explains that revenue from sales of this software helps defray his agency's operating costs and thus benefits the taxpayer. He also believes that products developed by the federal government at public expense should be made generally available.

Initially, NSRDS-created software supports the agency's mission, which is implemented at NBS headquarters in Gaithersburg, Md. and at several outside universities. But often, additional applications are found. So, even before the general distribution of these programs began this summer through the Clearinghouse, users were applying them to additional jobs. OMNITAB is a good example.

This program was written initially several years ago, and has been greatly improved since then, both by NBS and by the participating universities. At two schools, Iowa State University and the University of Maryland, students taking statistics courses are now using a conversational version of OMNITAB to do classroom assignments.

International Telecomputer Network Corporation, a commercial service bureau headquartered in Bethesda, recently added OMNITAB to its library and began promoting use of the program among statisticians, comptrollers, research analysts, and similar users. One of the developers of OMNITAB, Guy G. Ziegler, is an ITN executive. Last month, the applicatons and benefits of OMNITAB were discussed at a meeting of the American Statistical Association in Philadelphia.

CUC: EVER CHANGING, ALWAYS THE SAME

Computer Usage Co., "the oldest and the largest" computer software house, appears to be opting to stick with its programming and find itself a good merger deal. Until the latter occurs, though, it is changing presidents more rapidly than the changing of premiers in the heyday of the French Third Republic. However, due to the continued presence of Dr. Cuthbert C. Hurd, there is little radical change.

Dr. Hurd, chairman of CUC since 1962, assumed the responsibility of chief executive officer with the departure of Charles Benton, Jr., and became president of the company upon the abrupt departure of James E. Starnes last month. Previously Starnes had been chief operating officer.

This was the latest in the one step forward, two back sequence that has neutralized CUC's efforts to become profitable again. It is the third (or second and one-half) time the presidency has changed hands since first losses were reported in the last quarter of FY 1968. The nine-month figures for 1969 show the company still in the red. On an income of $9,447,800 there were losses of $724,507. There was an extraordinary gain of $52,605 from property sale. Dr. Hurd said it was the lowest operations loss since January and noted that revenues continue to decline. The board of directors recently voted to suspend, until further notice, the regular 5c quarterly dividend. In the first nine months of 1968 income was $10,714,-195 and CUC had a profit of $154,-367.

Since the end of 1968, a lot has been taken out of CUC in the hope that profits will come in. Elmer Kubie and Carl Reynolds left in July 1968. Benton, an ex-IBMer like so many at CUC Dr. Hurd included, came in and began pruning Computer Usage Education, Computer Usage Business Services, and Computer Usage Development Corp. CUE and CUBS have been pruned out of existence. The complete dissolution of CUE was marked by the departure in July of Nate Newkirk, Tom Gildersleeve and Larry Pendergast. CUDC still has a ghostly shape in the corporate structure.

Benton's pruning may have been too severe. There are reports that his intentions to take the knife to advanced software development alarmed CUC's stock in trade, its programmers, and possibly even Dr. Hurd. Benton's reasons for leaving were illness and doctor's orders. (Asked one way: "Dr. Hurd?")

At this juncture Hurd became chief executive officer and Starnes, vice president, operations, under Benton was named president and a director of the company. Starnes came to CUC from the post of director of defense programs for IBM, primarily a marketing job, and he was expected to strengthen marketing at CUC.

Starnes' reasons for leaving CUC are family reasons — he doesn't want to leave Washington, D.C. — and his belief that his talents could be better used in a large corporation. The latter makes one wonder if IBM executives can do well anywhere else.

The Starnes departure overshadows the earlier resignation of James S. Macdonald. With Macdonald went one level of management, the regional managers. He was eastern regional manager. Elbert Matthew, who was vice president and western regional manager, was named vp of marketing operations. District offices which used to report to the regional men began reporting to the president. The marketing vice president did too, and managers of personnel, contract administration, corporate systems and director of marketing reported to him.

The latest resignation has caused a series of changes through the ranks. Elbert Matthews, who was vice president of marketing operations, is now CUC vp of operations. Herbert Lechner also became a CUC vp — for federal operations. He had been vice president and federal region manager. The marketing vp post was filled by Hack C. Roy, former director of marketing.

Starnes' place on the board of directors has been filled by Walter Johnson, company vice president and treasurer. Dr. Hurd also said that Elmer Kubie, the other director, would take a more active role in the company.

Where does all this changing of personnel leave CUC? According to Dr. Hurd the company has the highest dollar volume of proposals out in its history and in-house has contracts for fourth generation systems work, part of a Honeywell system, and for development and installation of two on-line operation control systems. Unconfirmed reports give CUC three other large contracts, one said to be for programming the new 32-bit machines being developed by Systems Engineering Laboratories.

To Dr. Hurd CUC has a future as a full service systems house. Consulting and facilities management are in this mix along with CUC's software work — 20% systems programming, 60% business applications, and 10% scientific programming. About 10% of CUC revenues come from facilities management, although Dr. Hurd said the company has only one substantial contract and that there is little market for the service outside of NASA and the Dept. of Defense.

CUC is strong in Type I program development, said Hurd, which could give the company an edge in the market software houses see developing from IBM's separate pricing. It also could mean a lot if the fourth generation cycle takes off.

The present temper at CUC indicates greater conviction that the company can get back into the black.

There is talk that this will occur by mid-1970. A question is at what price. Matthews is expected to prune the CUC bush even more, which might cut down the already-diminished flock of programmers. One report has CUC's principal programmers down to 7 from a high of 30.

Nevertheless, the word at CUC is sell — software, that is — where only recently it was SEL (Systems Engineering Labs). Early in August acquisition talk with SEL terminated because of CUC's losses, said one source. There were also reports of talks with Honeywell. Dr. Hurd discounts much of the conversation as the usual inquiries that come when a company is in difficulty. He also explains that CUC must hold discussions with its customers, many of whom could be likely partners.

It is still a good bet that one of them will acquire CUC. The continued pruning, the effort to secure the company on a software base, and the continual departure of executives who might not be inclined to merger make it apparent that this is considered the solution to the company's problems. A lean — and even marginally profitable — company should be very attractive to someone in this software challenge-hungry business.

ONCE MORE INTO THE BREACH WITH ADR

Applied Data Research will begin marketing two new software packages "shortly." One is a conversational remote job entry system meant to compete directly with IBM's recently-announced CRJE and Call 360/OS packages. The other is a system simulator aimed at the market now dominated by SCERT.

An ADR spokesman admits that if IBM implements its announced plans to offer CRJE and Call 360/OS free, the market for ADR's new terminal system will be drastically reduced. But the spokesman added that it was "possible" ADR would "take steps" to prevent the IBM action. Asked whether ADR would seek a court injunction, the spokesman answered "yes, if necessary."

He indicated the company would also try to halt distribution of CRBE, a batch-type remote job entry program that is now available to 360 users free of extra costs.

ADR's CRJE reportedly will permit some programs to be executed at the same time others are being created, debugged, or updated. IBM's CRJE lacks the ability to perform both functions simultaneously, the spokesman said. He contended the ADR system has two other unique features. One is a generalized facility for programmed instruction. It allows a user to construct interactive learning sessions of his own design, which then can be executed in conversational mode. The other feature provides the terminal user with immediate syntax checking of COBOL, PL/L, and FORTRAN source programs, including JCL statements, and an immediate report of the results.

ADR's CRJE system operates under OS 360 with MFT or MVT. Separate memory partitions are assigned to program execution and program creation-maintenance functions. Normal batch processing also can be performed while either or both of these operations are underway.

The company plans to release its new program in three phases. The first, scheduled for next month, will encompass remote data set maintenance and conversational remote job entry. This capability will require a 64K core plus 1K additional for each remote terminal. The system can support up to 31 terminals, consisting of Mod 2741's, 1050's, and 2260's in any combination.

"Early next year," the program execution routines are scheduled for release. "During the first quarter of 1970," the final portion of the system, consisting of special COBOL debugging and program creation routines, is scheduled to become available.

ADR's new system simulator utilizes a discrete-step simulation process, as opposed to Monte Carlo techniques, says the company spokesman. Input preparation is "relatively very simple." ADR plans to teach users in a week how to input configuration data themselves. According to the spokesman, the simulator can accomodate "simple configurations, consisting of a single cpu and single program mode, up to a large, multiple cpu configuration operating in a multi-programmed, real-time mode." Reportedly, simulation parameters, debug facilities, and reports for a model can be specified at simulation execution time without the necessity for generating a new model.

Both of ADR's new programs probably will be leased to users in this country through the company's marketing subsidiary, Data and Information Products. Distribution abroad will be in charge of licensees. ADR has three, covering the Far East, Scandinavia, and the Common Market countries.

No prices have been announced for either package.

The system simulator will be leasable by the month or by the job. Customers will be able to run the program on their own equipment or they can utilize ADR service centers in Princeton, N. J. and Washington, D. C. Currently, the simulator is programmed for a 360 with 100K core. It will be translated into 1108 code shortly, according to the company.

AFTER THINKING IT OVER 118 YEARS, WU MAY CHANGE

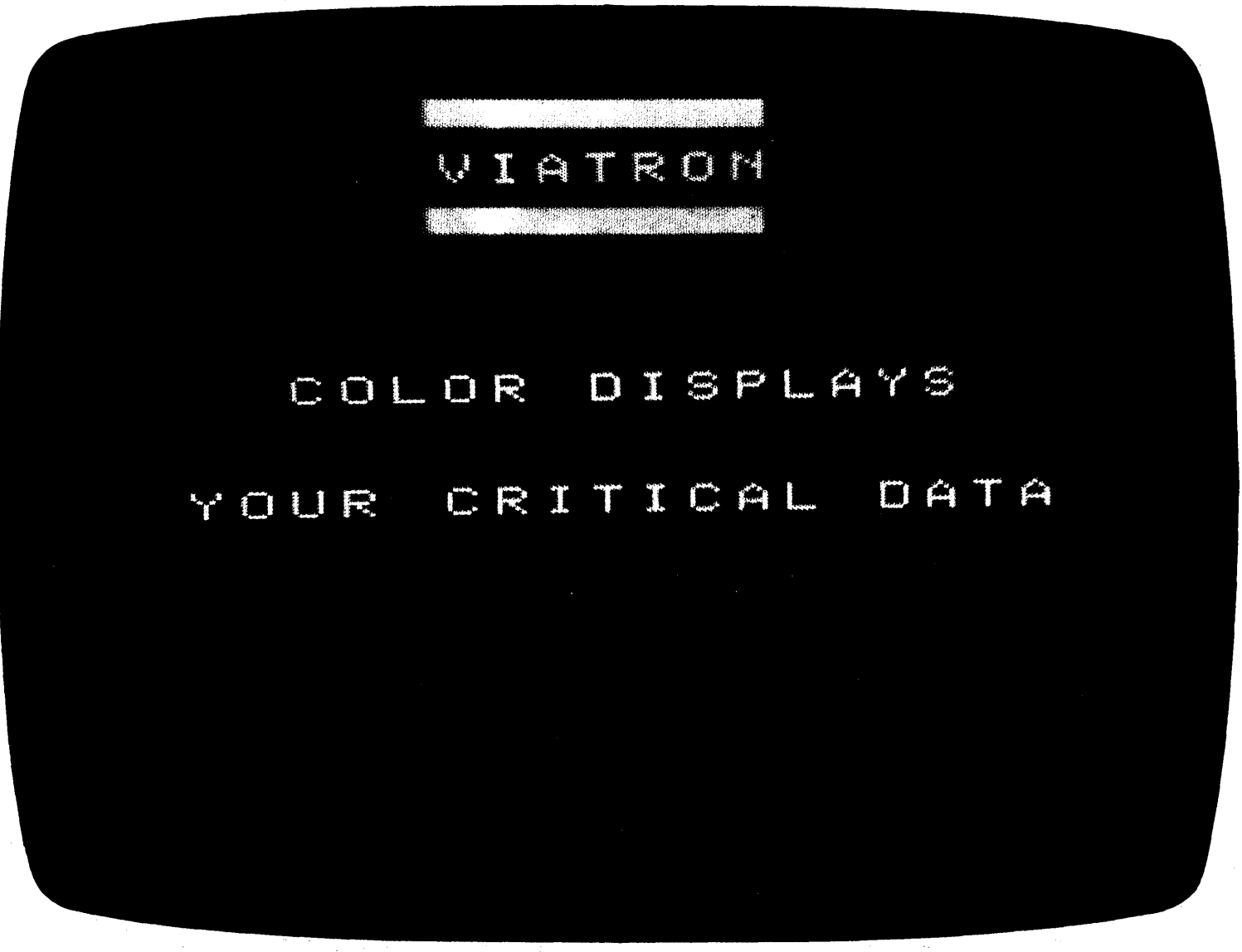
Western Union has decided the time is right for a change in its organization. In its first major change of corporate structure since formation 118 years ago, WU is planning to form a holding company. If approved by stockholders at a special October meeting and by interested regulatory agencies, the company would be incorporated in Delaware and called the Western Union Co.

Flexibility and responsiveness figure heavily in discussion of the WU plan: flexibility in financing and responsiveness to the market place. All operations would be in subsidiary companies. Initially there will be one, the existing Western Union Telegraph Co. But once this is established each key entity within the operation will be examined as a possible candidate for subsidiary number two, three, four, etc. Among the key entities are WU's private and public wire services, its government services and computer sharing operations.

The reorganization may be the capstone of Russell McFall's efforts to update the company that hadn't changed much since it went west with the railroads. It could mean WU might become the computer utility it said it was going to be back in 1963.

McFall came to WU in 1963 as executive vice president and, since becoming president in 1965, has added a marketing vice president, long range planning, and research and development. He has reduced the authority spread from 135 field, district and divisional jobs to 18 regional managers and has pulled in a great deal of new blood. Out of 20 corporate officers 11, including himself, did not come up through WU ranks. Recently he established an assistant vice president level with some 45 men recruited from NASA and technology-oriented companies such as TRW, Litton Industries, and GE.

The current phrase for the type of company WU wants to be is "record-/information service." This indicates a heavy integration of Telex and TWX, which WU is currently acquiring, and the public message network with computer-based services. WU, after messing around with customization of computers for communication and such services as PICS (resume/job matching) and Law Research, is now offering SICOM (Security Industry Communication), Info-Com, and TCCS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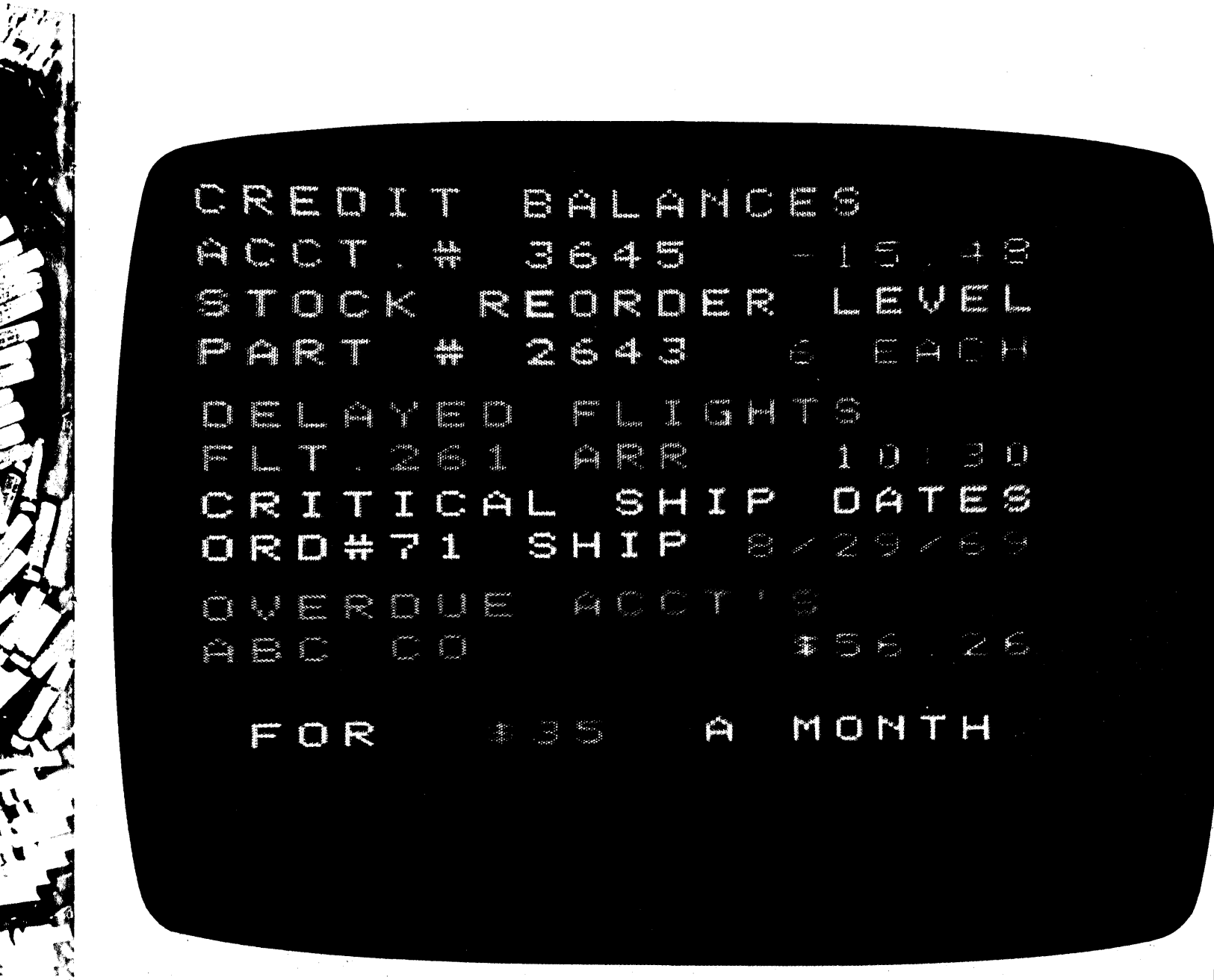

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(Telex Computer Communication Service). SICOM and Info-Com are both shared services; the one interconnects a brokerage firm — sales, back office, branches, correspondents and exchange floors — the other provides private record communication for private business. SICOM users have been going on the system since October of last year and now number about 10. Info-Com is currently being used by 10 customers; among these are United Aircraft, Kaiser Aluminum & Sales Corp., Montgomery Ward and the Sunkist Growers, Inc.

WU computers — Univac 418s — are in four centers, New York City, Mahwah, N.J., Chicago and San Francisco. New York has six of the machines. The rest have three each, one for processing, one for communication and one for backup. A computer will go into operation in Atlanta Oct. 1, to handle communication of Info-Com and TCCS.

New York handles TCCS, Chicago handles Info-Com, and San Francisco handles both. Mahwah is the center for SICOM and also takes care of research and development. In the shared services area, R&D currently includes phasing in of a Univac 1108. One is at the center being used for software development. In a few years, according to WU people, it will go online to control Info-Com, TCCS and public network operations. The plan is to have strategically placed 1108s handling messages fed from the 418's, which will become concentrators and link all centers.

WU also provides private message switching systems. One example is the 250-subscriber Bank Wire, a national network controlled by a Chicago and New York center — each with two DDP 124's.

WU still puts its circuits at the top of its asset list. It claims that once the computer conversion of its public network is complete and combined with its interconnected computer services it can give customers access to the largest communication network available. Telex users number over 30,000 and TWX will add 40,000 more. The claim of availability, however, may be premature. It depends to some degree on how the Federal Communications Commission decides its regulatory powers extend to computers used with communications.

Some observers see the WU reorganization as a move to put the company in a better position to make the most of the FCC decision. This group thinks that the commission will be more lenient with the subsidiary of a common carrier if it offers computer/communication services than it will be if the services are part of the parent company. If this is true, then some of the AT&T operating companies are prepared too.

WU is currently having a go-round with the FCC on the acquisition of TWX. Prepared to pay $105 million for the network and embark on a three year take-over process, WU began hearings before the FCC at the end of July on the acquisition, only to have them suspended until at least Oct. 13.

The reason for the suspension is that FCC examiner Arthur A. Gladstone wants an answer to why TWX/Telex subscribers can't own their own terminals and the Carterfone people are concerned about some competitive aspects of the acquisition. The competitive picture may be cleared up by economic information to be filed on Sept. 2. The matter of customer-owned terminals may take more discussion.

John E. Cox, WU assistant vice president, communications systems and equipment design, stressed the need for compatibility and proper functioning of all terminals. He said WU could not be responsible for the maintenance of such equipment. He noted that enforced compatibility of customer terminals shuts out those who wish to use a noncompatible machine, while the present arrangement of renting compatible connections from the carrier permits the use of any kind of machine.

Thus WU moves to get itself in shape for the 70s.

CONSENSUS AGAINST APPROVED CENSUS BILL

Ostensibly, the House Post Office Committee tried to give individual citizens more protection against government invasion of their privacy last month; but another view of the Committee's action is that it merely papered over a pervasive, serious, and rapidly worsening social problem.

The Committee approved a bill, HR 12884, that would amend the section of the U.S. Code that controls the Census Bureau. If HR 12884 is enacted, new language will be added to the Code forbidding the Bureau from publicly disclosing the names or addresses of individuals who answer Census questionnaires. The Code also will explicitly forbid the Bureau to "make any publication which will permit significant or systematic disclosure, by statistical inference, of data furnished by any (census) respondent."

The Bureau already imposes identical restraints on itself through administrative regulation. "If these controls are adequate, there is obviously no need for a law," explains one critic. "If they are inadequate, as many of us believe, then the proposed new law obviously isn't going to improve the situation."

But HR 12884 may not be a complete bust. It recognizes that personal privacy can be breached by statistical inference; this threat has been ignored almost completely so far in the public discussion of the privacy problem. The emphasis has been on the protection of dossier-type information. Some specialists believe that the computer makes statistical inference a far greater threat.

HR 12884 also requires the Census Bureau to get Census queries approved in advance by Congress. If the bill is enacted, this provision may give the critics a substantially greater opportunity to affect the kinds of questions asked, and the language employed.

The bill erases the present 60-day prison sentence imposable on respondents who decline to answer Census questions (they'd still be liable to fines, though), and rescinds existing authority allowing courts and state governments to obtain copies of census questionnaires filled out by individuals. Under the new language, only the respondent, his heirs and authorized agents would have access to these reports. Several other provisions permit new kinds of cooperation between Census officials and outside organizations — e.g. "joint statistical projects" are authorized, on a shared-cost basis, between the Bureau and nonprofit groups, and Bureau officials are directed to "acquire and use information already available" from public and private sources wherever possible, instead of conducting surveys or enumerations.

The hearings that led to the Committee's adoption of HR 12884 were precipitated by some 60 bills, sponsored by roughly 150 Representatives, which provided for a reduction in the number of mandatory census questions. But Census Director Ross Eckler insisted that voluntary answers would not provide accurate data, and, despite extensive evidence to the contrary, the committee discarded the bills.

HR 12884 is now awaiting a green light from the Rules Committee to move to the House Floor. If approved there, it will go to a Senate Judiciary Subcommittee, headed by Sam Ervin of North Carolina. He has drafted legislation that would make answers to most Census questions voluntary.

Meanwhile, the House Post Office Committee is considering another bill, HR 12938, that would allow the Cen-

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sus Bureau to take a mid-decade nose-count, and gather "such other census information as is necessary," beginning in 1975. The Committee is expected to approve this bill shortly.

HOW MUCH IS THAT SOFTWARE IN THE WINDOW?

A brave and cheerful IBM man came out one hot night in August to face the members of the San Fernando Valley DPMA chapter in a question and (in some cases) answer session on separate pricing of software.

Jim Foyer, marketing manager for the retail apparel industry in the Los Angeles area, first gave a masterful summary of the whole separation scene — systems engineering, future program products, and education. In the best definition we've heard of systems programming, which is still free from IBM, he said it's the kind "you've got to have." As for program products, it was his opinion that those now existing, which the company has said are in the public domain, will have the same status when a new version is issued. DOS was mentioned as an example. Later on in the question period, though, this issue turned out to be less clear cut. The conclusion seemed to be that a major revision of an existing program might become subject to charges, but the user could continue to operate the former version free.

After the summary came the questions from a group of about 50 edp managers representing a cross section of business applications from Mod 30 types to a big aerospace company. Some examples:

Q. "Why did IBM start this separation, anyway?"

A. "It was announced in December, 1968, and we think it's good" (groans).

Q. "Suppose a customer has a proprietary program of his own and hires an IBM SE to work on it. Will he do it?"

A. "Yes, but we couldn't guarantee the proprietariness of it."

Q. "What happens if the SE's working at our installation aren't done with the job they started by Jan. 1 (the end of the transition period before charges start)?"

A. "We would have put more SE's on it to finish in time."

Q. "What if a customer modifies an IBM program? Would they pay us?"

A. (Inaudible because of audience laughter.)

Q. "What assurance does a customer have that the program he agrees to pay for will work?"

A. "We can't guarantee lack of bugs ... the programs will be field-tested before release, as they always have been."

Q. "If we have a backup computer, do we have to pay for a second license for a program normally run on just the first machine?"

A. "Not for *emergency* backup ... but you would if the second one is for overflow work."

Q. "What if we have equipment on third-party lease?"

A. "All IBM equipment will be treated the same."

Q. "How did you arrive at that 3% discount?"

A. "You've got the wrong guy for that."

FIRMS KEEP COOL IN SUMMER SUITS

A long-festering problem — the walking trade secret — is coming to a head in the courts. If the legal decisions made become precedents, an employee who breaks away to use his experience to compete in the same field as his former employer could either be freed to do as much good or damage as he pleases, or be quarantined as a kind of carrier — of knowledge which has been injected into him and now cannot be removed.

The IBM suit against Cogar (Aug., p. 120), is the most notable instance of alleged trade secret violation, involving no less than 66 ex-IBM employees who walked away to the other company within eight months.

Another suit in which IBM is involved but not a participant, has been filed in Los Angeles by Applied Magnetics Corp., Santa Barbara manufacturer of disc pack heads, against Information Magnetics Corp., ditto, ditto, ditto. The latter was started in June by six ex-employees of the former. Both claim to have permission from IBM to make a patented disc pack head for independent users such as Univac and RCA, which amount to about 20% of the market. IBM acknowledges that a license has been issued to the original company, but remains mum on every other question "until things get further along." The end product of both companies is acknowledged to be the same; the point is *how* they're produced. Daniel Gillum, president of Infomag, maintains he and the others left Applied Magnetics because no attention was paid to their improvement suggestions, so they decided to do it themselves. Applied Magnetics retorts that since it developed the "basic" production method, it is entitled to keep it away from predators. Infomag says it will stick to the end — a settlement or a court decision — and has hired a double set of lawyers to do it.

Not to be outdone, Dallas has a similar suit of its own: Texas Instruments Inc. vs. Optron, Inc., a yearling firm which recently began to manufacture a light sensor competitive with TI, after several TI people opted for Optron or defected, depending on the observer. Optron has taken the offensive by filing a counter suit, charging harassment.

"A little bit childish" is the way Optron President David H. Monnich characterizes the TI action. "They're harassing the hell out of many little companies with these suits," he said, "even though there is little legal substance to their claims." The reason behind this: he feels that TI is only awakening to the danger posed to their personnel resources by the plethora of small new businesses started by ex-employees, and would like to curb the trend. Optron, which now numbers 30 employees itself, has not had its growth impacted at all by this suit, noted Monnich. Nor does he anticipate that it will be.

In any case (literally), court decisions on these suits could determine finally: 1) the legal definition — or at least the anatomy — of a trade secret; 2) the legality of proprietary agreements with employers (IBM claims the ones it had were ignored); 3) whether the man is the message, or merely the container of someone else's secrets.

P.S.: Nobody's gotten an injunction yet.

HONEYWELL-AUERBACH BREAK IT OFF

Honeywell, Inc., and Auerbach Corp. have split up Honeywell-Auerbach Computer Services, Inc., their four-month-old venture into dedicated systems. Reasons for the split as given are: both companies realized that savings and loan companies did not offer the market for dedicated services they originally thought it did; and Auerbach's customers were questioning the consulting firm's objectivity. The first reason is rumored to be close to the real problem, which included a company in which neither principal company had clear control, and a management that was hamstrung by both and without the mandate to implement any other program.

Auerbach appears to have gotten the best of the deal. It still continues to be a consultant to Honeywell. Honeywell is taking the operation to Minneapolis where it will be under the wing of Claude Smith in Honeywell Information Services. However, there is some question of just what the operation will amount to, since few of the people in Honeywell-Auerbach appear to be making the trip west from Philadelphia. Frank Rowe, ex-presi-

dent of the company, is busy resurrecting plans for a dedicated system development firm conceived before his sojourn with Honeywell-Auerbach. Jerry Herbert, Chiam Solem and James Campbell, all ex-H-A executives, are joining him. Much of the 16 man H-A staff could follow suit. The company at its demise had no products.

COMPATIBILITY IS GROUNDS FOR NEW DISC DRIVE FIRM

A new, 2314-compatible disc drive manufacturer, Clasco, Inc., expects to begin production "sometime this Fall" in Sunnyvale, Calif.

Joe Koenig is Clasco's president; he was formerly with Taxon, Inc., a Sunnyvale software-hardware development firm. Clasco has 10 other technical and managerial executives; they came from Lockheed, from IBM's recently-disbanded Advanced Computer Systems Group in Menlo Park (July, p. 121), and from Peripheral Systems Corp., a Memorex subsidiary and one of the new company's competitors.

Harrel Creasey is head of manufacturing at Clasco and Ken Fannin is head of engineering. Previously, they held similar jobs at Peripheral Systems. The IBM alumni include Hans Jeans.

Computer Learning and Systems Corp., headquartered in Rockville, Md., owns an 83% interest in the new enterprise. Koenig and his associates own the rest. Computer Learning is best known for its dp training programs, and for a dp system simulator called "Case." The company is investing $1 million in Clasco, part of the proceeds from a recent 450K share, $3.5 million stock issue.

Clasco's first product will be a single-pack drive that it hopes to market to end users through an exclusive arrangement with an edp equipment leasing firm. A micro-programmed controller is "planned." A Clasco spokesman said the new drive unit would offer greater reliability, faster access, and be substantially less expensive than the competing products of Memorex, CDC, and IBM. The increased reliability will come from in-house manufacture of "the principal subassemblies."

THE OLD ESSEX WAS NEVER LIKE THIS MIGHT BE

A Computerized Energy Distribution and Automated Control System (CEDAC) for automobiles has been developed by Essex International and a group of Essex-sponsored scientists and engineers at Mellon Institute of Carnegie-Mellon Univ. The electrofluidic system was designed to replace automotive electrical circuitry and related components. Its heart is a digital computer the "size of a match box," which is connected to a single energy distribution and control harness that is routed throughout the vehicle to sensors and actuators for control of "virtually every automotive function of cars of the future."

The primary concept of the system is the use of digital controls to reduce wiring. In effect, each function will be time-sharing a wire, a method that is just beginning to be used in advanced aircraft.

Essex also announced collateral development of an external diagnostic computer that interrogates the CEDAC System and isolates maintenance problems. The firm intends to enter high volume production of integrated circuits, which are part of the system.

Essex president Paul W. O'Malley said "a pilot line will begin manufacturing components for the CEDAC System this fall in Pittsburgh, Pa. By 1978, volume is expected to increase annually to 400 million integrated circuits, 200 million power transistors and 100 million fluidic devices."

MAGNETIC BUBBLES TO REPLACE DISCS?

A single-wall domain magnetic memory developed at the Bell Telephone Laboratories could someday offer a replacement for the magnetic disc. A patent for the new memory was issued last month to Dr. W. H. Shockley, a Nobel prize winner for his work as co-designer of the transistor effect, Stanford Univ. physicist, and Bell consultant; others named in the patent are A. H. Bobeck, U. F. Gianola, and R. C. Sherwood, all of Bell Labs.

Minute magnetic "bubbles," which are locally magnetized areas that can move about in thin plates of magnetic material, are the basis of the new development. The bubbles can be created, erased, and moved anywhere in thin sheets of magnetic material without interconnection. They may interact with one another in a controlled fashion and their presence or absence can be detected. Therefore, devices employing them could be made to perform such functions as logic, switching, or adding, in addition to memory, all within one solid magnetic wall.

The energy needed to manipulate the bubbles can be applied either by current carrying conductors or picked up from a surrounding magnetic field by microscopic "ferromagnetic antennae" in printed patterns distributed over the surface of the material. The bubbles may be controlled either by programming electric currents in an overlayed pattern of conductors, or — with no connecting wires — by controlling the surrounding magnetic field.

Stepping-stones to the new technology are the orthoferrites, magnetic materials composed of rare earth iron oxides. When a magnetic field of a critical value is applied to an orthoferrite, bubbles — almost perfectly cylindrical magnetic domains — are formed. These bubbles can be moved at high speed in the plane of the sheet of the orthoferrite material. As the bubbles are moved into precisely defined positions, their presence or absence at different positions can represent binary numbers.

Bubbles of a size corresponding to only a few wavelengths of light can be manipulated, permitting memory densities of about one million bits per square inch. The energy required to move, or switch, such a bubble is minute — a fraction of that needed to switch a transistor. One experimental device using the bubble technology is a shift register. Bell Labs claim that data rates of three million bits per second have been demonstrated with the bubbles.

The firm states that "much work still remains before these devices can be shown to be practical for use in computer or communications systems." However, they have a high potential for "functional adaptability, physical simplicity, small size, low power, and low cost" that may open the door to "new strategies in system organization." The conventional random access memory organization does not appear to be a particularly suitable vehicle for the bubble technology. On the other hand, the fact that logic and memory "now appear almost indistinguishable" suggests that other organizations may be appropriate. The potential low cost may even portend trade-offs between hardware and software.

Bubble technology is still in the research & development stage, and Bell Labs would not comment on any price range for the memories. An article in *Electronic News,* however, quoted an anonymous source "close to the Laboratories" as saying the price would be "in tens or hundreds of dollars rather than thousands per memory unit."

But if you're not satisfied with bubbles, how about ...

ERASABLE HOLOGRAMS FOR OPTICAL MEMORY?

Well, if we can put a man on the moon, maybe RCA can do something practical with holograms. The new holograms are the result of four years' development, and can be erased magnetically. Called phase holograms, they are produced on a special magnetic surface through the interaction of both the heat and light inherent in a laser beam. Significance of the new RCA technique, which is still in the research and development stage, is that it could make possible an optical computer memory able to store 100 million bits of data in a film one inch square that could be read out, erased, and reused repeatedly. Other experimental techniques based on the use of photographic film or similar photosensitive materials have resulted in read-only memories that cannot be erased because they undergo permanent chemical changes when exposed to light.

The RCA process is said to make it possible to write information onto a magnetic film in 10 billionths of a second, and to erase it in 20 millionths of a second. Reuben S. Mezrich, who developed the technique under the direction of Dr. Jan A. Rajchman, Staff vp, Information Sciences, described it as follows:

"An extremely thin film of manganese bismuth, a magnetic material, is deposited in a single-crystal layer two-millionths of an inch thick on a base of mica. The film is then subjected to a strong magnetic field that forces all its magnetic atoms to line up with their north poles in one direction, their south poles in the other. Next, the light from a pulsed laser is split into two beams, one going directly to the film and the other going first to the information bit pattern to be recorded and then to the film. At those points where the two beams interfere constructively (add their powers together) the heat from the laser beams warms the magnetic material sufficiently to allow its magnetic atoms to realign themselves so that the north poles of those in the heated portions now point in the same direction as the south poles in the unheated portions. Where the two beams interfere destructively, nothing happens.

"Thus, a magnetic pattern is created in the film that corresponds to the interference pattern created by the converging laser beams, and a magnetic hologram is born. The magnetic hologram can be read in two ways, either by transmitting a laser beam through it, or by reflecting the beam from it. Finally, the hologram can be erased simply by electronically pulsing a nearby wire coil that subjects the film to a strong magnetic field and forces the magnetic atoms to line up, as at first, with all north poles in one direction, all south poles in the other."

The speed and ease of making and erasing magnetic holograms, coupled with the fact that their resolution of 2,000 lines per millimeter far surpasses that of ordinary photographic materials, make the process very attractive for achieving an optical memory. Thus far, there is no indication that the process causes any thermal decay or other fatigue in the material. Apparently, the write-erase cycle can be repeated indefinitely, and, because of the inherent redundancy of holographic storage, dust or minor imperfections in the magnetic film do not seriously affect the hologram readout, which can be read by light-sensitive devices, or even the human eye.

NEW FIRM TO SELL NEWSPAPER SOFTWARE

Tal-Star Computer Systems, Inc., a joint venture between the Washington Star and Talcott National Corp., a New York City holding company, was organized recently to offer specialized software, consulting, and equipment leasing services to the newspaper and radio-tv industries.

A dp center will be built in Princeton, N. J. "within 12 to 18 months," according to Edward H. Fawsett, Tal-Star's vp and treasurer. The center will provide users of Tal-Star's software with an on-line batch processing facility.

The company will concentrate on the newspaper market initially, and develop related software and services for the broadcasters later, Fawsett explained. The software will perform various business-accounting functions, and control computerized composing machines — both the hot and cold type variety. The specific business-oriented applications include payroll, advertising accounts payable, budget analysis, and subscription fulfillment.

Composing room equipment as well as data processing equipment will be leased. Talcott National is already in the dp leasing business through its subsidiary, Talcott Computer Leasing Co.

Truman F. Rice is chairman of Tal-Star, and Ira. S. Zweifler is president. Rice is vp of a Talcott subsidiary engaged in commercial factoring; Zweifler is a vp of the leasing firm. John McBride, formerly corporate dp manager for Copley Press, is marketing vp for Tal-Star. Fawsett is assistant to the president of the Washington Star, which has been using computers in its own operations for several years.

Tal-Star is currently headquartered in Washington, but will move to Princeton when the service center is completed.

FJCC EXHIBITS SOLD OUT; HOTEL ROOMS GOING FAST

A record 337 companies will exhibit at this year's Fall Joint Computer Conference, to be held in Las Vegas Nov. 18-20. Approximately 65 of these firms are first-time JCC exhibitors.

The original allocation of 780 booths was sold out in June, and the conference booked an additional 200 booths at the Sahara Hotel, not far from the Las Vegas Convention Center where all the exhibits were originally to be housed. This extra space was sold out immediately, and the total now stands at almost 1000 booths. Compare this with 174 companies in 427 booths at this year's Spring Joint Computer Conference in Boston and approximately 100 exhibitors manning 265 booths in 1965, the last time the Fall Joint was held in Las Vegas. Incredible.

The American Society of Information Processing Societies (AFIPS), sponsors of both the Spring and Fall Joint Computer Conferences, expects that subsequent JCC's will have enough space to accommodate the same number of exhibitors that will be in Las Vegas this November.

Because of the overwhelming response to the preliminary housing reservation forms distributed at the SJCC, the conference has also contracted for additional hotel rooms. Motels on The Strip and hotels and motels in the downtown area have been added to the original list. These do not appear on the reservation request card in the "Action!" folder being mailed to all AFIPS sponsoring society members. Approximately 4000 rooms are still available. If you have not made hotel reservations for the FJCC, write immediately to the FJCC Housing Bureau, Las Vegas Convention Center, Las Vegas, Nev. 89101.

BARTON SPEAKS FROM AUSTRALIA

Robert S. Barton, professor of computer science at the Univ. of Utah and a participant in the design of the Burroughs B5500 and B6500, visited Australia recently and advocated decentralized computer operations for Australian governmental and semigovernmental bodies. Barton disagrees with the large network philosophy that calls for one super-scale computer tapped through transmission lines, and recommended that each city or region have its own, smaller computers. His main objection to centraliza-

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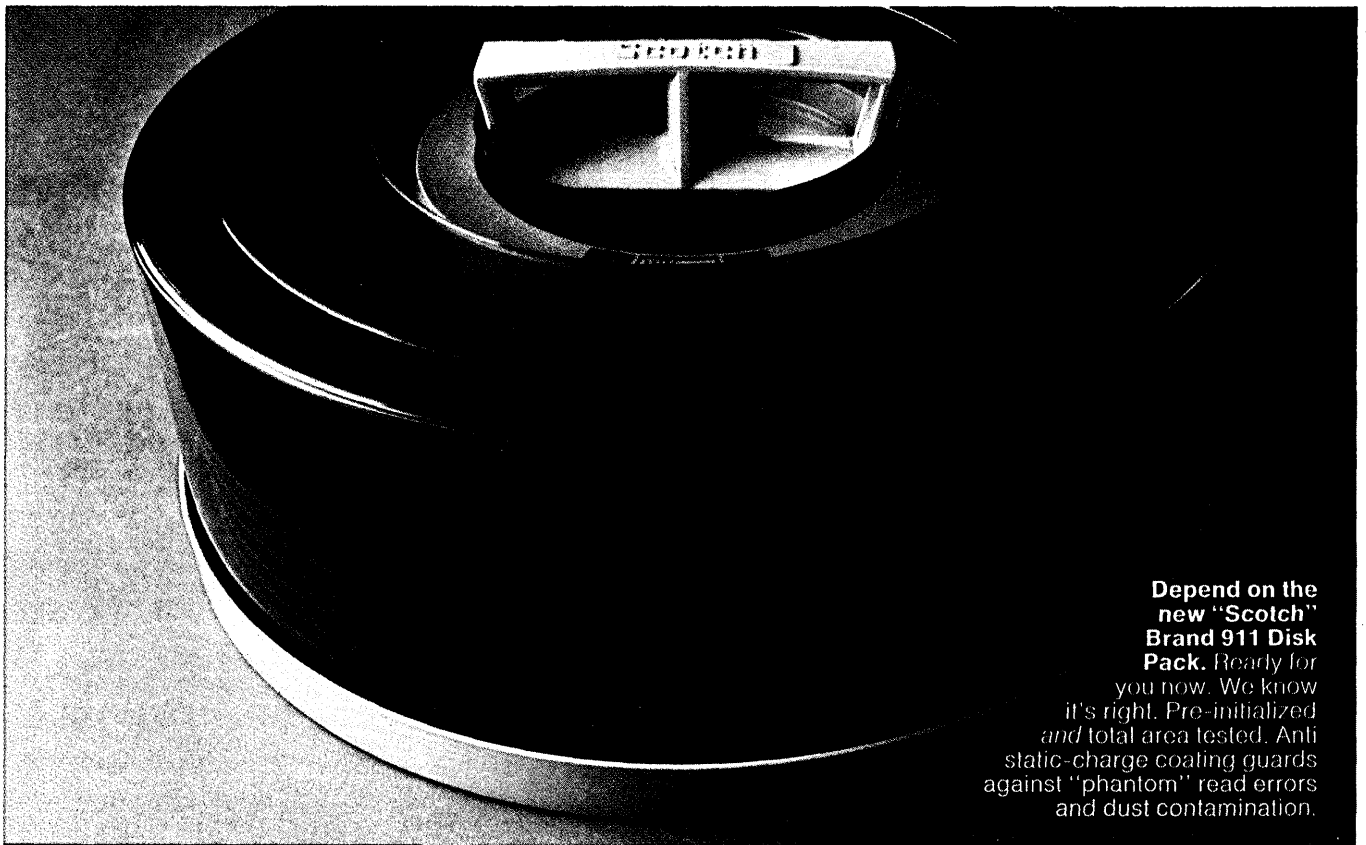

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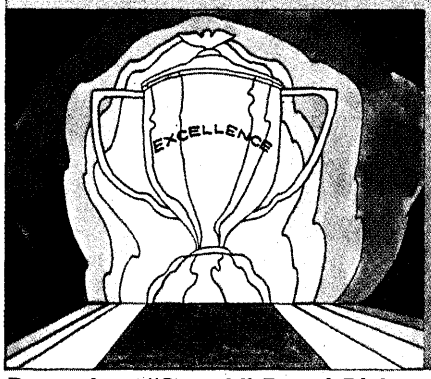

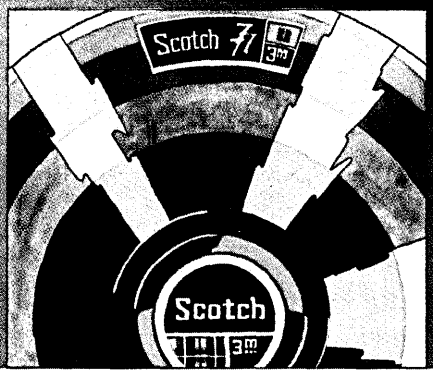

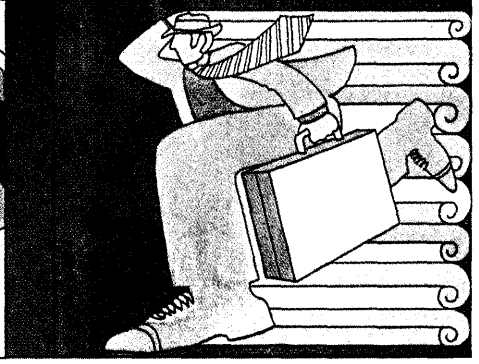

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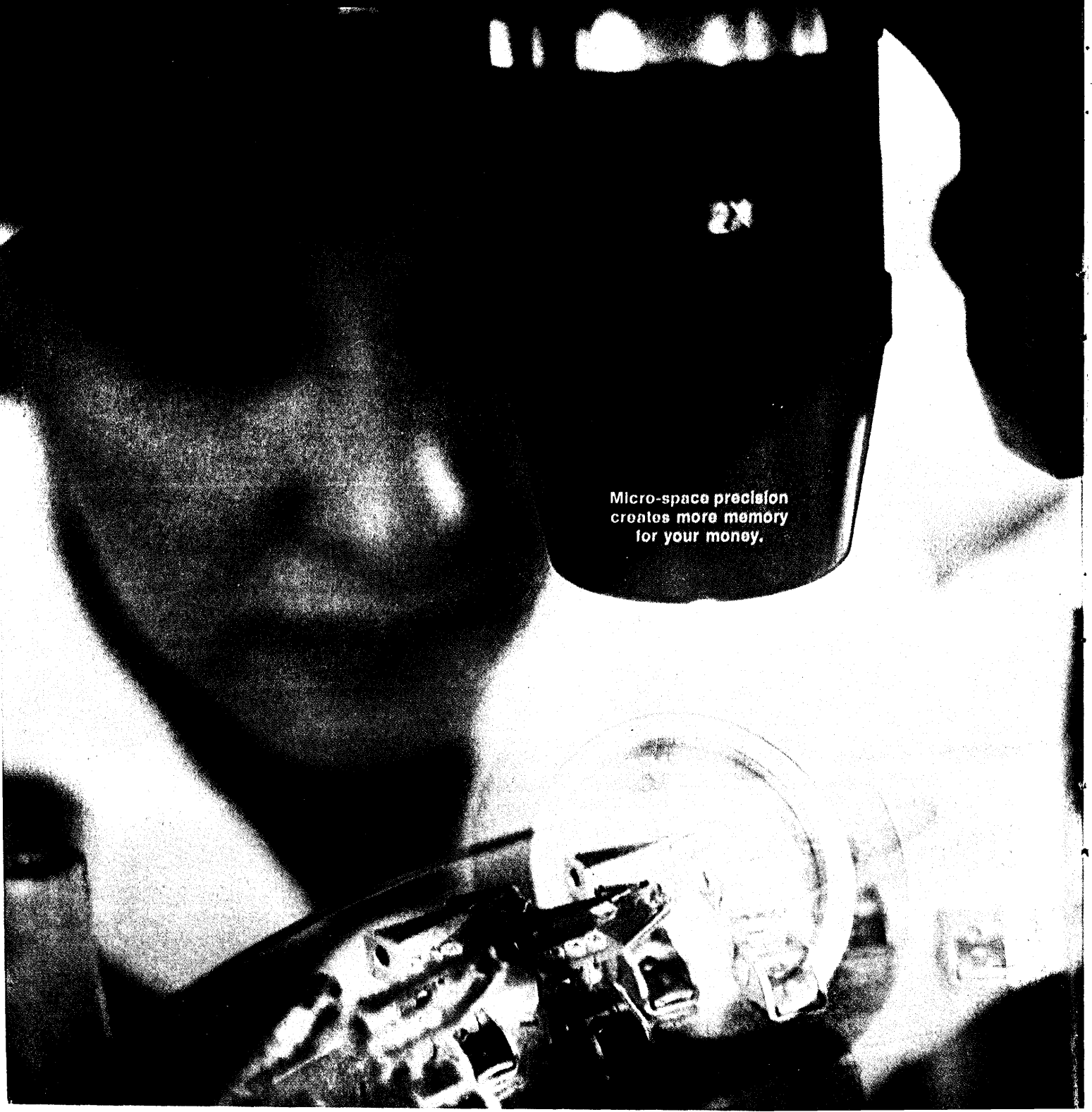
DATA DISC



Micro-space precision creates more memory for your money.

tion was the cost of transmission lines. He said the costs far exceeded those for the U.S. when the distance involved was more than 10 miles.

Barton also said that recent studies had shown that the throughput speed of a computer was directly proportional to the cost of the computer. The thinking used to be that by doubling the cost of the computer it would perform four times the amount of work, he said, but he questions this, averring that by doubling the cost, only twice as much work is performed. "The economy of scale myth applied to the utility concept," he said. He stated that in the past, technological advances had been first applied to the larger machines, but that "the advantages that once were the province of these machines have now filtered down to the smaller-scale machine."

CMC GOES INTERNATIONAL, ANNOUNCES NEW SYSTEM

Computer Machinery Corp., Los Angeles, one of the first firms with a key-to-disc through a computer system (Sept. '68, p. 17), has formed Computer Machinery International to manufacture and market its Key Processing System everywhere. The first subsidiary will be headquartered in London, with France and Germany to follow.

James K. Sweeney, president of CMC, has also announced a new product, the Data Central System, a computer communication system designed to collect data transmitted simultaneously from more than 50 incoming lines for recording onto a single reel of tape. The system can translate from transmission code to mag tape code, check for transmission errors and test for validity before outputting onto tape. The new system interfaces with Data-Phone sets or equivalent modems on either private wire or dial-up network service. It will accept input from a variety of remote terminals, including TTY 33, 35, and 37, IBM models 1001 and 1050, and the Burroughs TC 500.

The system consists of a multiplexor, one or two small computers (for backup), a monitor teletypewriter, a mag tape unit and the system's operating programs. The system also provides software support, including a reporting package that supplies pertinent traffic analysis information.

A standard Data Central System will accept data from four lines and will lease for "less than $1,500 a month." Additional lines may be leased for $50 per line, per month, and initial delivery is scheduled for the summer of 1970. For information:

CIRCLE 581 ON READER CARD

GROUP FORMED TO PROMOTE MEDICAL RECORD STANDARDS

The Association for Health Records has been formed in Ann Arbor, Mich., to work for "a multidisciplinary approach to the problems in the field of medical and health records." Membership includes doctors, nurses, hospital administrators, statisticians, systems analysts, and medical record librarians.

In a two-day session, the group discussed the goals of the organization, set up executive and steering committees, arranged for presentation of bylaws to the membership later, and agreed to hold the next AHR conference in June, 1970.

William H. Kincaid, co-chairman of the AHR executive committee and associate director of the Commission on Professional and Hospital Activities, gave the keynote address on the reasons for forming the association. There has been, he said, "no group addressing itself effectively to the interdisciplinary nature of the design, the handling, and the use of health records and their systems." The problems, he said, "are not going to be solved by the physician working alone, nor by the medical record librarian, nor by the systems expert imported from industry, nor by the computer itself, no matter how many buttons it has."

Kincaid offered an example of the extent of the confusion in dealings between medical and computer people. "We put abstracts of medical records on magnetic tape so that the computer can handle them. You would think then that when we spoke of a 'record' everyone would understand it to be a patient's medical record. Not so. We found that in computer language a 'tape record' was made up of many 'items' which are defined as 'logical records' — which are the medical records all containing 'items' of information. Clearing up the confusion on this point alone has cost the commission many thousands of dollars and the battle isn't won yet."

Details may be obtained by writing to AHR, P.O. Box 432, Ann Arbor, Mich. 48107.

INPUT FROM COMPUTER FIRMS NEEDED FOR U.N. REPORT

Professor Harry Huskey of the Univ. of California, Santa Cruz, and Professor C. C. Gotlieb of the Univ. of Toronto have been named consultants to the Office for Science and Technology of the United Nations in the preparation of a report by the Secretary-General on the use of computers and computer techniques and the methods by which international cooperation in the field can be increased. The report was requested by a U.N. resolution on the Transfer of Technology that noted the necessity to expand the use of computer technology for the benefit of developing countries.

Initial response to enquiries for information was invited from member nations, various international professional societies, and U.N. organizations, but the current emphasis is on cooperation in the supplying of data by the private sector of the industry. Recently, the Congres International d'Organisation Scientifique (CIOS) was commissioned by the U.N. to present a report on behalf of computer-related private industry. CIOS is working through the Council for International Progress in Management (CIBM) and, in particular, through Professor Alex W. Rathe of New York Univ. (34 Bittersweet Lane, Mount Kisco, N.Y.), who invites participation in the effort.

The report of the Office for Science and Technology will be reviewed by the U.N.'s Working Party on Computer Technology in March, 1970, submitted to the summer session of the Economic and Social Council, and thereafter to the General Assembly.

CREDIT DATA CENTER ESTABLISHES NEW CREDIT

Faltering somewhat after incorporating three years ago, Computer Reporting Systems has staved off its difficulties with a June stock issue that brought in $2¼ million to work with, and has moved into the South Tower of the Irvine, Calif., Financial Center. Owned by 37 various credit bureaus in southern California, southern Nevada, and Arizona, the firm will go into operation in about nine months as a credit data center for its member bureaus, providing information on deadbeats or otherwise in "an average 2-second response time."

Eugene S. Mikkelson, president of CRS, said the firm is developing the software for the system in-house under the direction of Jack Strickland, formerly of Computer Planning Corp., and formerly, also, of CRS in the early days. The program is called the Credit Bureau File Conversion Program, and it will operate on twin 360/40's to convert the 1½ million files the firm has on hand at present, to which will be added 10 million "items of record" in the next two years. It has a 360/50 on order, but has not yet decided on the terminals it will install in the member bureaus.

(Continued on page 168)

news briefs ...

SAC TO HAVE COMPUTERIZED MESSAGE SWITCHING SYSTEM

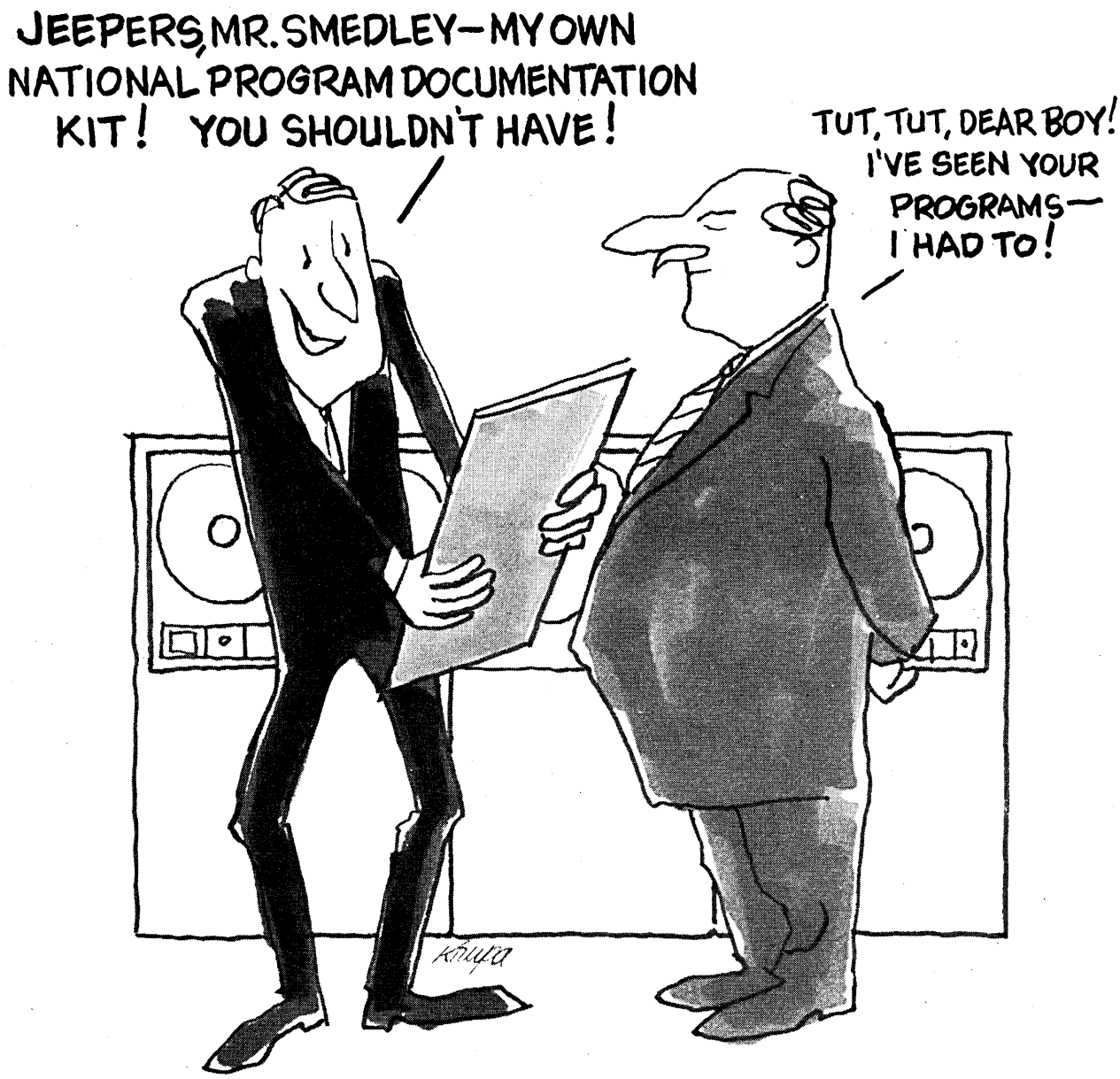
The Air Force's $3 million SATIN (SAC Automated Command Control System/AUTODIN/Teletype Interfaces) message switching system located beneath Offut AFB in Omaha will use eight RCA computers as a "high-speed switchboard." Two Spectra 70/45's and six RCA 1600 satellite processors will channel messages to SAC's worldwide bases and direct operational and administrative communications to the Joint Chiefs of Staff in Washington and other key agencies.

Incoming messages will be allocated to the 70/45's according to traffic volume from three of the satellite processors. The other three 1600's will control the peripherals. Messages are received and checked by the machines for accuracy. If a line is busy, the message is stored in memory for subsequent relay. Messages will be classed by priority in order of importance and relayed under direction of special programs written by Air Force personnel with the help of RCA systems programmers. The computers also will process statistical analyses of message traffic to determine whether new lines should be added during peak periods.

Installation of the 70/45's begins in January. Presently, SAC uses airmen to monitor communications terminals in the underground command post — "the nerve center of America's global strike power." The operators decide whether normal routing or crossfiling is required. When messages must be crossfiled, they are manually translated into appropriate formats and then refiled via keyboard. The new system will handle all interfacing and relay requirements, automatically taking into account various circuit speeds and format conversions.

new companies ...

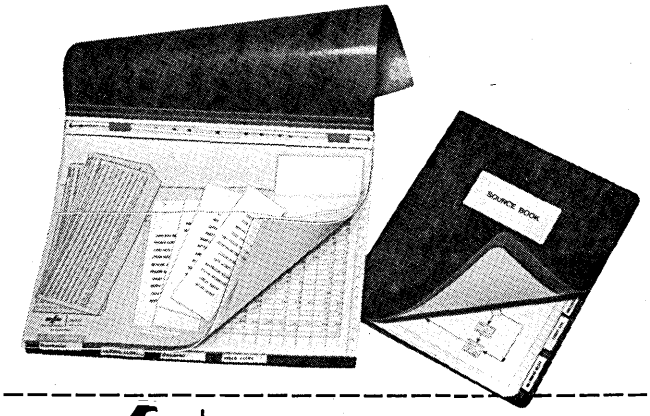
DataTerm, Inc., is hopefully the permanent name of a new computer peripheral manufacturer in Levittown, Pa. The company went through three other names that did not smell as sweet before arriving at its present one, once because it inadvertently took someone else's, once because its hastily amended name was too similar to a couple of other famous firms which could have sued, and finally because one of the owners just didn't like the third name. The present one is being legally searched and reserved in all 50 states, so speak now, or ... Bankers Trust Co., 7th largest U.S. bank, has elected to go into partnership with Cybernetics International Corp. to form **Cybernetics World Trade Corp.,** with London as its first overseas base, to market proprietary computer programs ... A keypunch service bureau has been opened in the heart of NYC's Harlem by Forbes **Computer Services, Inc.,** new subsidiary of the parent advertising co. The center will work for both government and industry, plans to set up a keypunch school with federal assistance. Head of the firm is a 24-year-old mother who was once a welfare recipient ... **Compdata Services Corp.,** Philadelphia, will furnish specialized manpower for the computer and software industry, backed by a coalition of Auerbach Corp. and Comprehensive Designers, Inc.... A jointly-launched Las Vegas-based company, **Optim, Inc.,** will use a mass memory from Advanced Patent Technology, Inc., and the experience of Computer Complex, Inc., of Houston, in time-sharing operations, to make an advanced t-s computer. ... **Delta Systems Corp.,** Wilmette, Ill., will provide consulting and systems design services, plus software... Urban environmental problems will be attacked by **Urbdata Associates, Inc.,** out of Philadephia. Its president is a former White House science staff member ... Small users in the Los Angeles area will be serviced by two divisions of **Administrative Research Industries:** Minimatics (minicomputer t-s) and Applicon (operations research and statistics) ... **Structronics Associates** has been established to give the San Francisco area more software service ... A graphics service in software, precision drafting and circuit board artwork, **Systematic Design Inc.,** has been started in Dallas, using its own design language ... **Interface Industries, Inc.,** has been formed on Long Island by three former Sanders executives, offering customer computer systems featuring remote I/0, with terminals and modems ... **International Data Applications, Inc.,** will be headquartered in Montgomeryville, Pa., but plans to establish a plant in Taiwan to supply "programming resources available in the Far East which are in critically short supply at home," and also to bring advanced systems design to companies in transition over there. IDA is a subsidiary of Scientific Resources Corp.... A major steel foundry has gone into the computer business with its **Maynard Data Processing Div.** in Milwaukee ... **WMM Industries, Inc.,** has been founded in Washington, D.C., offering system design and analysis. Another D.C. entry in the software field is Hendrickson Corp.... Free listings in the computer time market will be published by **Computer Time Brokerage Co.** to attract charter clients. Based in Houston, the company will cover the Southwest ... **Computech Systems, Inc.,** in Dallas will concentrate on facilities management and developing applications packages ... Two new Canadian firms have opened in Toronto: **Syner-Data Canada Ltd.,** producing peripheral equipment, and **Multiple Access General Computer Corp. Ltd.,** one of the country's largest service bureaus ... **Public Computer Systems, Inc.,** Minneapolis, has been born from Midwest Datacenter, Inc., and its subsidiary, Business Data, Inc., and will offer systems and dp services, plus efficiency-gauging software ... Dp repair and preventive maintenance in the New England and New York area will be provided by **Service Associates, Inc.,** operating out of Chelmsford, Mass.... **Data Card Corp.,** Minneapolis, will produce encoding equipment to be leased or sold to large credit card issuers ... Puerto Rican businesses will have the services of a dp center called **Delta Caribe,** supplied to them in a joint venture by two local firms with Delta Data Systems, a software firm based in College Park, Md., which will furnish already developed proprietary systems ... **Allstates/Programming & Systems, Inc.,** NYC, has been born from the service bureau divisions of Programming and Systems, Inc. (PSI) and Allstates Design and Development Co.; its centers will operate on the mideastern seaboard ... **Telecomputations** will time-share in the Washington-Maryland area .... **Macrodyn-/Inc.** is a new software service firm operating in Hillsboro, Ore.... Expansions and divisions: One of the first firms to provide dp on a commercial basis, **Statistical Tabulating Corp.,** has a new division, STAT:COM, tailored to give special attention to R&D companies, engineering departments and consultants, and offering instantaneous access through remote terminals without prior scheduling ... **Computer Automation, Inc.,** Newport Beach, Calif., has opened an office in Amsterdam to bring its minicomputers to the Dutch and the rest of Europe ... **Nera Systems Corp.** is an affiliate of National Economic Research Associates, Inc., will engage in systems and software in Washington, D.C.... **General Telephone & Electronics Laboratories, Inc.,** has established a research center at Waltham, Mass., consisting of two groups: Semiconductor Devices R&D, and Communication and Information Sciences ... Creation of a Computer Systems Div. by **Randolph Computer Corp.** will enable that company to give direct competition to IBM in software and proprietary programs installation, now that the unbundling is here ...



Designed especially for programmers, the new National Program Documentation Kit holds all working elements you need in a compact, neatly arranged form: listings, source information and control cards. Protects and houses each individual program. The kit consists of the following:

- Genuine pressboard data binder in Pacific Blue with styrene channel and nylon posts.
- Clear vinyl documentation envelope with three pockets in front to hold control cards, tapes or notes and a large pocket in back to hold the documentation folder.
- Documentation folder with copper reinforced indexes. Removable so program documents can be kept confidential.
- Indexes for listings with Mylar* reinforcing.
- Pressure sensitive labels for quick, easy identification.
- 65 pre-printed insertable titles plus blank inserts for special needs.

*Mylar is the DuPont name for its brand of Polyester film.



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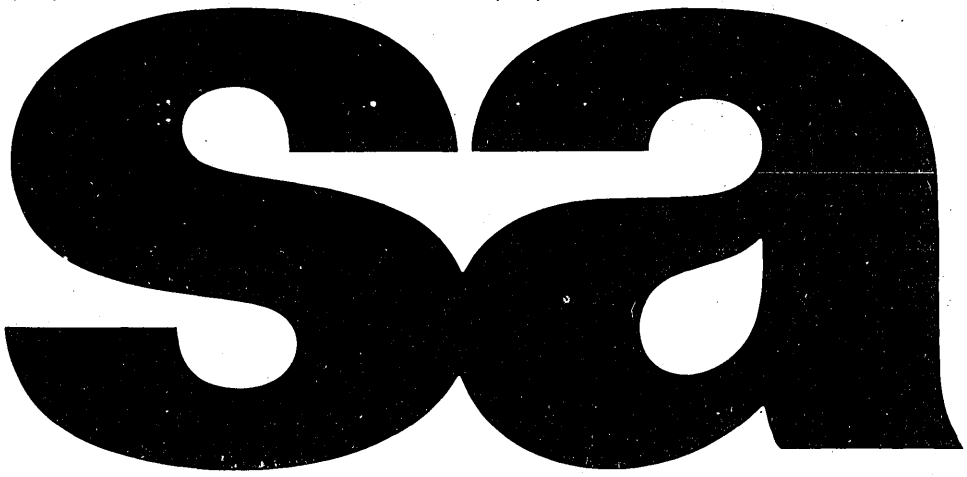


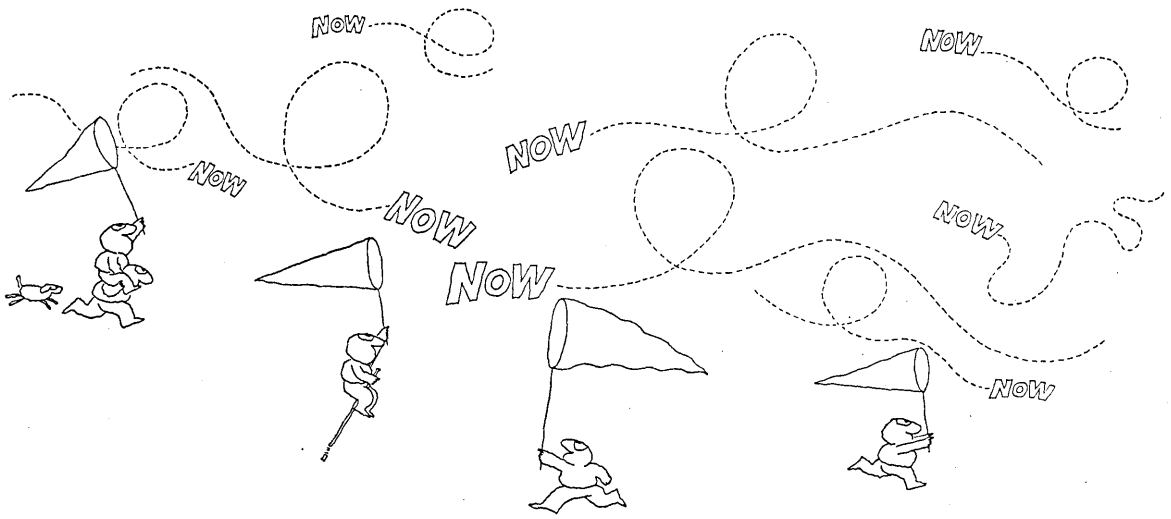
news briefs...

Fedder Software Corp. is another subsidiary which will offer software — products and management consulting — to outsiders while continuing to furnish them for its parent company, Fedder Data Centers, Inc., from a Baltimore base...

mergers, acquisitions...

A computer-based literature library service, **Share Research Corp.**, Santa Barbara, Calif., is being acquired by **Diversified Data Services and Sciences, Inc.** SRC features special notification for the clients' special interests... **Scientific Resources Corp.** of Philadelphia has acquired **Publication Engineers,** a technical documentation and engineering service in LA... An unidentified "leading institutional investor" has bought 27.56% of **Call-A-Computer, Inc.,** the Minneapolis-based time-sharing organization owned mainly by Pillsbury and Occidental Life of North Carolina. C-A-C plans to market a fourth generation computer designed especially for t-s... Another insurance giant, Travelers Corp., is expecting that a merger with **Randolph Computer Corp.** will expand the service of Traycom, Inc., its dp subsidiary... **E.P.G. Computer Services, Inc.,** NYC consulting and compcenter operator, has agreed in principle to acquire the computer assets and proprietary software packages of **Longardner & Racek, Inc.,** an Indianapolis architectural and engineering firm... A one-bank holding company, **Industrial Bancorp, Inc.** (for Rhode Island's Industrial National Bank) is taking **Hudson Leasing Corp.** into its expansive fold... **Computer Aid Companies, Inc.,** of Dallas has acquired **ZMZ, Inc.,** of NYC, will apply computer techniques to ZMZ's designs of heating, air conditioning, electric, plumbing and drainage systems... **Data Products Corp.,** perhipherals maker, is acquiring **Intrex, Inc.,** precision machining company, both in LA... Acquisition of **Laser Applications, Inc.,** of Palo Alto, Calif., will allow **Data Memory, Inc.,** in nearby Mountain View to combine laser technology with disc memory systems... No sooner was **Diablo Information Systems Corp.** formed in San Francisco than it was bought out by **ITEL Corp.,** a diversified dp company in the same city. Diablo will continue to manufacture peripherals... **Flow Corp.,** Watertown, Mass., has been absorbed by **Datametics, Inc.,** Waltham, which in turn has become a division of **CGS Scientific Corp.,** Southampton, Pa. They, or it, will still make environmental sensors and measuring units... **Machine Accountants, Inc.,** Waco, Tex., has been taken over by **Computer Management and Research Corp.** and will operate as **Computer Management Services**... **Computer Communications, Inc.,** (August '69, p. 33) has agreed to acquire **Wescal Industries, Inc.,** LA manufacturer of computer components... **American Data Services, Inc.,** which supplies computerized cost analysis, accounting and payroll dp to the Portland area, has agreed to become part of **Orbanco, Inc.,** an Oregon holding company... The **National Connector Corp.** name, as well as its connector division plants in Minnesota, will become a part of **Fabri-Tek, Inc.,** of Minneapolis. The seller company will select a new name and go into avionics... **Computer Property Corp.,** NYC marketer of systems and software, has agreed in principle to acquire **List Management, Inc.,** in Rye, which manages computerized direct mailing lists... **Honeywell's Sonalert** operation will move from its Computer Control Div. in Peterborough, N.H., to become a part of **P. R. Mallory & Co., Inc.,** in its Huntsville, Ala., plant. Mallory already had been marketing the audible signal devices, now will produce them... **Computing and Software, Inc.,** has arranged to acquire **Preferred Business Service Corp.** of Chicago, which furnishes data specialists for limited duration assignments... Merger of **Cyber-Tronics, Inc.** into **Dasa Corp.,** Andover, Mass., has been approved in principle... A company just organized in New Orleans in January, **International Data Systems Corp.,** has acquired **Management Concepts, Inc.,** a conventional software service firm in Baton Rouge. It plans further expansion. Do not confuse with **Data Processing International,** assembler and marketer of computer systems for small businesses, which has bought **Mahling, Newman & Associates,** a technical documentation company of East Orange, N. J.... **Astrophysics Research Corp.** of LA has bought **Circuit Research,** a Calif. div. of **Raven Electronics, Inc.,** printed circuit board manufacturer, in a planned expansion into hardware, complementing its recently formed software division in Washington, D.C.... **Dataline, Inc.,** a yearling company of Bridgeport, Pa., which supplies strip-printers to **Technitrend, Inc.,** New Jersey maker of portable terminals and voice response systems, has sold part of its action to its customer, so they can respectively share in security and productivity... **Superior Computer Corp.** has bought the Superior Electronics Div. of **Aiken Industries, Inc.,** both in Clifton, N. J. The similar names are no coincidence: both companies were started by the same man, who has now bought back his own. The older firm produces tv components; the newer specializes in computerized medical billing... A Milwaukee outlet, **Tab-Fax Service Bureau, Inc.,** has been acquired by **Facs Data Centers, Inc.,** Chicago. The accounting portion of the firm will be sold, and the remainder will become a dp input center... **Church Records Management, Inc.,** which also furnishes dp services to synagogues, has agreed in principle to merge into **Management Systems Corp.** in Dallas. CRM's system was developed by a reverend as an outgrowth of his master's thesis... **New England Education Data Systems** (NEEDS), a project of the New England School Development Council since 1960, has merged with **Westinghouse Learning Corp.** As a pioneering agency, NEEDS established computerized grade reporting, scheduling, attendance accounting and test scoring in 80 school systems... **Scientific Control Corp.** of Dallas has agreed to acquire two diverse companies: **General Design, Inc.,** Melbourne, Fla., card punch and reader manufacturer, and **Graham Magnetics, Inc.,** a magnetic tape maker near its home base in Texas. These make three acquisitions so far this year. Also in Dallas, **Sigma Systems Corp.,** electronics research and manufacturing, is acquiring **C. M. Hathaway Engineering Laboratory** in Colorado City, precision machiner of hardware components... **Raytheon Co.** and **United Engineers & Constructors, Inc.,** have decided to merge... A six-year-old programming school, **Business Technical Institute** in Pittsburgh is being acquired by **Calculator-Computer Leasing Corp.**... **URS Systems Corp.** is acquiring all the stock of **Madigan-Hyland, Inc.,** New York consultant firm in engineering, architecture, planning. It expects to apply computer techniques to the firm's broadly-based projects... Fizzles: **Consolidated Analysis Centers, Inc.** (C.A.C.I.) and **Technology Service Corp.,** both of Santa Monica, Calif., have called off their merger... **National Computer Analysts, Inc.,** Princeton, N. J., has decided to stay separate after all from **Data Systems Analysts** of Pennsauken... **United Data Centers, Inc.,** NYC, won't merge with **Computer Servicenters, Inc.,** Greenville, S. C., because of "significant changes in the economic climate."

• The new president of Varian Data Machines, Irvine, Calif., is George J. Vosatka, formerly vp of marketing of Univac's Data Processing Division, where he will be succeeded by Al Fera, the vp of field marketing. Vosatka said he was delighted to be



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with Varian, delighted to be back in California, delighted to know that Varian is considered one of the big four of the small computer manufacturers, and he intends to make it grow even faster, "even if that sounds like a platitude." The company's new facility is now at capacity and an additional plant is being considered. Bob Herman, former president and one of the founders of Varian, will now pursue "outside interests."

• Latest work completed by the USA Standards Committee X3 is the approval of five new proposed standards: (1) magnetic tape labels for information interchange; (2) revision to X3.11-1966, general purpose paper cards for information interchange; (3) revised Hollerith punch card code; (4) revision to X3.12-1966, vocabulary for information processing, and (5) flowchart symbols and their usage in information processing. Also approved was a recommendation that subcommittee X3.2 be restructured into two groups — one to deal with codes, formats and related matters, and the other to consider standards for physical I/O media.

• A terabit memory (TBM) system, with a storage capacity around 1000 times greater than that of the largest random access erasable and updatable memory systems extant, has been ordered by the government from Ampex Corp. The system will store two trillion bits by utilizing videotape recording techniques. It achieves very high data packing density by recording bits which are shorter and narrower, and by data tracks which are much closer together than is practical with standard computer tape transports. A prototype has already been built and tested.

• ADAPSO's Computer Time-Sharing Services Section has filed its response to the seven-volume study conducted by the Stanford Research Institute in connection with the FCC utility inquiry (see June, p. 126) into the regulatory and policy problems presented by the interdependence of computer and communication services and facilities. CTSS agrees with SRI that message switching should not be regulated; however, CTSS does not agree that consideration should be given to allowing common communications carriers (Western Union and GT&E) to engage in commercial data processing.

• Human beings have landed on the moon and returned safely. Historian Henry Steele Commager said, in a TV interview, "Who knows what the by-products of landing on the moon will be. After all, space, itself, as a reality to humans, is a by-product of computers."

• Scientific Data Systems has entered the peripherals market with a family of five rapid access data files which it expects to sell to other computer manufacturers and systems houses who integrate various components into proprietary systems. The models vary in storage capacity from 6.4 million to 51.3 million bits, with average access time of 17 msecs. Other peripherals are under development.

• Atlantic Technology Corp. has agreed to manufacture an IBM-compatible plug-to-plug interchangeable video display terminal exclusively on behalf of Data Processing Financial & General Corp. The contract contemplates that up to $12-15 million of these units will be ordered within the next two years, with deliveries to start this fall. The new terminal is competitively priced and directly interchangeable with the IBM 2260/2848 and 2265/2845 display systems, but is said to have features giving it superior performance characteristics. The terminal may also be used as a keypunch replacement. DPF&G has a similar arrangement with Business and Computer Devices for IBM-compatible tape drives.

• The Federal Aviation Administration has implemented the initial portion of the first "semi-automated" air traffic control system with the installation of a 360/50 at the Jacksonville, Fla., Air Route Traffic Control Center. The system is semi-automated because it only provides information to the air traffic controllers; it is an aid, and does not make or suggest decisions. Eventually, some 20 centers will be computer-equipped, and controllers will be provided with information on flight plans, radar data, and suggested solutions to traffic problems. Plans call for installation of about one computer per month. When completed, the air traffic control system may cost a half billion dollars and be the largest real-time network in the world.

• IBM and Mohawk Data Sciences Corp. have entered into a patent cross-licensing agreement under which, as is usual with such IBM dealings, the parties have "agreed not to disclose the specific terms of the agreement," and Mohawk states that it "has no immediate plans to expand its product line as a result of the pact." Instead, its significance lies in the "freedom of action afforded both companies in meeting future needs." MDS has acquired more than 100 patents during its five-year history; which patents are involved in the agreement was not revealed.

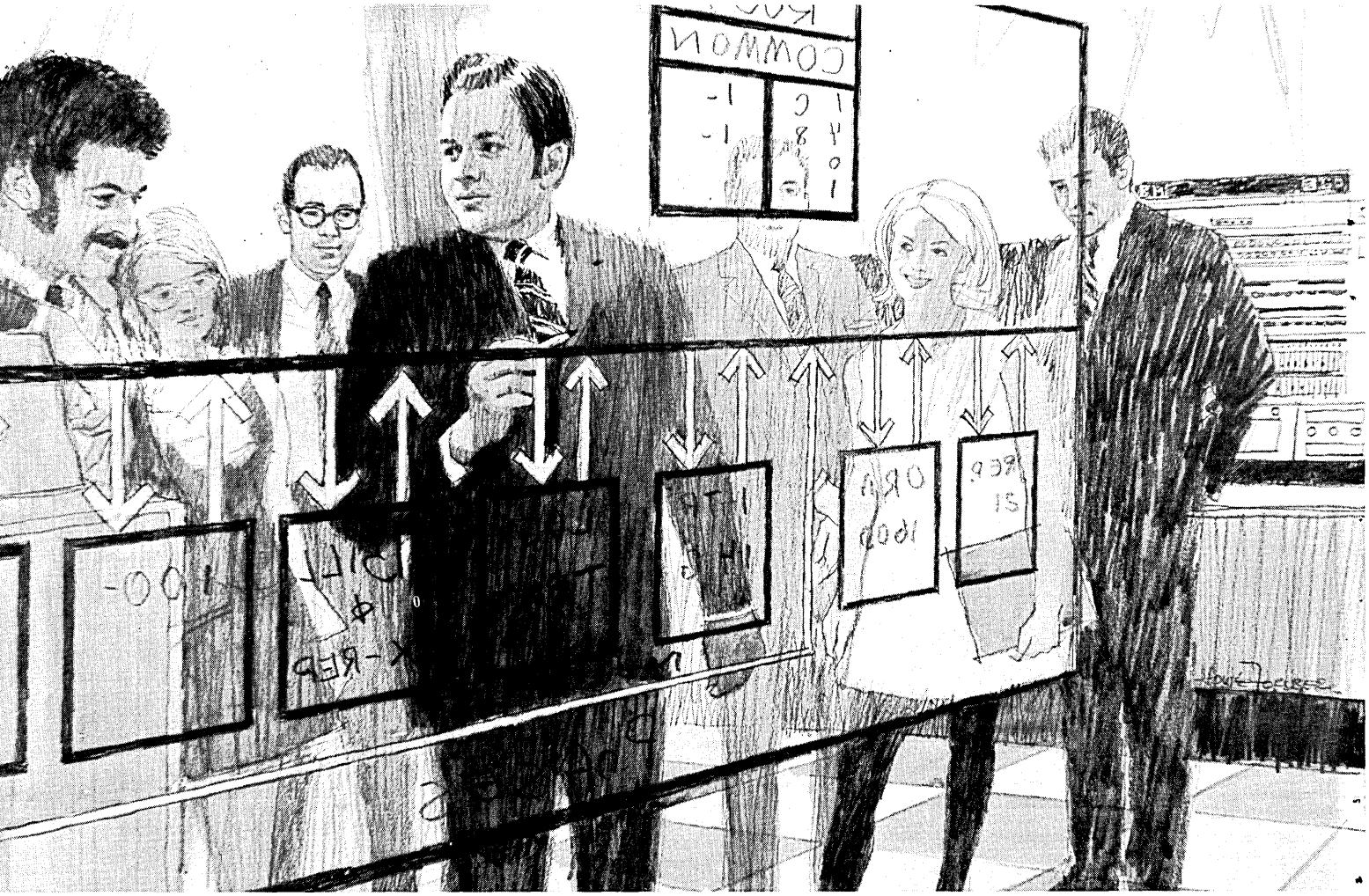
• That fond dream, a tamperproof computer, has been tackled this summer at Case Western Reserve Univ. with project LOGOS, which essays not only to design a new computer, but to devise a design system for a whole new race of them which will be fool- and theft-proof. Major support for LOGOS is a 2½ year grant from the U.S. Defense Department's Advanced Research Projects. Project Director Edward L. Glaser is using a PDP 10/50 computer to help design the other computer(s).

• A six-year-old, $1.5 million IBM 7094 died in the arms of a scrap metal dealer recently. He paid $25K for the remains to a user who had not even been able to give it away to a university because of maintenance and reliability costs. Two 1401's brought $100K, however, and are alive and well.

• Com-Share, Inc., has adopted a new pricing schedule as of Sept. 1. The changes are in conjunction with the time-sharing service company's introduction of its W-04 operating system. The new system will measure subsystem and central processor utilization, which includes accessing on-line data storage and user-initiated program transfer. Data storage will be provided in blocks of 256 words, and a volume use plan is included. Educational institutions will get a 15% discount.

• As the S. S. Manhattan, a 100,000-ton tanker, tried to establish a Northwest passage through the polar icecap this summer, she had a Sigma 5 computer system on board to help keep a record of her performance. There were sensors on her engines and on her reinforced hull to measure the squeezes and stresses and several thousand reels of data will be analyzed to find if she is a stout enough party to establish a route to transport Alaskan oil to east coast refineries. The analyzing will be done by Newport News Shipbuilding and Dry Dock Co., which also plans to use the computer for submarine research and to develop improved steering and diving controls.

• The Univ. of Southern California, under a National Science Foundation grant, is training 100 inner-city high school youths in computer science in an effort to help close the competition gap that may confront them in the future. Program participants are in two major categories — 80 students who have some background in mathematics and science and will most likely get into college; and 20 others, most of whom will be looking for jobs when they leave high school. The first group is receiving four weeks of intensive training in FORTRAN IV. Their programs are run on USC's IBM 360/44. This training should enable the students to compete successfully with other more privileged students in col-



John Czerkies, Director of Research and Special Projects, conducts a project team briefing session at DDSS.
Mr. Czerkies, with 13 years in data processing, has extensive experience in designing complex software systems.

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The Division has other proprietary programs in the design stage and is prepared to acquire complementary programs from outside sources. It will also enter into joint ventures in such areas as time-sharing, operating systems extensions, tele-processing, project control, systems support programs and language processors . . . as well as consulting on software and hardware problems.

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lege. The second group is getting a less technical, but extremely practical eight-week course in data processing. It is hoped that this group of students will have sufficient background to apply for trainee positions in the computer field and that the business community will participate in the program by expressing genuine interest in employing the students. USC conducted a more limited version of this program last summer, and it was successful enough that a larger grant was given for the project this summer. Students receive a $25/week stipend during the course.

• Latest project of the Louisville & Nashville Railroad and its software subsidiary, Cybernetics & Systems, Inc., is a computer communications system which keeps track of thousands of freight cars at the road's Radnor yard near Nashville, hub of the line's operation. Entries of arrival and departures, plus descriptions and status of trains and cars in the yard, are constantly made through IBM 2260 terminals operated by yard personnel. The information can be entered and recalled by individuals with no special training, using a COBOL-like language with "pidgin English" request words. Requests for information can be entered from any of the terminals, providing answers to such typical questions as "How many loaded tank cars have been in the yard for more than two hours?" or "How many cars of what tonnage are in the yard, designated for company 'X', and have been there longer than two hours?" The system helps build trains from cars with common destinations and ensures that cars are not lost or misdirected. It will eventually be extended to additional L&N yards. A 360/40 and a /50 are now in use.

• Under a $1.7 million contract to Bunker-Ramo's Business & Industry Div., Pan American World Airways is installing data display systems in seven passenger terminals through 1970 to provide computer processing of passenger check-in and load control data during the six-hour period just prior to the departure of each flight. Some 190 Model 2212 desk-top consoles with a keyboard and 6" crt screen capable of displaying 444 characters on 12 lines (along with B-R communications and interface equipment for operation with an IBM 360/30 computer at each location) will be installed in San Juan, London, Los Angeles, Paris, Miami, Frankfurt, and San Francisco. Called Panacheck, the system receives reservation information from Pan Am's New York-based Panamac computer, controlling seat assignments, special passenger arrangements, and weight and balance computations. Load control supervisors and check-in personnel use the devices to enter and retrieve data from the local computers. Some work stations are also equipped with printers and tape punches. An early version of Panacheck was installed at JFK in New York in 1965 and one last year in Honolulu.

• Informatics, Inc., is offering a new, lower-priced version of its MARK IV file management system called the MARK IV/32, which was adapted for use with the 360/25 and 30 and their 32K bytes of memory, compared with the 65K necessary for MARK IV. The firm estimates an available market of 9,000 users of these smaller 360's and has priced its new system at $700 per month, payable over three years, or $20K on a one-time basis. It's available now.

• Davis Computer Systems, Inc., New York software/services firm, has entered the service bureau field through acquiring instant s-b capabilities by subleasing the facilities of two data centers and two 360/30's from Strategic Datacenters, Inc., a subsidiary of Strategic Systems, Inc. All of the assets of the two centers, located in New York City and Union, N. J., were purchased by DCS. Both centers are being operated using former Strategic Datacenters personnel, continuing to serve SSI customers. As part of the agreement, SSI will market DCS computer time and services utilizing the two centers' Mod 30's as well as a Sigma 7 recently installed in New York by DCS. SSI believes it will benefit through being able to offer its clients "the expanded services and computer operating expertise which DCS can provide."

shortlines . . .

Unbundling and inflation have reached Control Data Corp., which is due to further separate its systems pricing, maintaining that this will allow the user "a freer choice in selecting among the available services." Contrariwise, Univac says it will go on offering packaged pricing for systems and services, that "the past few weeks do not justify any modification of our established practice" . . . Univac's Australian division is profiting from its location with a $2.3-million order from Compunet Ltd., Sydney service bureau, for an 1108 which will be linked to terminals in Canberra and Melbourne to service additional major industries in those cities. Compunet is partly owned by a subsidiary of Occidental life of North Carolina . . . Data General Corp. is projecting a higher magnitude Nova; reportedly a "super fast" computer will be announced this fall . . . Computer Technology, Inc., is decentralizing its operations by forming three regional subsidiaries to supervise their respective areas: CT/East will be hq'd in White Plains, N. Y.; CT/Southeast will have offices in both Jacksonville, Fla., and Atlanta, Ga., and CT/Midwest will use most of corporate hq outside Chicago (Skokie). CTI deals in computer management services, is itself a subsidiary of LTV Aerospace Corp. . . . Princeton U has opened a new computer center with an IBM 360/91 for the benefit of its thinkers (some 2000 of whom are expected to use it). It will operate 24 hours a day, seven days a week, with only Christmas and New Year's off . . . The Delaware Valley Chapter of ACM has a record of 19 (out of 20) graduates from its computer operator course, specifically designed for ghetto high school seniors. It is planning an expanded course next year and will publish a newsletter to keep prospective employers informed. Any company that has a dp center is eligible to receive it; the dispenser is Al Tonik, Univac, P. O. Box 8100, Philadelphia 19101 . . . Varian Data Machines will deliver about $8 million worth of small 520i computers to Burroughs Corp. through calendar 1971. They will be used to control remote peripherals and in data concentrators in communications networks, to provide remote access to large Burroughs computers . . . Computyne, Inc., has officially changed its name to Computing Efficiency, Inc. because it better reflects the success of its first product, COMPUMETER I. The company now plans to drop its hardware projects and concentrate on software. Headquarters are in Deer Park, N. Y. . . . Users of the Century 100 and 200 now have an NCR Century System Users' Group, with information available in Houston (contact R. E. Davis c/o Automated Systems Corp.) . . . Bunker-Ramo has consolidated its Business and Industry Div., Numerical Control Systems Div., Numerical Control Retrofit service, and Data Technology Inc. into a new organization called the Information Systems Group. The new group will be headquartered in Stamford, Conn., under the direction of group vp Dean W. Freed, formerly vp/gm of the N/C Systems and N/C Retrofit Divisions . . . Archie J. McGill, former marketing vp for IBM's data processing division, has been named president of Data Processing Financial and General Corp. in NYC. He succeeds Harvey Goodman, who will go on to be chairman and chief executive officer and work in other areas than operations to forward the expanding company. ■

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modeling

ST. LAWRENCE RIVER MODEL

National Research Council, Ottawa, Canada

The Canadian Department of Transport is responsible for maintaining and improving the shipping channels of the St. Lawrence River east of (downstream from) Montreal. The department requested that the Canadian National Research Council study means of improving some aspects of the shipping lanes and the consequential effects on water level and mean currents in the river. The improvements to be considered consist of dredging or changing the contours of the river bed to allow larger ships to make the upstream passage to the Port of Montreal. The council has developed a mathematical model to simulate the problem of water levels and mean currents and simultaneously has created a physical model to be used in conjunction with the mathematical model.

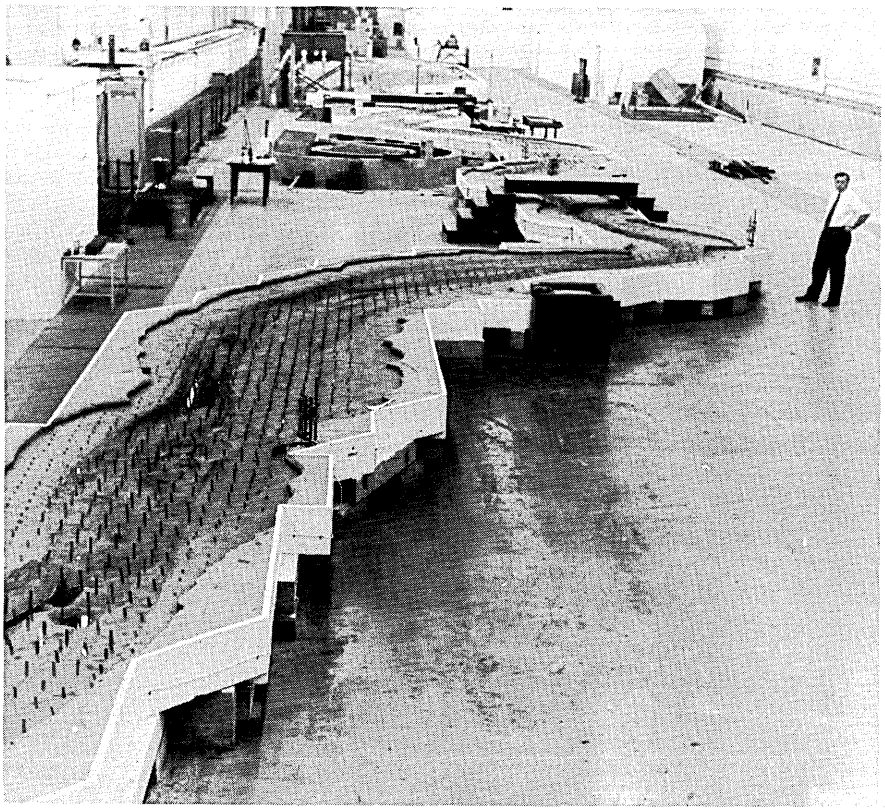
computer and peripherals

EAI 640 digital computer with 16K words of core; 1.65 usec cycle time

EAI 693 A/D interface with 96 analog input and 8 analog output channels. 16 output control lines, 8 sense lines and 8 gp interrupts

plus two EAI 640/260 disc drives with 720K 16-bit words of storage and 17 msec access time, card reader, CalComp plotter, ASR 35 tty, Kennedy 1400RH mtu and Kennedy 2200 cartridge recorder

This portion of the upstream part of the model shows the contours of the river bottom plus the vertical metal strips used to slow the current.



application

The 750-foot-long model simulates a 325-mile section of the St. Lawrence River from Montreal to the town of Bic. The model varies in depth from four inches at Montreal Harbor to over 10 feet at the easternmost end. A horizontal scale of 1:2000 and a vertical scale of 1:120 is used. Tidal variations are consistent with real world measurements to within 1/10 foot and repeatability of measurements on the model is better than 3/1000 inch.

To compensate for the distortions introduced by using two different scales (the slopes of the riverbed are made to look too steep), metal roughness strips are used to slow the current.

The model is constructed partly of concrete blocks sculpted to match the riverbed, and partly of contoured sand surfaced with a two-inch concrete skin. Tributaries, such as the Saguenay, are simulated by appropriately scaled constant discharges of water into the model. Tidal variations are simulated with a large pump and a series of three movable dams, or weirs, at the deepest end that can cause the water to back up into the model just as the actual tide at the Gulf of St. Lawrence causes the water level to rise in the real river.

hardware

There are 52 water level and 18 water current gauges placed along the model at locations corresponding to similar field stations on the river. The water inflow at Montreal is kept constant for a particular test, but may vary between tests from 0.08-0.20 cubic feet per second, corresponding to a river discharge of 200,000-540,000 cfs.

The cpu monitors the water level/current gauges, storing readings every 2.4 seconds and controlling the action of a continuously variable, bidirectional pump and the three dams. Control of the pump, which can create currents of up to 35 cfs, is based on a mathematical model of the dynamic storage capacity of the river basin and on built-in compensations for the nonlinear characteristics of the pump itself. The 10-foot-long dam blades can be moved over a vertical range of 4.5 inches by stepping motors. The stepping motors are, in turn, driven directly by the output control lines of the computer; their rates are controlled by an oscillator serviced by a low-level interrupt. One of the dams is controlled by a feedback logic scheme using computer stored information describing the tidal profile. The other dams are driven by time delayed profiles of the first dam to simulate the skewed propagation of the tidal front.

The water level can be varied by these controls over a maximum range of 1.5 inches—corresponding to a maximum tidal range of 15 feet. Each real world tidal cycle of 12.48 hours is "duplicated" on the model in 4.08 minutes.

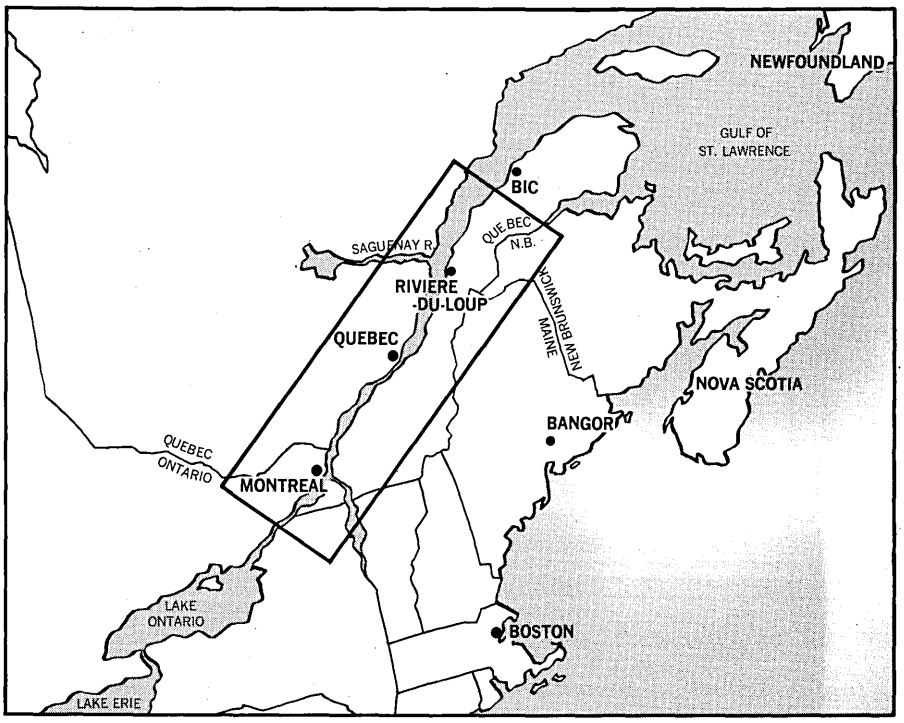
software

The operating system is divided into two parts, for off-line processing and for on-line; both share a 4000-word data base. The off-line phase provides for reading of reference data from cards, translating the reference data into equivalent control units (this involves offsetting, scaling, phase shifting, and compensating for system nonlinearities), reading or writing disc or tape, and demultiplexing disc resident data.

The on-line phase consists of initialization and start-up routines, a driver program for handling nonalarm fault conditions and producing warning messages or initiating shutdown procedures, and several real time subroutines.

The subroutines are serviced by five levels of interrupts. Level 0 is for alarm conditions such as power failure or when emergency thresholds are exceeded. Level 1 is used for monitoring the feedback transducer on the controlled dam blade and calculating the actuating error by reference to stored data; it is accessed every 800 msec. Every 2.4 seconds the Level 2 interrupt comes into play for storing the data from gauges. Level 3 is reserved for stepping motor updates; accessed every 4 msec, it reverses the logic state of the control lines driving the motors which raise and lower the weirs. Level 4, finally, is used by routines driving the plotter. During on-line processing the CalComp is used to display the instantaneous water surface over the length of the river. During off-line processing, the outputs from any of the measuring stations can also be recalled and displayed on the CalComp or on an oscilloscope. ■

The 325-mile portion of the St. Lawrence that the model duplicates, extending from Montreal to Bic, is shown in the boxed portion of the map.



One 9600 bps modem contains enough power to cure five common ailments.

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When communications data is being transmitted or received by the computer, any simultaneous data processing efficiency is reduced. And the longer it takes for input/output, the longer data processing takes. At 1200 characters per second (9600 bps) data transfer is completed up to four times faster. That leaves the computer free to process more data, faster. It can do more work, more jobs — in less time. Maybe even save you from buying another computer.

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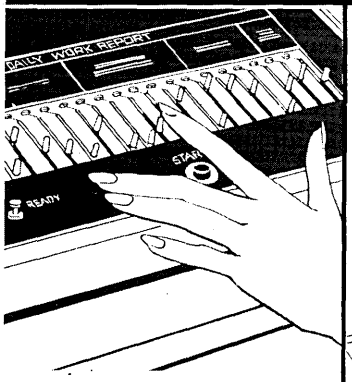

The keyboard is so simple any unskilled operator can encode a message and scan it for accuracy. He can then transmit it (by pressing a button) over owned or leased lines. With North's Acoustic Coupler he can transmit over switched telephone networks.

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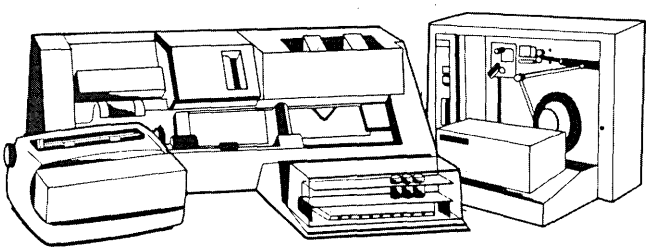

The Message-ComposeR System can transmit messages to any point and, automatically operating a North solenoid pack, produce punch cards, key tapes or typewritten copy—all three if required.

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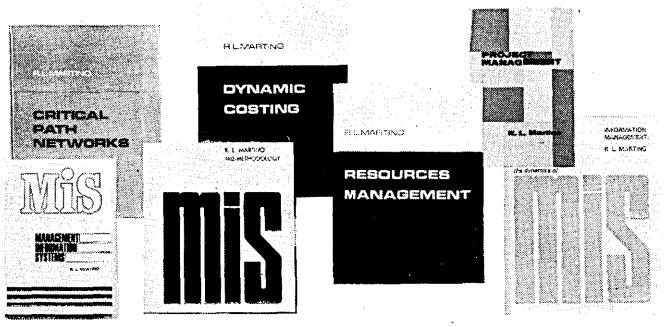
By Dr. R. L. Martino



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Dr. Martino is President of Information Industries, Inc. A graduate of the University of Toronto, he has been active for more than seventeen years as a consultant to the management of business, government and educational organizations. As such, and as an international authority and pioneer in the development and use of computers, he has held key positions with, and been advisor to, a variety of the most important firms and institutions of our day. Among clients he has served internationally are U.S. Navy, Unilever, American Telephone and Telegraph, General Electric, Canadian Department of Defence, and the Department of Health, Education and Welfare.

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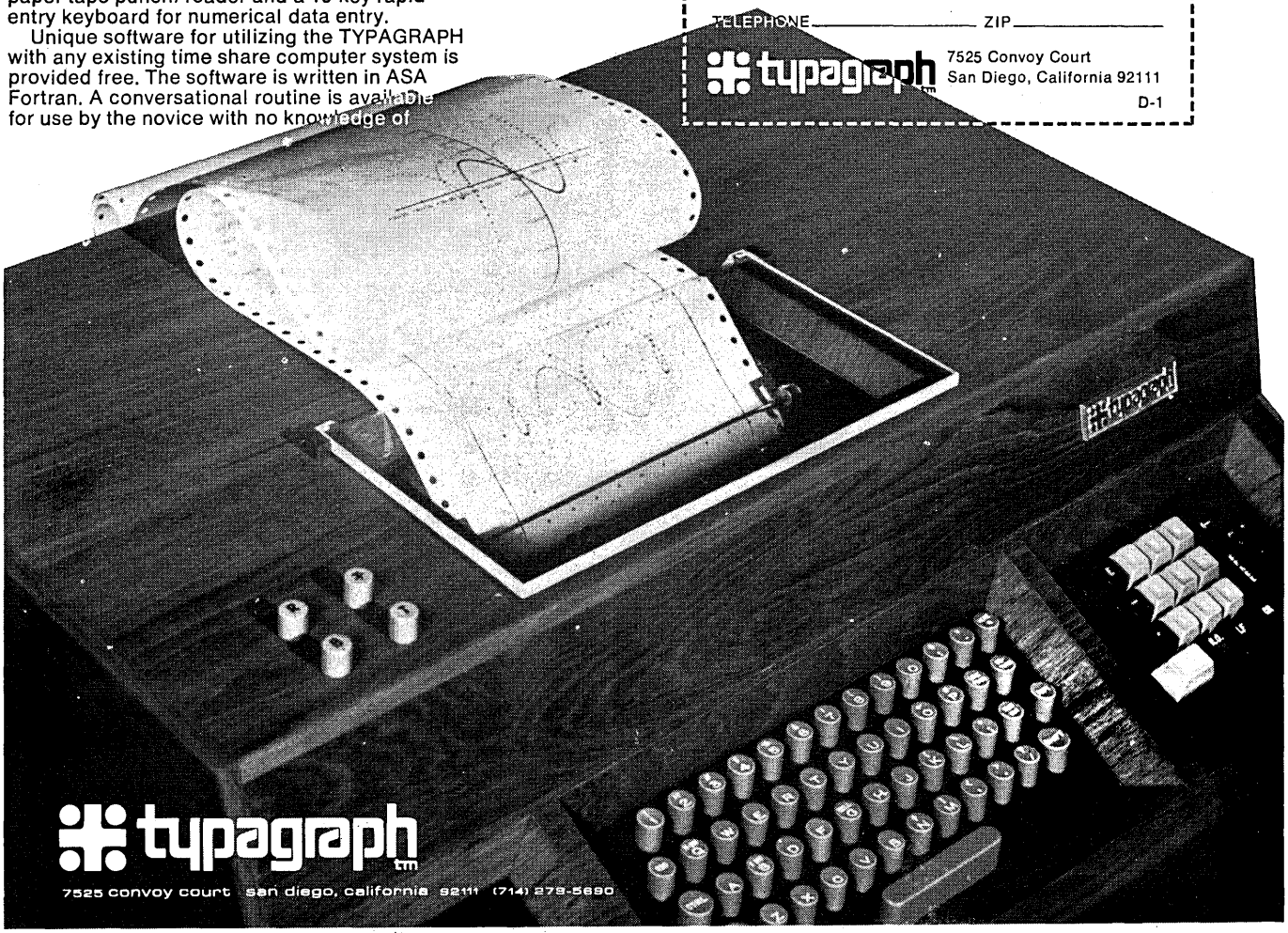

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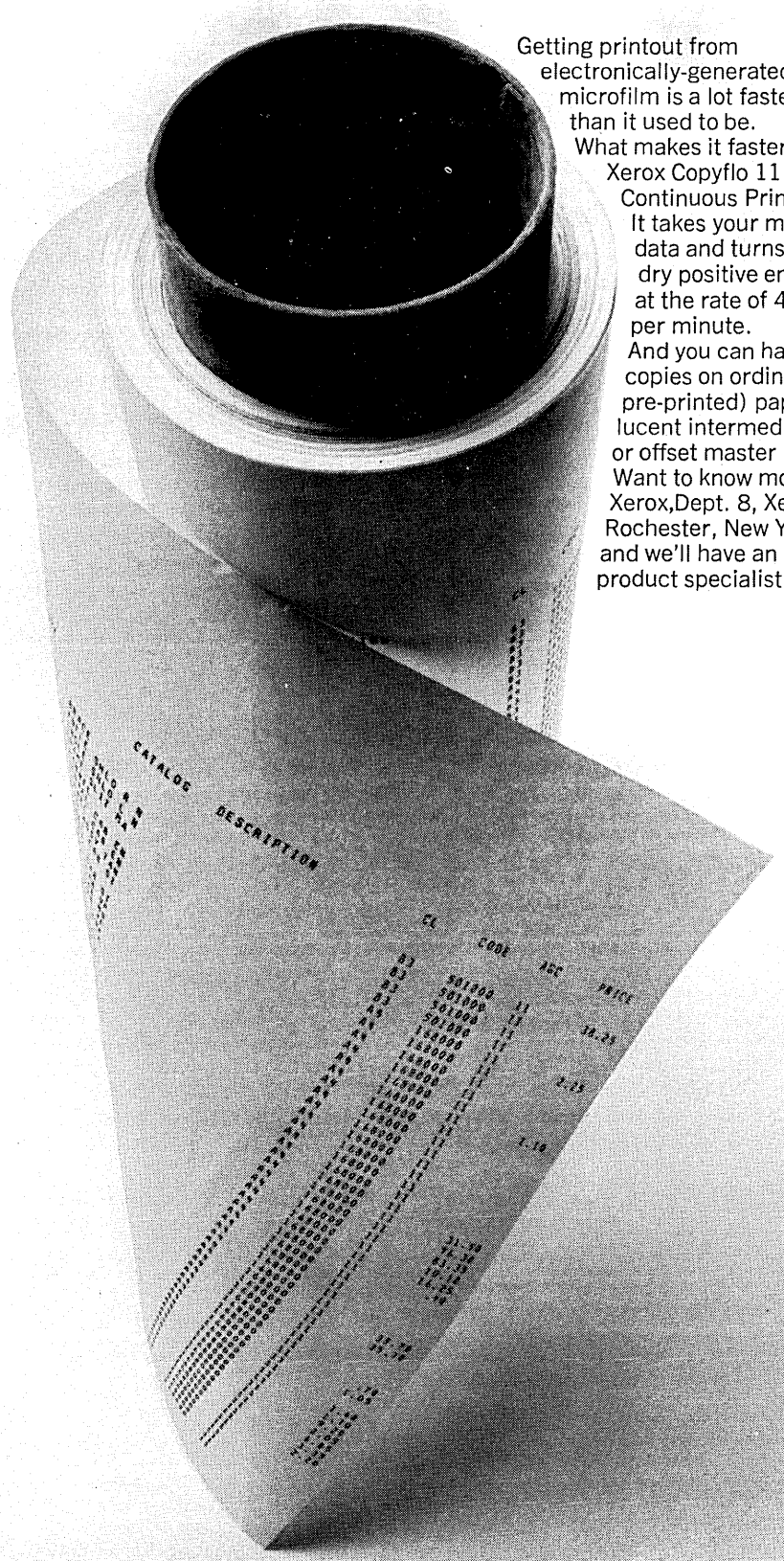

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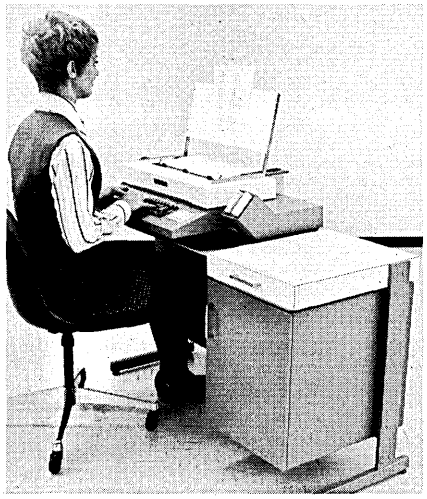
new products

high performance 1050

The president of this firm once characterized his model 5-50 terminal as a mag tape, high speed, error correcting, IBM 1050 in a stand. He also characterized the market for teleprocessing terminals as worth $100 million per year now but going for $4 billion per year by 1972. Thankful to IBM for developing the teleprocessing market so beautifully, he feels that the 5-50 will cut itself in for a big share of it.

The 5-50 is built around an IBM Selectric typewriter, a 3500-bit delay line buffer, and a mag tape cassette recorder (which alone required 15 months for development). It is capable of sending/receiving data at the typewriter at about 15 cps, or of sending/receiving data through the tape cassette at 240 cps. Start/stop transmission is standard, but binary synchronous is available. Automatic answering and polling and addressing operation are also offered optionally.

Unlike an IBM 1050, the unit is designed for composing a record (or a tape file of up to 48,000 characters per reel) off-line and sending at tape speeds, not type speeds. Record edit-



ing is provided through DELETE CHARACTER, DELETE LINE, and XMIT ERROR keys. Vertical parity checking is standard, LRCC (longitudinal redundancy check character) block parity checking and CRCC (cyclic redundancy check character) checking for binary synchronous transmission are also available.

The buffer memory is bus-oriented so that additional peripherals will be easy to add when they are developed. (Card gear is already planned.) Records can be "peeled off" the top of the buffer by a polling cpu while the operator is busy typing away. Actually, the 5-50 operates as a small stored program I/O controller, but the operating program can only be changed in the field by factory personnel.

Although the vendor conceded that the new IBM 2770 was aimed at the same broad market, he noted that the IBM gear still will not allow for editing, for 240 cps transmission from tape, nor for unattended operation. Also, the 5-50 is base priced at $5,500-$6,500 for a minimum system compared with a $27,000 range for the 2770. NOVAR CORP., Mountain View, Calif. For information:

CIRCLE 546 ON READER CARD

stored program terminal

The Compat 88-23 Stored-Program Terminal has send/receive capability in either on-line conversational or unattended batch modes. Simultaneous hard copy is produced for all data sent or received. The unit uses a unique 30-inch continuous loop tape cassette which stores 50K 8-bit characters, with maximum access to any character in less than .7 seconds. The I/O device is a Selectric typewriter modified to provide coded signal outputs for all keyboard entries and printed copy for all coded signal inputs. An auxiliary keyboard contains 12 keys which provide control functions and are used as the entry device for an optional adding machine function.

The 88-23 includes the Compat 88 Stored Program Computer, which provides all operating control signals and performs all calculations required for operation of the terminal. The 88 has 4K 16-bit core memory with 1 usec access time and includes LSI and MOS components. The 88 can be programmed to perform additional tasks including the simultaneous operation of parallel keyboards.

The normal sequence of operation of the terminal consists of accumulation and storage of data during the regular workday, transmission of the stored data when polled by the central computer at night, and recording messages from the central computer after the completion of data transmission. The next morning the data recorded on tape from the central computer is printed.

For communications operation in the on-line mode, the 88-23 simulates an IBM 7701 terminal, so that a System/360 computer connected to a 2701 with SDA-1 synchronous adapter may be used to receive the data. Simulation of the 7701 permits use of the STRAM access method without modification. The terminal is available for use with either a model 201A3 (2000 baud) modem, or a 202C (1200 baud), according to user require-

ments. Any 8-level code may be used, although ASCII is standard. The entire terminal is housed in a desk-console approximately 42 inches long, 29 inches high, and 28 inches deep. Rental ranges from $220 to $370 per month, depending on quantity and configuration, with purchase at $9600 to $1200. Delivery requires 90 days ARO. COMPAT CORP., Westbury, N.Y. For information:

CIRCLE 545 ON READER CARD

computer monitor

As computers have become more complex—gaining more kinds of channels, more kinds of peripherals, multiprocessors and multimemory banks, and supervisors for multiprogramming, real time, batch and remote batch operation—visibility into their performance has decreased proportionately. The more complicated the system, the more difficult it is to determine how efficiently it operates. Both hardware and software products have been designed to help determine system utilization by program and by component. Software monitors have not been able to measure everything; hardware monitors are often not flexible enough.

The Computer Performance Monitor II is a hardware monitor designed for flexibility. It uses from 20-40 two-wire probes to measure usage of components (memory banks, cpu, or peripherals), of channels, and specific core locations (and hence programs or partitions). The device also keeps track of set-up time, idle time, and time spent

If you're up in the air about remote-access terminals

Terminals are our only business. Which means we make a specialty out of solving other people's remote-access terminal problems.

One of our specialties is fast delivery of terminals. Another is knowing how to help you set up your system for maximum effectiveness. Still another is a nationwide service network.

Regardless of how big a system you are planning we can take all the strain and pain off your hands.

We'll help you select the right type of terminal for your system, arrange for fast delivery from our own large inventory of BCD and ASC II units, and work out all the installation and maintenance details for you.

We deliver our TST 707's and Model 33's on short notice. We also offer Model 37's, high speed printers, 10-15-30 CPS conversional terminals, and CRT's.

Furthermore, we offer the most realistic rental contracts available anywhere.

Most of our contracts are on a 30-day cancellation basis. We think it's a comforting feeling for you to know you aren't locked into a long-term, no-way-out contract.

And when it comes to service, you've come to the right people.

Our nationwide service organization has the know how to keep your terminals running smoothly.

As we said, terminals are our business. Our only business.

IF YOU ARE A TIME-SHARING COMPANY . . . You're only as good as your terminals—and your ability to deliver them in quantity on short notice. You tell us where, when and how many terminals you want, we'll do the rest.

FOR TIME-SHARING USERS . . . If you're hung up on which way to go, what types or speed terminals you should have installed, call us. We'll help you select the terminals that will give you the performance you need.

IF YOU ARE BUILDING A COMMUNICATIONS SYSTEM . . . For corporations, Government agencies, brokerage houses and others planning a communications network, we'll take the worry out of selecting terminals, and help you set up the most effective, efficient, and economical terminal network possible.

For more information about the services we offer, please call or write: Mr. James Gillece, Vice President, Marketing, Time-Sharing Terminals, Inc., 2351 Shady Grove Road, Rockville, Maryland 20850 (301) 948-0700.

TIME-SHARING TERMINALS INC

REGIONAL HEADQUARTERS:

EASTERN
Virgil Hunt
Eastern Regional Manager
2351 Shady Grove Road
Rockville, Maryland 20850
(301) 948-0700

NORTHEASTERN
Joseph A. Just
Northeast Regional Manager
2 Penn Plaza Suite 1500 B
New York, New York
(212) 565-1778

CENTRAL
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Central Regional Manager
4118 W. Lawrence Avenue
Chicago, Illinois 60630
(312) 282-5590 282-5591

WESTERN
Phillip Rojas
Western Regional Manager
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(213) 376-7981

we'll put you on solid ground.

ibm's system/3

IBM's long-awaited System/3, known through rumors as the 3.7, is the smallest in the IBM business dp line and is aimed at filling the void between the 360/30 and the accounting machine and tab equipment market—something the 360/20 could not fully accomplish. Its introduction signals a hurried shift in dp marketing directions.

First, the computer uses monolithic integrated circuitry, establishing a shift from IBM's hybrid circuitry for all future systems. Second, the 3 comes in card and disc versions, but the punched card it uses is a 96-column card that is *one-third* the size of the standard 80-column card and the disc it uses is not 360-compatible. These nonstandard features preclude immediate competition for the estimated 25,000-unit mod 3 market. The first quarter 1970 delivery date for the card system (third quarter for the disc-based version) does not give the competition much time to react, either.

User programs are designed through the use of a proprietary program, Applications Customizer, which uses fill-in-the-blanks inputs to prepare program outlines, including flowcharts, for user programmers to follow in coding RPG II programs—the only language for the 3.

Although not up to the throughput of the 360/20—due to its single channel and slow peripherals—the "baby" system boasts an add time of 26 usec for two five-digit numbers compared to a 206 usec listing for a comparable add on a /20. No communications capability is offered with the 3 either (that might be hard to do with a single channel).

System/3 has an 8-32K character memory and uses EBCDIC internally. The disc version, which requires at least 12K of core, comes with one or two drives providing a capacity of 2.45–9.8 million characters with 153-269 msec average access times. Even the single drive can have one fixed disc and one removable cartridge of 2.49 megacharacters each. The two-drive configuration offers either one fixed and two removable or two of each.

For card-based versions there is an IBM 1442 card reader/punch that will handle the good old industry standard 80-column card. For both card and disc versions there are two models of a multifunction card unit, which read (250 or 500 cpm), punch (60 or 120), collate, and print (60 or 120 cpm, again). Other peripherals include 100 and 200 lpm printers, 1000 and 1500 cpm sorters, a Selectric printer-keyboard, and an off-line key-to-mini-card data recorder.

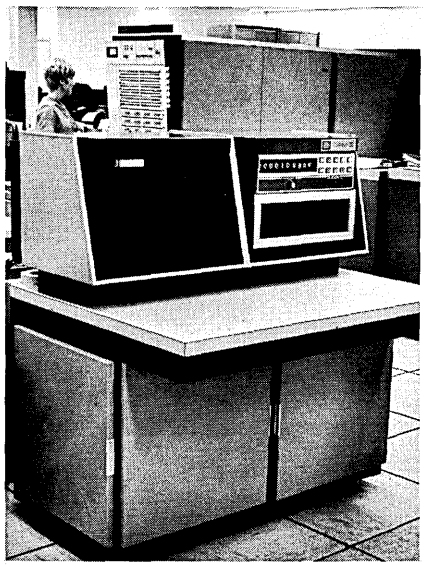
The cpu cost for the card system ranges from $310-$985 per month, or $15,200-$48,275 on purchase. The disc system goes for $435-$1110 per month and $21,325-$54,400 on purchase. Add to that the $35 or $45 per month for RPG II (the software is "unbundled," remember?), $10 per sort or utility, $180-$265 per program for the Applications Customizer service, $120-$200 per person for education, $22 per hour for system engineering help (estimated at 100-160 hours per system installed). IBM, White Plains, N.Y. For information:

CIRCLE 544 ON READER CARD

in wait status.

The CPM II's development is an unusual story. The partnership formed to produce the CPM I was dissolved and the machine produced under the name of SUM (Systems Utilization Monitor) by Computer Synetics. In rebuilding the CPM I—from scratch—the remaining partners added a real time clock, extended the basic 16 counters from 6 to 10 decimal digits, added thumbwheel inputs for record ID, expanded the plugboard from 450 to 600 hubs, upgraded the 7-track 556 bpi tape unit to 9-track 800 bpi, and developed the two-wire (rather than three) probe. The machine was so different they decided to update the numerical designation.

Monitored functions are recorded in 175-character tape records for use in a measurement summary report program. Although the base system has 16 counters, 16 more functions can be monitored optionally, increasing the length of the tape record. The output reports can be used to justify changing the machine configuration, the operating system, or even the job mix of a computer system.



CPM II is sold for $35,000 and leased for $1,155. Up to 75% of the rental applies to purchase. A maintenance contract is available after the first 90 days for $950 per year, but the company expects to train users in the device's maintenance requirements. Documentation and software for use on non-360 systems is optional. (A consulting service based on one week's use of the CPM II is offered at $1,500 for those who do not wish to purchase or lease but still need the capability.) ALLIED COMPUTER TECHNOLOGY, INC., Santa Monica, Calif. For information:

CIRCLE 547 ON READER CARD

keyboard to tape

Keyboard-to-tape data entry, once the purview of one manufacturer, is still having a population explosion. The latest system is from Penta Computer Associates, Inc. Bolstered by a flock of edp talent from CUC, a $5 million hardware deal with Redcor Corp. and a well received stock issue, Penta is beginning to market its computer-controlled, multi-station Key-Logic data entry system.

Configuration for Key-Logic ranges from 8 to 64 terminals connected to a 12K Redcor 70. A 2-million-byte fixed-head Burroughs disc takes care of file accumulation and Peripheral Equipment Corp. 9-track or 7-track tape drives record 360 or 1400 and 7000 compatible output.

Penta has followed the IBM-compatible credo to a new extreme. Operator terminal for the system is IBM's 029 keypunch keyboard with modifications and the terminal table is an exact replica of the IBM product down to the Formica. The Penta people feel this adherence to IBM engineering will make operator changeover easier. The supervisor console is a Selectric.

Modifications to the 029 include a battery of toggle switches for fixed and repetitious functions and a back-lighted display. The display shows error and control messages and characters, numeral and symbols as they are keyed-in.

Penta feels two things distinguish its data entry system from the others in the marketplace—the use of the 029 keyboard and "a complete range of data validation and editing programming." The company admits other systems have validation software but claim theirs is the more complete.

In Key-Logic every character is validated as it is entered. It is checked against a format table automatically. If in error, an error sign is displayed designating specifically what is wrong, i.e. invalid value, alpha only (when a numeric is keyed in an alpha table) or numeric only. The characters are held in core until a record is complete and then transferred to the disc. When a complete file is accumulated it can be kept on the disc for verification or recorded on tape. Standard verification procedure on the system includes check digit, batch and range checking. Error correction in verification is also immediate.

Penta is responsible for the conception, software design and hardware specification for the Key-Logic. It will market the system and support the software. Redcor is assembling the system and constructing the interfaces between the components. It will also maintain the hardware.

Purchase price for the Key-Logic

Honeywell Keytape* can feed a computer a thousand miles away.

It phones data directly to the computer site.

From magnetic tape to magnetic tape.

So you can link all your branch offices to one computer in the home office.

When you're not transmitting, your Keytape Communicator can be recording all your source data onto magnetic tape.

With 52 Keytape models that print, add, list, pool, validate check digits and take care of other data preparation jobs, you don't have to worry about getting one that fits your operation.

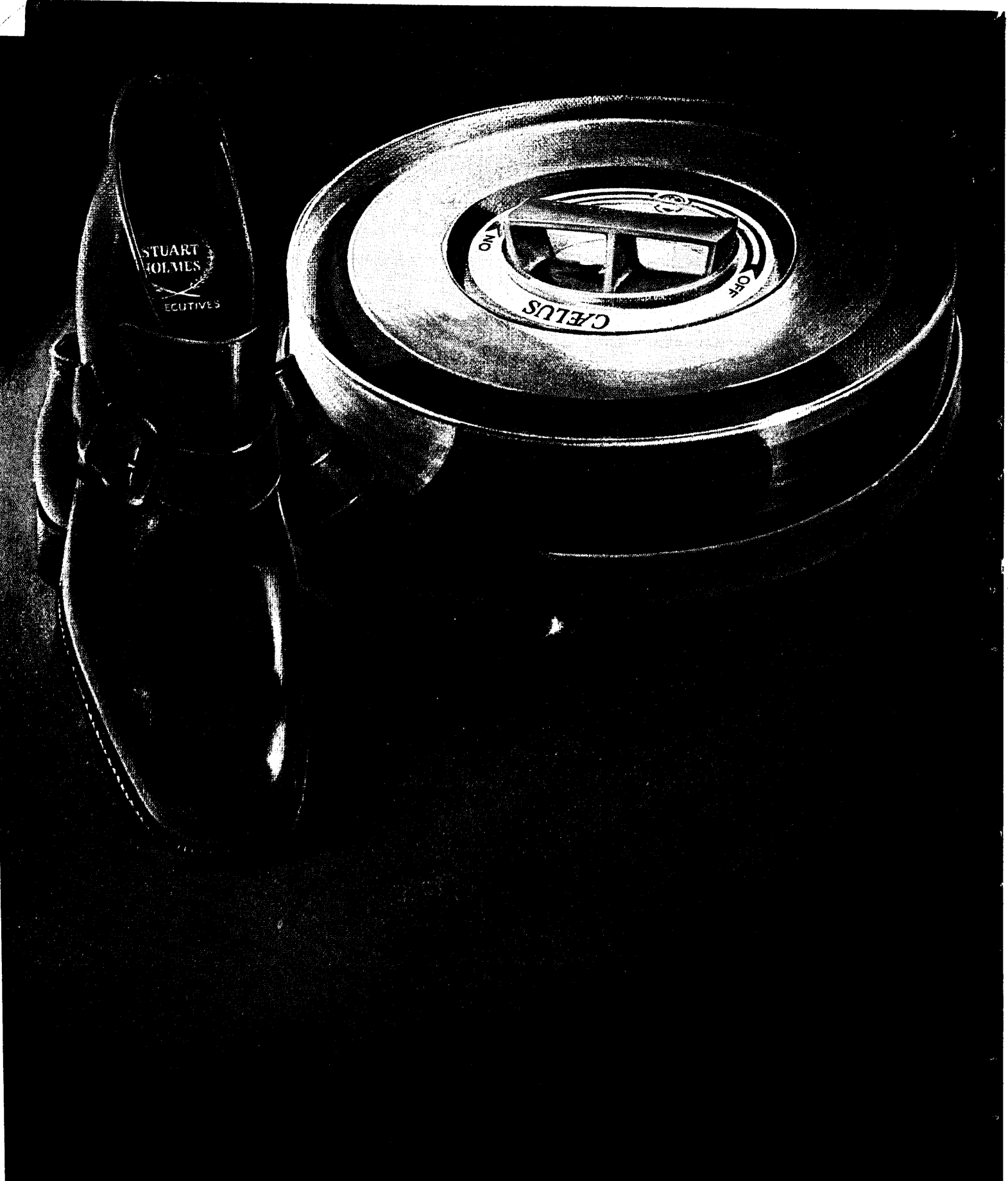
And we'll deliver your Keytape unit anywhere you can put a branch office.

* Trademark of Honeywell, Inc.

The Other Computer Company:

Honeywell

CIRCLE 144 ON READER CARD



The oldest and largest family shoe chain in America, Kinney's Shoes, relies on Caelus disk packs to keep inventories up to date. Have you ever seen a Kinney's shoe store that didn't have shoes for sale? Enough said.

CÆLUS MEMORIES, INC.

P.O. Box 6297, San Jose, California 95133. Telephone (408) 298-7080. Sales offices strategically located throughout the United States and Europe.

CIRCLE 67 ON READER CARD

varies with number of terminals. An 8-terminal system goes for $100,000; 16 terminals for $140,000; 24 terminals $170,000; and 32 terminals $202,000. The price for systems outside the 8-terminal progression is set on individual requirements. Penta is also negotiating a leasing arrangement. PENTA COMPUTER ASSOC., INC., New York, N.Y. For information:
CIRCLE 579 ON READER CARD

ibm teleprocessing gear

The 2770 modular terminal system can handle, in various combinations, punched cards, paper tape, manual keyboard input, mag tape cartridges, a magnetic character reader, and a new medium-speed serial printer. The serial printer operates at up to 66 cps using a design in which impact points in a matrix are electrically grouped and forced into a ribbon to form characters on paper.

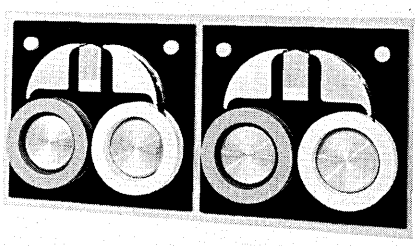
With the new IBM 1255 magnetic character reader, the 2770 can process magnetic-ink-encoded documents such

as bank checks, transmitting the data directly to a remote computer. The reader can also sort up to 500 documents a minute off-line. Information on magnetic tape also can be transmitted by the 2770, using the tape cartridges produced by the IBM 50 key-to-tape device. The 2770 uses binary synchronous transmission, enabling it to communicate with another 2770 or with a 360. Under control of a 360/25 or larger, it can operate on the same line with the IBM 2780 data transmission terminal, an 1130 computer, or a 360/20. Phone line transmission speed is up to 2400 bits per second, using either EBCDIC or ASCII.

A typical 2770 system, consisting of a control unit and keyboard, card reader and printer, will rent for about $600/month and sell for about $2,600. First deliveries are scheduled for the second quarter of next year. IBM, White Plains, N.Y. For information:
CIRCLE 549 ON READER CARD

minicomputer tape deck

The C0600 LINC Tape System, a mini-tape system for minicomputers, was named in deference to the MIT computer project called LINC which first defined a need for such a peripheral. The C0600 consists of two tape drives, each with 150 feet of ¾ inch tape, which hooks up with a mini-cpu. Each reel of tape is capable of storing over 100,000 16-bit words in blocks of 256. The data transfer rate for the device is roughly 4.2KC, and the time required for a pass of a full tape is listed as 27 sec.



The system approximates a random access storage device. It is not used as a standard tape deck, but more as a disc. The 256-word blocks are given permanent, pre-recorded numbers. The numbers are used to retrieve the 256-word data elements as though they were recorded on addressable disc tracks. Each block is given a checksum, and tape searching may be done moving the tape forward or backward.

Two models are available, an "A" model which uses an I/O channel of a Varian 620/i and costs $9,950, and a "B" model which uses 620/i direct memory access, transfers through a double buffer on a cycle stealing interrupt basis, and costs $10,500. Software issued includes utilities, a loader, assembler, FORTRAN with math and I/O routines, and bootstrap. Although the Varian-compatible version is ready, models for the Honeywell 516 and 316 and the General Automation SPC 12 are expected. COMPUTER OPERATONS, INC., Silver Spring, Md. For information:
CIRCLE 548 ON READER CARD

ge-100 midi

The GE-120, fourth in the GE-100 family of computers, is tucked in between the small GE-115 and the larger GE-130. All are upward compatible, of course. Initial applications for the 120 are expected to be found in the assembly manufacturing industry in such areas as parts explosion and random access inventory control, with eventual use in distribution, hospital administration, insurance, banking, and retailing. The system is available in both magnetic tape and disc configurations.

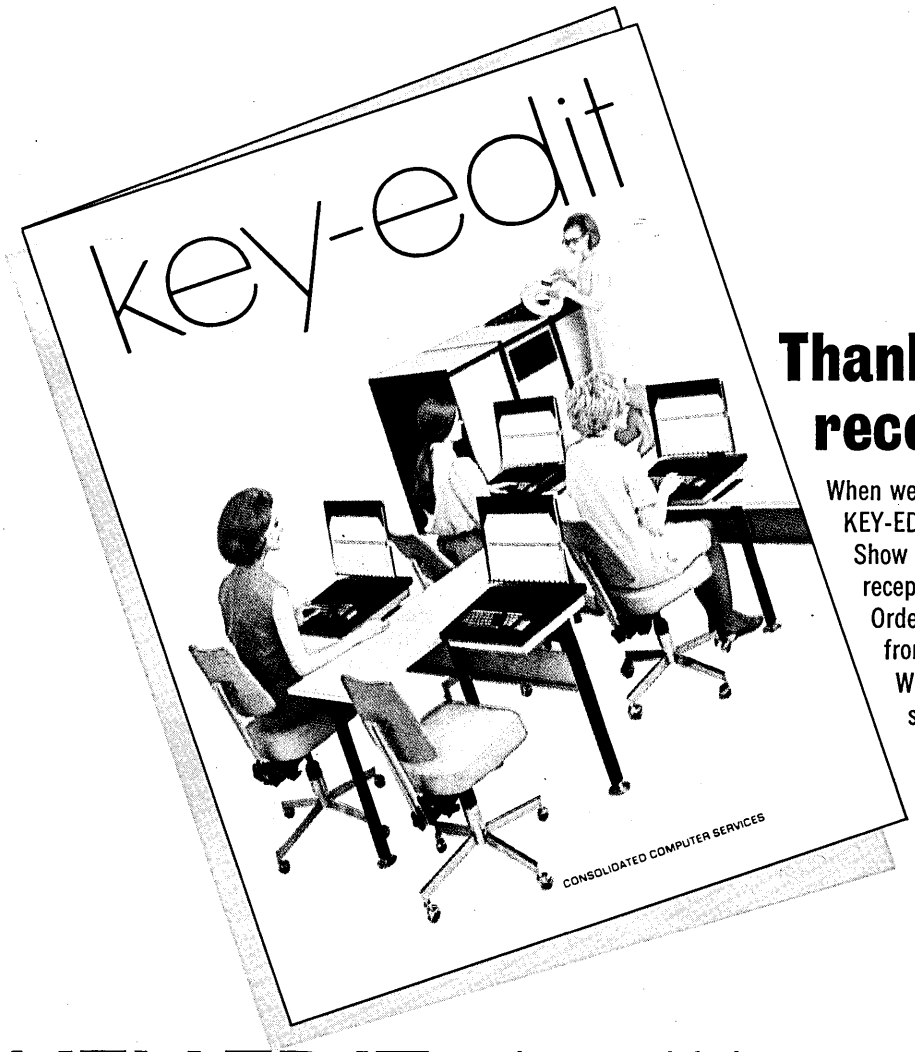
The GE-120 is designed with monolithic integrated circuitry. Memory cycle time is 4 usec. Memory capacity is 12K, 16K, or 24K bytes. The machine has a repertoire of 63 instructions, eight index registers, complete overlapping of processing with I/O operations, a program interrupt, and communications capabilities. Software includes GE-100 RPG, Operating Systems, Assembly Programming System, COBOL 65, FORTRAN IV, and Sort-Merge Generators. Rental for a tape system begins at $2,980/mo. at a selling price of $128,600. A disc system rents from $3,310/mo., and sells at $143,702 and up. Delivery requires six months ARO. GENERAL ELECTRIC CO., Phoenix, Ariz. For information:
CIRCLE 550 ON READER CARD

multistation display

CDC's modular multistation display subsystem consists of a 216-4 display controller, 211-4 input units (keyboard and crt), and 218 output typewriters. The equipment provides immediate visual display and hard copy printout of messages composed on the keyboard or information generated by the controlling computer. The controller can handle up to 12 stations. The display stations can be operated at distances of up to 3000 feet from the controller, or the subsystems can be linked by telephone lines to form a network.

The full-edit keyboard provides capabilities for any type of message composition as well as an operator/computer conversational mode. An internal memory for each station allows off-line operation, except when communicating directly with the computer. Information is displayed on the 14-inch crt in lines or pages. Page format is offered in 20 lines with 50 (5x7 dot matrix) characters or with 13 80-character lines. An underline chain shows where the next character will be entered.

This configuration, equipped with polling, is said to be especially suited to applications such as management information systems, airline reservations, weather reporting, military command and control, insurance files, and election returns. The display controller sells for $17,500 (leases for $440/month); the input station has a purchase price of $3,500 ($114/month lease price); the typewriter stations sell for $8K and may be leased for

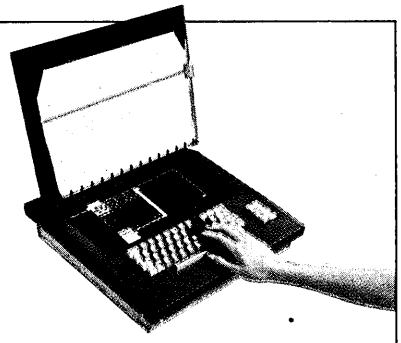


Thanks for the reception!

When we announced and demonstrated KEY-EDIT at the International DPMA Show we expected an enthusiastic reception. But we were overwhelmed! Orders and inquiries have poured in from every section of the country. We are meeting our production schedule and first deliveries will be made this month.

KEY-EDIT makes multiple tape units as obsolete as punched cards

Third generation computer capacity—now! KEY-EDIT—today's most economical, flexible and powerful data preparation system actually eliminates the need for multiple tapes and the noisy keypunches. It does away with associated tape labelling and tape traffic problems. It provides automatic pooling and its editing reduces verification to a minimum. It cuts down on batching delays. It is singularly effective for installations with many small jobs. And equally effective for those with large volumes on a few jobs. Up to 32 keyboard terminals can be connected "on line" to the central processor for entering and verifying data. Modular design of movable key stations lets you expand as you wish and put floor space to optimum use. To sum up, KEY-EDIT can save you time, money, and personnel turnover. Make your enquiries now! We will be happy to give you an explanation and a demonstration of this remarkable system just as quickly as possible.



KEY-EDIT'S functionally designed key station increases operator productivity and accuracy. Input data, format information and column number are displayed clearly in "letters and figures". Operator errors are detected and diagnosed immediately. And corrected. Our standard 64 character keyboard minimizes the need for operator retraining.

CONSOLIDATED COMPUTER SERVICES

Consolidated Computer Services Limited
48 Yonge Street, Toronto, Canada
Telephone 416-366-7643

Consolidated Computer Services International Inc.
P.O. Box 5308, High Point, North Carolina 27260.
Telephone 919-883-9818

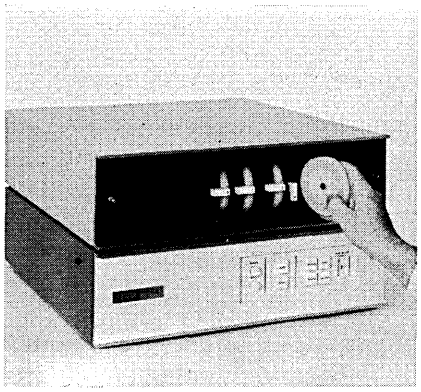
$270 a month. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 551 ON READER CARD

1600 bpi mini-tape

Three 3-inch spools of ¼-inch mylar tape such as those used on the 1640 Series Disc Tape Unit hold as much data—roughly 11.4 million characters—as a 1200-foot 7- or 9-track 800 bpi tape reel. The secret lies in packing 450 feet of tape onto each tape pack and packing bits onto that at 1600 bpi.

The 1640 is intended as a mass storage medium. It comes in configurations of from two to eight tape transports and is capable of accessing data on any of the tapes in an average of 23 seconds. This access time puts the 1640 in a unique position, halfway between a disc and a standard tape drive. Searching can be done reading forward or backward at up to 120 ips. If desired, the data can be stored and retrieved in a block mode, which allows for reading or writing one block at a time as on a random access storage device. Also as a random access device, data is recorded on four bit-serial tracks (actually eight tracks, but each pair is parallel redundant to insure validity since there is no read-after-write capability); each track can be addressed and searched individually.



Data transfer is at 21KC, and additional speed is gained through being able to read one tape while writing another. Typically, the unit is set up to handle 16-bit words, but 8-bit and 12-bit word interfaces are available optionally, and 18, 24, or 36-bit words can be accommodated by specially altering the 1640's data transfer registers.

Unit prices for the 1640 range from $7,900 for a two-tape system to $16,000 for an eight-tape unit. Interfaces are listed separately at $1,150. Most of the smaller machines can be interfaced to the tape system now, including the Digital Equip. Corp. PDP-8, the Varian 620/i, and Data General's Nova. Interfaces for the larger word length machines will be developed as needed. ELECTRONIC ENGR. CO. OF CALIF., Santa Ana, Calif. For information:

CIRCLE 552 ON READER CARD

remote terminal computer

The GE-105 RTS small-scale computer is designed primarily to serve as a remote terminal for a large system, but may also be used as a stand-alone machine. The 105 can be used to communicate with all computers in the GE-100, 400 and 600 lines, as well as with computers of other manufacturers. It is fully compatible with all other GE-100 systems. Used as a free-standing system, computer time and communication lines costs can be reduced—data to be transmitted to a central computer can be reduced, validated and edited before transmission—or raw data returned from the larger computer can be edited by the 105.

The basic system consists of a 4K memory, a 300 cpm reader, a 250 lpm printer with 120 print positions, and a half-duplex synchronous single-line communication controller. Data transmission rate is 2000 bps over public telephone lines; 2400 bps over leased common carrier voice-grade lines.

Remote terminal functions are provided by software packages that include subroutines for message transmission and reception, simultaneous card reading and transmission, and simultaneous reception, printing and/or card punching.

Options include an additional 4K of memory, 16 additional print positions, and a 60-200 cpm punch.

Monthly rental ranges between $1,145 for the basic system to $1,675 with all options. Purchase prices range between $56,670 and $78,940—again depending upon configuration. Initial deliveries are scheduled to begin in December; delivery is six months after contract approval. GENERAL ELECTRIC CO., Phoenix, Ariz. For information:

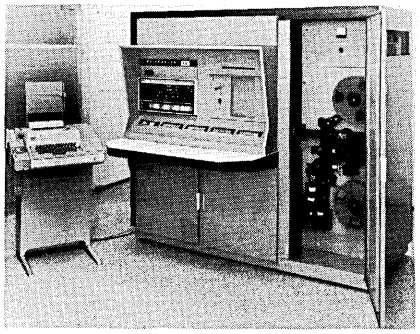
CIRCLE 554 ON READER CARD

document retrieval

Computers being introduced for the next decade's worth of sales are more predicated on data dissemination than today's general purpose data processors. This is seen in the number of communications channels built-in, message concentrators added or offered as peripherals, and expanded interrupt schemes. The trend is also seen in peripherals such as the File-Search IV, a document retrieval system based on 16mm and 35mm cam-

era equipment and a built-in cpu.

The FileSearch IV system consists of a recording unit with a 35mm camera, a punch for edge-punched cards, a keyboard, and the FileSearch IV retrieval unit with its copy cameras and



controller and Teletype keyboard. An edge-punched card is prepared for each "document" to be recorded. (Documents may be several pages or single pages.) The punched section of the card is photographed along with the document on the recorder; the punches act as the identifying and indexing information.

The 25X image film, which can be produced in lengths to 1000 feet (32,000 pages), is mounted on the retrieval unit. There the randomly photographed documents can be copied onto another reel in logical order, or the randomly recorded reel can be searched at 200 feet/min in response to console inputs or inputs from remote terminals.

In response to an inquiry, the retrieval system will stop on the first document that fits the index description and display it on a crt screen. If desired, a ⅔-size hard copy can be created in 5-8 sec or a 35mm or 16mm film copy produced in ½ sec. (The 16mm film copy does not include the punched card image associated with a document.) The crt display need not be used if, for instance, a request for "all documents" fitting a description is received.

The built-in Digital Equipment Corp. PDP-8/i enables the system to perform all kinds of index manipulations and matching, and to keep track of the number of times a document is accessed or to print "new document" listings for a hard copy index. (The PDP-8 is a popular machine for these kinds of functions. The last recorder/retrieval systems we saw, Terminal Data Corp.'s Scannermate and Displaymate, also incorporated it.)

The basic system, including the recorder, the tty console, the retriever with its film processing equipment, and a card punch will run something under $200,000. Peripherals, such as mag tape equipment or discs, can be added at the user's discretion from other vendors' lines. Peripheral data storage gear is suggested since it makes the system capable of storing reader profiles and automatically searching new documents for matches. Over twenty service center locations for the gear are already in operation. FMA INC., Los Angeles, Calif. For information:

CIRCLE 553 ON READER CARD

360 communications computer

The Compat 270 is a communications computer which provides on-line interface between System/360 cpu's and remote terminals. It arranges the data from telephone dial-up connections into manageable data blocks which are transferred to the 360. In addition to communication functions, the programmable unit performs code translation, transmission speed matching, and message length control. The 270 uses IBM tape-drive software, permitting the 360 to handle it as if it were a tape drive, without the necessity of BTAM, QTAM, extra core, or system upgrading in order to perform teleprocessing. A tape drive controller is not required, however.

The 270 accepts input from up to

How to evaluate Sigma 5, 360/44 and SYSTEMS 86 real-time computers.

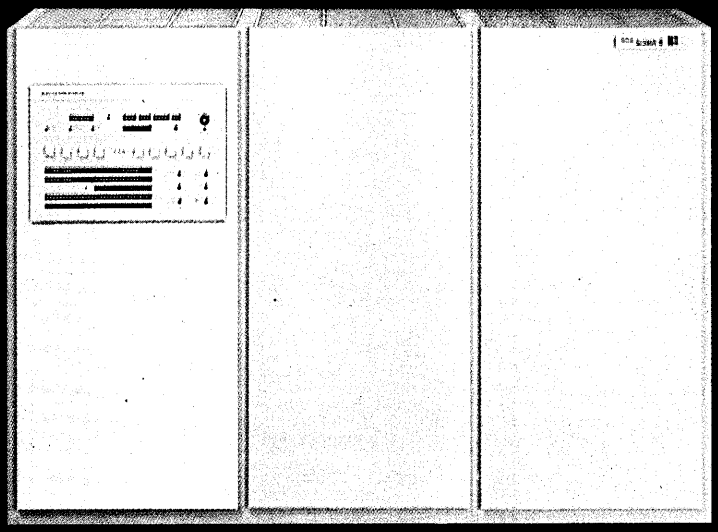
Take a close look at price-performance.

Not just the words, but a detailed comparison—using actual computer kernels—of the real-time response and throughput rates of each computer operating in a multiplexed I/O mode. With a hard-nosed dollar-to-dollar cost comparison.

It shows one of these machines is not only 15% faster, but more than 15% less in price.

It's the one you helped design. Because it grew out of our experience in meeting your real-time hardware requirements. Satisfying your custom software needs. Solving your front-end application problems.

We'd be happy to share the specific results with you. Just send us the coupons.



Sigma 5

32-bit real-time computer
Memory cycle time—850 nanoseconds
Typical batch configuration—$435,000

SYSTEMS Engineering Laboratories
6901 West Sunrise Boulevard
Ft. Lauderdale, Florida 33310

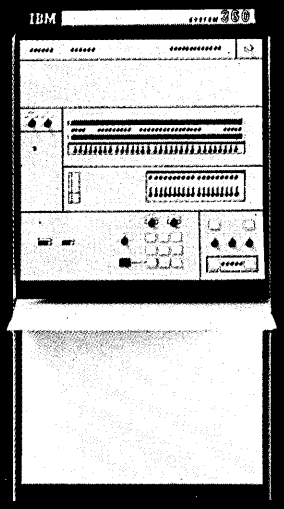
I'd like to see the actual test results that show why the Sigma 5 came in second in your price-performance comparison.

Name _____

Company _____

Address _____

City _____ State ____ Zip ____



360/44

32-bit real-time computer
Memory cycle time—1000 nanoseconds
Typical batch configuration—$475,000

SYSTEMS Engineering Laboratories
6901 West Sunrise Boulevard
Ft. Lauderdale, Florida 33310

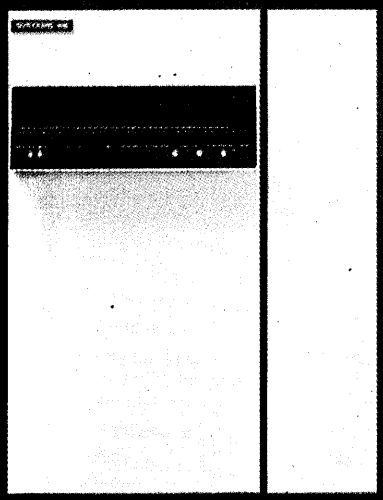
I'd like to see the actual test results that show why the 360/44 came in third in your price-performance comparison.

Name _____

Company _____

Address _____

City _____ State ____ Zip ____



SYSTEMS 86

32-bit real-time computer
Memory cycle time—600 nanoseconds
Typical batch configuration—$360,000

SYSTEMS Engineering Laboratories
6901 West Sunrise Boulevard
Ft. Lauderdale, Florida 33310

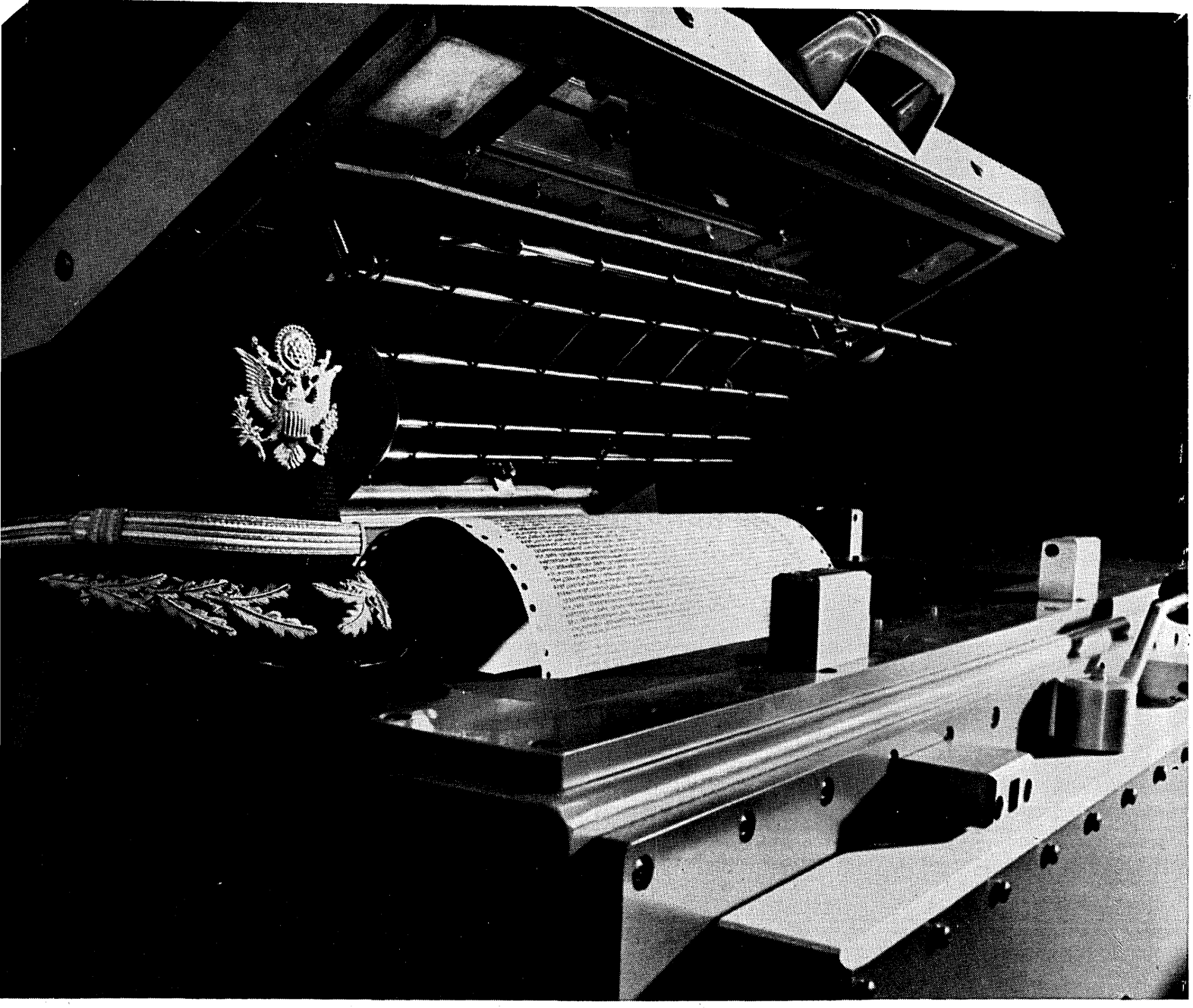
I'd like to know more about SYSTEMS 86. And about how the new SYSTEMS 88 can give me true multi-processing capability in a real-time application.

Name _____

Company _____

Address _____

City _____ State ____ Zip ____



The 4910, our newest military Line Printer, rates a salute. It costs less than $40,000. It meets RFI MIL-I-16910. It operates in 0 to 50°C. It's a direct descendent of the fully-militarized RO-280/UYK you've specified when extreme shock and vibration are of prime importance. Because of our patented one-piece print hammer, the 4910 offers time-proven reliability and prints the straightest, cleanest line in the industry. For all the details call Bob Allen at 213/887-8000.

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CIRCLE 62 ON READER CARD

96 low-speed lines, expandable in increments of 8. It is programmable to accept up to four different transmission speeds to 1200 baud. Any 5-, 6-, or 7-level code is acceptable. The 270 uses an 8K 16-bit stored program computer which is expandable to 32K. Interface is provided with up to four high-speed lines and input can be to either the multiplexor channel or selector channel. Options include a real time clock, power failure interrupt, and automatic restart capability. Price is $70-150K depending on number of lines required. Deliveries are scheduled for the first quarter of next year. COMPAT CORP., Westbury, N.Y. For information:

CIRCLE 555 ON READER CARD

communications terminal

The ASC 1170 computer system is designed for use as a communications terminal. The core memory, expandable in 4K modules to 32K bytes, features an up to 1K read-only memory that allows up to 4800 baud I/O transfer rates, full- or half-duplex, with EBCDIC or ASCII coding conventions: Paper tape reader/punch, I/O keyboard, and communications adapter are included in the basic system. Reader speeds are up to 400 cps; punch, up to 50 cps. Options include a line printer (up to 300 lpm) and card reader with speeds up to 500 cpm. The peripherals are of various manufacturers.

Optionally, the 1170 system can also be configurated with multiple low-speed line and adapter for implementation as a communications data concentrator. Also optionally it may be purchased for stand-alone use as a general computer system with full programming capabilities for off-line functions. According to the company, price of a minimum configuration will be about $12K, but the cost of a more typical configuration will be closer to $15K. Delivery is 10 months. APPLIED SYSTEMS CORP., Detroit, Mich. For information:

CIRCLE 556 ON READER CARD

hybrid

Analog hardware is great for simulations and for process control work where a fixed program is to be used and the variables altered; digital systems, of course, have larger memories and more logical control, but are slower and more expensive. A hybrid seems to be an ideal solution for those users who require control logic and memory in an analog application, and the SD 80H is aimed at that market.

The vendor has been building analogs for some time, so the 30-120 amplifier (typically configured), 50 KHz bandwidth analog part of the 80H hybrid is rather stock for them. However, a digital interface, which is rated at a 100KC throughput figure, has been added to the 100v analog hardware. The interfaced system can be built to customer requirements in about 90-120 days. A 50-amp system will run something like $50,000. SYSTRON-DONNER CORP., Concord, Calif. For information:

CIRCLE 559 ON READER CARD

audio response terminal

The IBM 2981 is a compact five-pound keyboard terminal for use with audio-response systems. Users may enter alphanumeric information as well as queries into a System/360 and get computer-compiled spoken responses over the phone. The 26 alphabetic keys are arranged sequentially, along with 22 keys representing numbers and special characters. The computer can be programmed to talk the user through each step. A plant worker might hear, "Please enter your badge number." After he keys in this information, the computer might say, "Now enter your department number, job

new products ...

number, and the number of units produced." The 2981 requires telephone data transmission equipment in order to be linked to an IBM audio-response unit. Rental is $20/mo. and selling price $800. IBM, White Plains, N.Y. For information:

CIRCLE 557 ON READER CARD

multi-disc drive

IBM is now offering from one to eight active disc drives for its 2314 direct access storage facility. Previously, only 5- and 9-drive versions were offered. Each 11-disc pack (20 surfaces) has a storage capacity of 29 megabytes; maximum storage capacity with the largest version (using a ninth drive as a spare) is 233,400,000 bytes. The 2314 can be attached to IBM 360 models 30, 40, 50, 65, 67, 75, and 85. Access time ranges from 25 to 130 msec, with a 60-msec average. Monthly rental for the 2314 with a single drive is $2,015; purchase price is $90,940. The largest version rents for $5,505 a month and may be purchased for $248,710. First shipments are scheduled for the third quarter of 1970. IBM, White Plains, N.Y. For information:

CIRCLE 558 ON READER CARD

hard-wired asr-33

The DF33ASR-O is a modified ASR-33 Teletype which can be connected to standard telephone lines under the Bell direct access arrangement, avoiding the use of an acoustic coupler. The communications components are built into the terminal. A fully filtered transmitter and receiver data set is said to reject all harmonic and spurious signals. The unit is compatible with the Bell 103A, and an acoustic coupler is also included. Price is $1,550, and delivery is from stock. An optional answerback capability adds $100 to the price. DATA ACCESS SYSTEMS, INC., Landing, N.J. For information:

CIRCLE 561 ON READER CARD

1130/1800 double discs

The IODISC 1012 is almost two drives in one. The system uses single disc cartridges like the IBM 2315 cartridge used on the 2310 drive. The difference is that underneath the removable cartridge and its drive mechanism are another pair of heads and a non-removable disc. The idea is that a user can store his operating system and permanent files on the non-removable disc and use the removable cartridge

transferred with a single command. "Virtually all" logic functions are accomplished via hardware. On this basis only a short software driver is required for operation of the 1010. All units provided for use with H-P Series 2000 computers will include software drivers that are compatible with H-P FORTRAN and assembly language. Other drives may become available as other 16-bit computers are interfaced. Price is $21,500. COMMUNITY COMPUTER CORP., Philadelphia, Pa. For information:

CIRCLE 560 ON READER CARD

multiplexor

The TDML time division linking multiplexor is designed to work with 110 baud lines as input (the kind used, for instance, with a Teletype Model 33 or 35) and a 2400 baud line as output, although adaptations can be made for lines of different speeds. The unit is described as a linking multiplexor because several TDML's in various cities can be tied together onto one circuit. Whether using a single TDML or several linked together, the maximum number of terminals that can be routed over a 2400 baud circuit is 18. Up to 10 linked TDML's can be used to gather in the 18 terminals. The base unit price is $5,780 plus $40 for each bit-interleaved channel. (The channels need only be implemented at the linked station that receives them and at the cpu end of the line, not at all the intermediate linked stations.)

Other models of the same series offer additional features. The character-oriented TDML V can link variable speed lines (110, 134.5, or 150 can be dial selected). The TDMP is a five-channel, bit-oriented, 110 baud system with a built-in modem which is designed for opening new offices. One just coming out of the prototype stage is The Stream multiplexor, a device for linking four 2400 baud or two 4800 baud lines to a single 9600 baud line. It will sell for about $3,800 in its 2:1 version and about $7,600 in its 4:1 state. COMMUNICATIONS LOGIC, INC., Houston, Texas. For information:

CIRCLE 562 ON READER CARD

1800 extensions

New features added to the IBM 1800 data acquisition and control system include the doubling of main memory to 65K 16-bit words, expandable from a minimum 4K words in 8K increments. Additional new features are: An 1800/2790 adapter that allows the 1800 to become the system controller in a 2790 data communication system; a binary synchronous communications adapter that permits use of phone lines for direct communication between two 1800's or between an 1800 and 360 Models 25 through 85, an 1130 system, or the 2780 data transmission terminal; a new selector channel that permits attachment of up to eight 2311 disc drives and gives the 1800 the ability to share files with a 360; and expansion of the number of data channels from 9 to 15.

All the new features may be added to 1800's already installed at user locations. Each additional 8K of memory will rent for $585/mo., with purchase of $17,460. The 1800/2790 adapter rents for $630/mo; $25,220 purchase. The communications adapter rents for $223 and can be purchased for $8,925. A line adapter which rents for $165 and sells for $6,595 is required for each line attached. The new selector channel rents for $315 with purchase at $12,610. The data channel expander rents for $63 and sells for $2,520. First deliveries of the new 1800 features are scheduled for the second quarter of 1970. IBM, White Plains, N.Y. For information:

CIRCLE 563 ON READER CARD

disc series

There are 18 models in the 5200 and 5250 series of Parallel Disc Memories. They range from an eight-track model with a lower-cost hysteresis-synchronous motor for $7,270 up to a 72 channel version with a direct dc motor drive which sells for something over $30,000 in single units. In each case, each track can store up to 100,000 bits








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data input system

accepts the output from 60 or more key stations simultaneously

Time-shared input cuts data preparation costs 50%.

Now you can cut your computer input costs in half. This new innovation in data preparation techniques gives you two money-saving advantages over conventional keypunch or one-keyboard/one-magnetic-tape-per-operator systems: (1) the LC-720 employs a computer time-shared input; (2) it is the only system available that provides data output directly on IBM/360-compatible magnetic disc.

By time-sharing the data from 60 or more keyboard operators simultaneously, significant savings in data station costs of as much as 50% can be achieved. Costs drop to as low as $4300 per data station for a typical 60 station system. For large data preparation installations, the time-shared input is the only economical way to go.

Data entered into the LC-720 is processed by a small digital computer and stored on an IBM/360-compatible magnetic disc that provides the advantages of bulk storage and high speed random access of data. The problems associated with punched card handling or the mounting, pooling, merging and unmounting of magnetic tape reels are eliminated. All data is conveniently and economically stored in an IBM 1316 disc pack for direct high speed input to your modern data processing system. Naturally, an IBM/360-compatible magnetic tape is also provided with the system as standard equipment.

The LC-720 KeyDisc System also offers for the first time, data verification requiring one input pass only through the system, in addition to the normal technique of verification requiring two different operators. Record size is infinitely variable by each operator from 1 to 120 characters long and the system stores a large library of 30 or more different format control programs, all available simultaneously to any and all operators.

LC-720 KeyDisc System

Bring your own data for a demonstration

Logic Corporation invites you to see an operating demonstration of the LC-720 KeyDisc System at the company's premises. Bring your own original data and Logic will provide a reel of magnetic tape of the output of your data from the LC-720 for later printout at your own computer facility.

To arrange for a demonstration, contact Gary Tischler, Director of Marketing (201) 334-3713

LOGIC CORPORATION

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and transfer the data out in one revolution in 1/30 sec (corresponding to a transfer rate of 3 megabits/sec). The maximum access time is given as about 33 msec. Although the rpm's cannot be speeded up, the transfer rates can be increased by parallel reading on several tracks at once. Applications suggested for the disc series are display buffering, time-sharing buffering, content-addressed bulk storing, and instrumentation recording. DATA DISC INC., Palo Alto, Calif. For information:

CIRCLE 566 ON READER CARD

storage and retrieval system

Dimbo-10 is a self-contained information storage and retrieval system which utilizes a disc memory for storage and has optional I/O configurations utilizing a Model 33 Teletype as standard. Options are the Model 35 TTY or a Model 731 Selectric I/O typewriter. The Dimbo-10 will store 1200 to 40,000 32-character records; 64-character or larger record lengths and larger file capacities are available optionally. Other options include magnetic or paper tape I/O for file loading and audit train, an arithmetic capability, and remote consoles for inquiry into the central file. Average access time is less than .1 second.

The unit is designed for fixed-format storage and retrieval applications and is intended for the user who must search a large list of entries in order to retrieve information on one of them. A search consists of locating an item from its identifier, which is then typed into the Dimbo-10. The system locates the proper item and types all the stored information. The item may then be altered and returned to the file or deleted and a new item entered. Dimbo-10 is self-contained i n a 2 x 2 x 3 foot movable console, and sells for about $10,000. It's the first product of BCD COMPUTING CORP., Deer Park, N.Y. For information:

CIRCLE 564 ON READER CARD

data entry

The CCI data entry system joins the growing mob of key-to-tape units. It is designed for unit record data entry via crt/keyboard, using crt's which can handle a range of characters from 160 to 1920. Up to 12 terminals can be hooked onto a single cluster control memory unit which can transmit the data to standard magnetic tape or multiplex this information for direct or remote transmission to an IBM 360 computer. The system includes edit features such as insert character and insert line, plus tabbing and formatting, providing flexibility "comparable" to the recently introduced, and more expensive, CCI 520 off-line data terminal system (June p. 183); both systems employ the same core memory. Price of a system with 480-character crt's will run about $200/mo. per terminal, under a three-year rental. Delivery requires 120 days ARO. COMPUTER CONSOLES INC., East Rochester, N.Y. For information:

CIRCLE 568 ON READER CARD

free-standing keypunch

The A150 represents Burroughs' entry into the free-standing keypunch market. The unit incorporates both regular and alternate stacking pockets which are operator selectable. There is a 500-card-capacity feed hopper and primary stacker, plus a 400-card-capacity alternate stacker. The A150 punches and reproduces with interpretation at up to 20 card columns per second, and skips and releases at 80 columns per second. Duplicating capability permits full duplication of 12 zones or any combination in a single card column. Other features are program drum control of field definition, spacing, skip

A dirty tape can drive a computer crazy.

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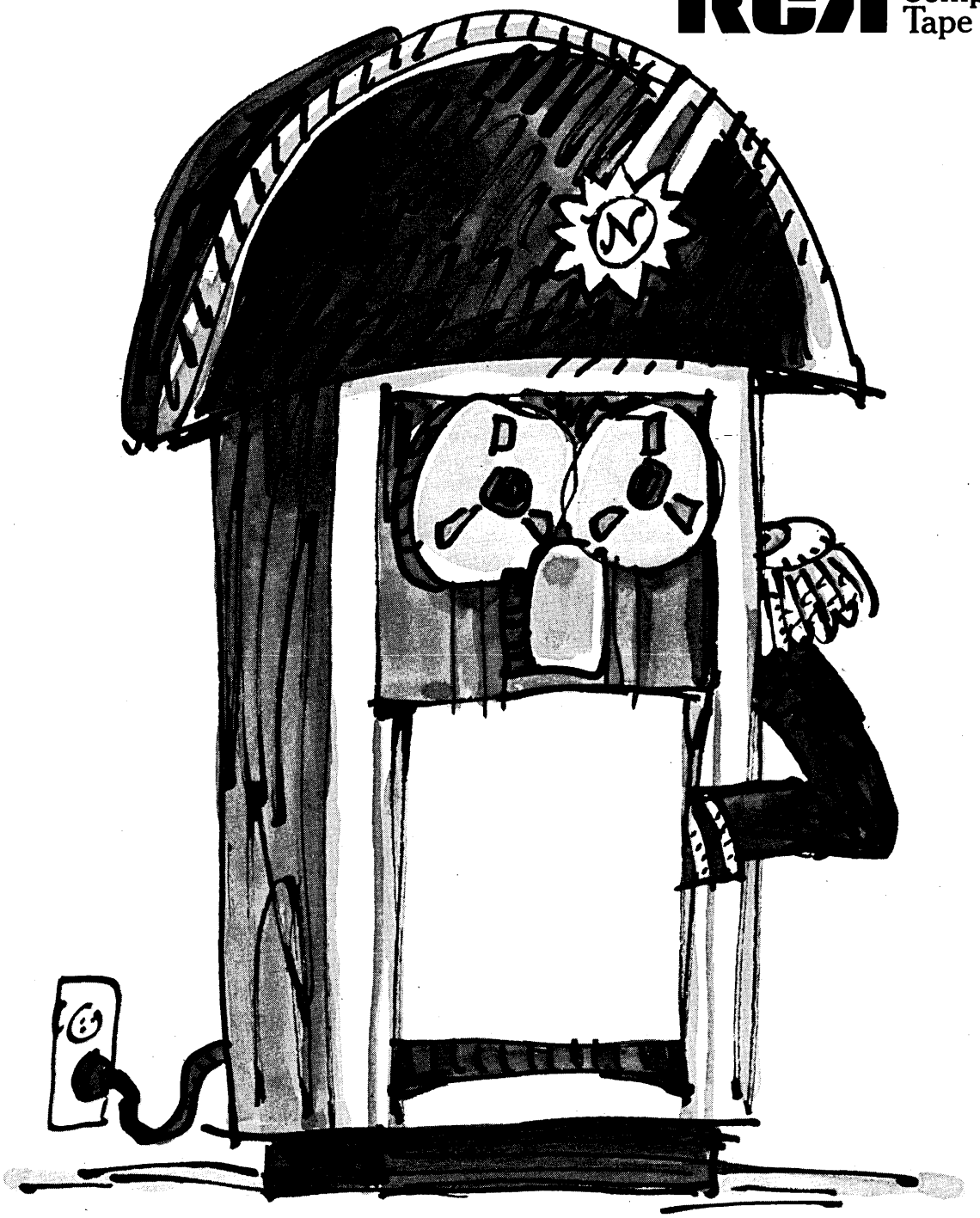

and duplication, alphabetic or numeric data fields, print or nonprint of preceding zeros, and print or nonprint of designated columns.

A programmed blank column check assures that data is punched in specified columns of the card field. Programmed automatic and selective overpunching allows punching 11 or 12 overpunches automatically, or selectively. Additional features include a 64-character movable alphanumeric keyboard, which includes the EBCDIC

character set, an error condition alarm, and a work area with cabinet storage. Price is $4990, or $85/mo. rental. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 567 ON READER CARD

magnetic card/tape unit

The MCT-10 data handling unit reads, writes, and revises digital information on either magnetic cards or magnetic tape. Computer system applications include use with data collection stations, keyboard data entry stations, information retrieval systems, special purpose accounting machines, automatic letter preparation systems, and time-sharing terminals. Information, such as computer programs, may be prepared off-line in the unit, and subsequently loaded into the computer.

The unit handles data incrementally at up to 75 cps or continuously at either 133 or 1000 cps. Recording density is 100 bpi. All functions can be performed in the forward or reverse directions. With incremental operation the need for buffer storage in the computer is eliminated, and with continuous operation, the transfer of bulk information is facilitated. With two MCT-10's, information may be duplicated between card and tape.

Typically, the MCT-10 handles a standard EIA RS-292 magnetic card, representing a unit record, that stores up to 700 7-, 8-, or 9-bit characters. Cards may be serially fed from a 500-

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Then: call any 360.

To go on line to any IBM 360 you need one of their terminals, right?

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Call Dura. We have two *portable* computer terminals that can talk to the 360 — our current, keyboard/printer only, Model 1021 and our new Model 1051.

Our versatile new 1051 Computer Terminal is a self-contained machine that talks with 360's through paper tape and edge cards as well as the keyboard. When you're off-line, it doesn't goof off: The 1051 can automatically type business documents such as sales orders, purchase orders, and provide batch processing.

Then there's compatibility. The 1021 or 1051 can replace 360 data terminals or operate in a mixed mode environment with them. In other words, if you have, or are planning to have, a 360 data communications system, you can utilize DURA® Terminals without any change in software. Also, our terminals can transmit and receive through acoustic couplers, Dataphones, or limited distance line adapters.

Our versatile, compatible, portable computer terminal can become yours at a significantly low cost. In fact, its low initial cost, and low operating cost, make the 1051 perfect for multiple terminal installations. Or a one-terminal-show.

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Gentlemen:
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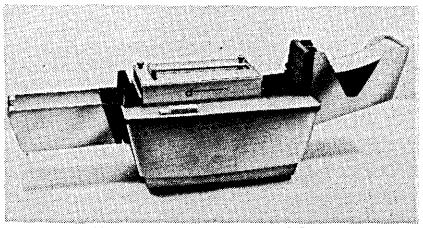
card hopper, or may be fed manually. By changing a switch position, the unit will accept a continuous-loop mag tape cartridge with a capacity of up to 300K 7-, 8-, or 9-bit characters. The cartridge plugs into the MCT-10, providing an integral file feature for the system with which it is used.

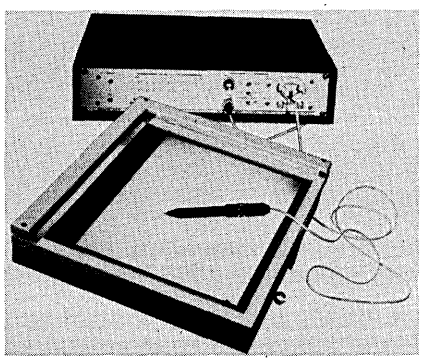


Overall size, exclusive of hoppers, is 16″ long by 9″ wide by 9″ high. The unit weighs 16 pounds. Customized versions of the MCT-10 will be available. Variations will include accommodation for larger size cards to increase data storage capacity, higher recording density (up to 200 bpi), greater incremental transport speeds (up to 150 cps), and either the card or the tape capability by itself. A single unit in the standard configuration will sell for approximately $3000; quantity discounts may be obtained. First production models will be available within 90 days ARO. CLARY DATACOMP SYSTEMS, San Gabriel, Calif. For information:

CIRCLE 565 ON READER CARD

graphical pen input

The Graf/Pen graphical input device for digital systems yields a permanent copy from material drawn, written, or marked with the device, and the x-y coordinates are simultaneously digitized for immediate or delayed computer analysis, real-time display on a storage crt, or transmission by radio or phone lines. Speed is up to 200 coordinate pairs per second, resolution is 1000 x 1000 line pairs, and over-all



accuracy is .03 inch. The Graf/Pen also provides a capability for direct interaction with the blank areas on a

crt. The system comprises a tablet with a 14-inch-square active area, a spark-gap/ball-pen stylus, and a control unit. Ten-bit binary numbers at TTL voltage levels represent the x and y coordinates of the stylus positions on the tablet. The Graf/Pen is sensitive to only the steep wavefront of the sound source, and discriminates against all ambient noise. Price is $2800 for a single unit, with reductions in OEM quantities. Delivery requires four to six weeks ARO. SCIENCE ACCESSORIES CORP., Southport, Conn. For information:

CIRCLE 578 ON READER CARD

1130/1800 graphics

The old IBM 1130 and 1800 systems are so popular that many many firms have helped keep them around, despite their second-generation origins, by developing interfaces to discs and other gear. The CHI Controller is designed to handle up to three I/O channels, and has built-in channel controllers capable of handling one or two peripherals. One use will be to hook up crt devices. The crt controller has been made compatible with existing hardcopy plotting routines, is capable of driving a crt plot at up to 300 ips, and runs between $3300 and $4000. With a Tektronix 611 crt, the controller would be delivered for about $5925. COMPUTER HARDWARE INTERFACE, INC., Sacramento, Calif. For information:

CIRCLE 569 ON READER CARD

stock monitor

VidiQuote is a stock transaction display system which utilizes multiple standard tv monitors under control of a converter which was developed as a joint project of CBS Laboratories and Trans-Lux Corp., and utilizes LSI, MSI, and MOS components, supplied by Texas Instruments Inc. The system translates incoming six-bit binary code from the New York and American Stock Exchanges using a read-only memory character generator which produces a precisely spaced train of pulses. These pulses are routed to a video decoder which causes them to appear as spots of light on the monitor screen, forming dot-matrix alphanumeric characters. The entire display is refreshed 60 times a second to give a continuous image. Monitor screen sizes range from 8 to 20 inches. Rental for the converter unit is around $195/mo. with an average additional charge of $30/mo. per monitor. Delivery re-

quires 30 days ARO. TRANS LUX CORP., New York, N.Y. For information:

CIRCLE 570 ON READER CARD

data set

EVI's first product is the model 101A 300-bps full-duplex acoustic data set for use over the switched telephone network. The units have a -40 dBm receive sensitivity, said to be a 3 to 1 improvement over conventional data sets. As far as the company has been able to determine, -30 dBm receive sensitivity is the industry standard. The 101A provides EIA RS-232B or TTY 33, 35, or 37 interfaces. Selection of the desired interface is provided by a front panel switch. The modems will be priced at less than $400. ELECTRONIC VOICE, INC., Long Beach, Calif. For information:

CIRCLE 571 ON READER CARD

core memory

The File-Store Core Memory System is a four-wire coincident current, IC magnetic core memory featuring 1.75 usec full cycle time, multiplicity of address options, DTL/TTL interface, full and half cycle operation. The system is designed for random/sequential access applications and can operate as a stand-alone or functional memory module. Capacity is up to 1K (32-bit) words per module (larger memories optional). Access time is 600 nsec. Operational modes: clear/write, read/restore, write only, read only, and read/modify/write. A 1K x 8 memory will cost $775; in quantities of 50 or more, $575. STANDARD LOGIC INC., Santa Ana, Calif. For information:

CIRCLE 573 ON READER CARD

direct connected modem

The DCM-151 provides reliable serial data transmission up to a 150 baud rate over private or leased voice-grade telephone lines up to a distance of five miles. Full-duplex operation with Teletypes is available on a four-wire connection and simplex operation with Selectric terminals on a two-wire connection. It will operate with peripheral equipment utilizing the standard EIA levels, such as teleprinter terminals and card readers. The modem is compatible with, and a functional replacement for, the IBM Limited Distance Line Adapter, Type 1A or 1B.

Price of the 7" x 11" x 2½" package is $349; monthly rental is $15. Quantity discounts are available. ANDERSON JACOBSON, INC., Mountain View, Calif. For information:

CIRCLE 574 ON READER CARD

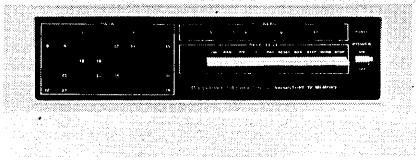
modem

The QDM-103 data set provides full- or half-duplex serial data transmission over voice bandwidth private or leased lines at up to 600 baud. The unit permits the multiplexing of several independent channels over one voice-grade circuit. (The number of channels that can be provided depends on the bandwidth and data rate selected.) The QDM-103 conforms with EIA specification RS-232B and offers full compatibility with Bell System equipment or with CCITT channels. Price is $575; delivery, 8-12 weeks ARO. QUINDAR ELECTRONICS, INC., Springfield, N.J. For information:

CIRCLE 572 ON READER CARD

16k core

Access time for the VersaStore IV is advertised as 350 nsec, with full cycle time of 900 nsec. Two models are available. One has a capacity of 4K x 40 bits, or 8K x 20 bits; the other, 8K x 40 or 16K x 20. Word lengths can be chosen in 8-bit increments for either model. With three-wire, 3-D organization, the memories will operate in full cycle, half, or split cycle modes.



Address options include random/sequential access and sequential interlace access. Approximately 20 service centers exist to repair them when they get out into the field. The OEM price is given as $3,000 for a 4K x 16 bit version sold in quantities. VARIAN DATA MACHINES, Irvine, Calif. For information:

CIRCLE 577 ON READER CARD

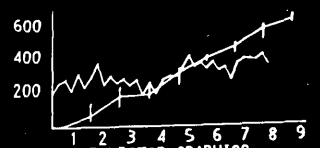
64-bit scratchpad

The first product for this California vendor is a 64-bit (16 words x 4 bits) scratchpad memory. Called the 3101, it features fast access—50 nsec is given as typical—and on-chip address, decoding, and buffering. Each 4 bit word is accessible through four input leads using binary code. Prices range from $99.50 down to $38.50 each in quantity. INTEL CORP., Mountain View, Calif. For information:

CIRCLE 575 ON READER CARD

FOR COMPUTEK CIRCLE 215 ON READER CARD→

The Computek Series-400 CRT Display System is a graphic and alphanumeric man-machine communications terminal. It features fast curve stroke graphic, vector graphic, alphanumeric and special symbol display generation even over ordinary telephone lines. The system is modular and upgradable and is supplied with a full software support package. Please contact us for further information.



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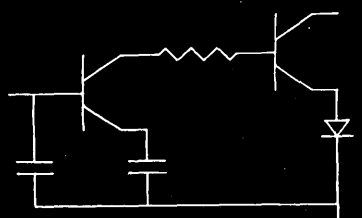

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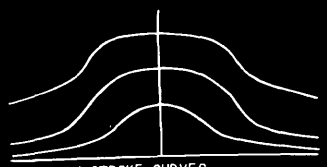

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$\int_0^\infty$ SPECIAL SYMBOLS
(each defined by an eight bit code)
Meteorological Symbols
Chemical Symbols

computek

Unsnarl the 360 terminal traffic jam

The KM-36 Multiplexing Computer

Your IBM 360 is spending a good part of its time and capacity controlling a network of terminal devices which costs you more money than you may imagine — both in processing time and computer capacity.

We designed the KM-36 to take over such routine chores as line control, line sampling and bit storage, character and message assembly, code conversion and message editing, thereby freeing your System 360 to do its real job — processing data.

To accomplish this we have developed within the KM-36 a specialized, communication-oriented, microcoded instruction set which permits the KM-36 to perform the job for which it was designed.

By making the line control coding independent of the message processing program, and through the use of dynamic relocation techniques and the resultant automatic terminal I/O addressing and core storage control, the KM-36 provides a unique solution to the terminal traffic jam.

The KM-36 is compatible with and operates under the control of O/S 360 and allows you to choose the terminal devices best suited to your need, regardless of manufacturer, code structure and/or transmission speed characteristics.

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new software

merger evaluation

Using stored models of industry group averages, MINI MAID projects the next year's annual report for a company which evolves from a merger. In fact, the program is generally used to compare what the merged firm's sales, earnings, P/E ratio, assets, liquidity, debt posture, etc., will look like compared to the projection for both unmerged corporations. More than 50 such annual report items are computed.

The stored models are taken from several sources, one being Standard & Poor's "Compustat" which takes in over 3000 corporations. For special situations, such as hotel chains, specific models have been developed or acquired by MINI MAID's vendor.

The program is written in FORTRAN IV for a 32K word machine or larger. A 65K machine is a better choice, the supplier says, since the source program itself comprises 20K words. The package is priced at $12,600. The models are supplied with the program, but updated versions sell for $50 per model. ECONOMATICS, Pasadena, Calif. For information:

CIRCLE 543 ON READER CARD

software testing

With the variety of software packages available to the end user, and with the number of software contractors vying for his attention, the customer is faced with some difficult choices. One problem is the choice of a software package when several from different vendors are available to perform similar tasks. Another problem, when no existing package fits a particular need, comes about in being sure that the contracted software developer actually delivers a system capable of doing the job for which it was ordered. A service being offered by a Baltimore-based firm is designed to help.

Called PAT, for Program Analysis and Testing, the service is meant to help decide whether a package can do the job for which it is advertised. The program is sent to the "unbiased third party" tester who exercises it and reports.

In cases where a contract programming house is to be employed, the firm will help write the program specs, then evaluate the resultant program to see if it fits them. In these circumstances the tester assumes responsibility for the appropriateness of the program purchased. Costs run somewhere between 10% and 20% of program developmental costs. COMPUTER CENTER, INC., Baltimore, Md. For information:

CIRCLE 524 ON READER CARD

1108 fortran 5½?

Univac 1108 users with large machines (core sizes of 128K-256K) have so far been restricted to running FORTRAN V programs small enough to fit onto a 64K machine. With this proprietary version of FORTRAN V, they can run single jobs that utilize almost all of memory; this can mean that, for instance, a 220K job will fit onto a 256K 1108 (some space is still tied up by the EXEC II supervisor).

Large programs that have previously been segmented may see greatly reduced run times, and program conversions from other large machines like the CDC 6600 or the IBM 360/75 should be made much easier.

Although currently executing jobs will run with the new compiler after recompilation, the vendor claims that its package is not identical to Univac's —it is significantly better. The language has been enhanced and bugs eliminated. In fact, the company started into business to do contract debugging for Univac and for Univac customers.

The rental on the extended compiler starts at $2000/month, but the user receives more for his money than a language processor and an extended version of EXEC II and its library. Customers become subscribers to a Cooperative Consulting Service, a plan by which the company undertakes the repair of client-discovered bugs, and under which the fixes are distributed to all of the company's clients. A monthly newsletter is distributed which contains a list of user hints (for more efficient programming or use of the 1108), compiler or supervisor corrections made that month and available to those receiving the newsletter, new routines or enhancements also available, and a questionnaire that seeks to determine which new features are most wanted by most users.

Potential customers for the compiler and its associated service are offered a unique trial option. The firm will send to them a mag tape copy of the compiler and supervisor for use for a two-week period. It would be too much of a give-away except that the tape "self-destructs" after two weeks.

Jack Perrine, the company president, was once quoted (in "Barron's") as saying "A software house becomes progressively more inefficient the larger it becomes. There is no economy in size." Apparently he still believes it; the company is being kept small and even the marketing of this package will be handled by someone else, Jacobi Systems. ATHENA PROGRAMMING, Redondo Beach, Calif. For information:

CIRCLE 525 ON READER CARD

file management

COGENT II has been seen before, but like a Detroit automobile with a faulty brake drum, it was recalled to the factory once and this is its second introduction. The program is a file management system with its own shorthand language, a pre-compiler linked to a report generator. It is designed to make a COBOL programmer's job easier by taking away from him the responsibility for opening and closing files, reading and writing them, doing the pre-processing house-keeping tasks and the post-processing wrap-up. Sometimes, the vendor claims, a four-page program can be written in four lines. In short, the programmer is asked only to define his files, specify what he wants done with them, and format his output reports. (It is possible for COGENT II to do most of the report formatting, too.)

From the input file definitions, COGENT II creates the COBOL environment and Data Divisions. Normal arithmetic and Boolean operations are provided for in the data management specifications. A "pictorial display" sheet is used to outline the formats of required printouts.

The file managing report generating pre-compiler needs a 360 with DOS (65K of core or more) or OS (with 128K). The program itself requires something like 48K under DOS and 88K under OS. It is sold for $25,000 or leased for $1,200/mo. Under the terms of the lease, 75% of the rental monies can be applied to purchase. An update

new software...

service is available to purchasers at a rate of $100/mo. Five man-days of in-house training and a six-month warranty are included in the purchase price. COMPUTER SCIENCES CORP., El Segundo, Calif. For information:

CIRCLE 526 ON READER CARD

program analyzer

"Faster than GPSS and cheaper than SCERT." That's the claim for System 6403, a software package said to perform about 90% of the functions of such programs as SCERT, CASE, and GPSS, and at greater speed. A proprietary algorithm and analysis technique is said to result in a system which is fast enough to be "print bound." System 6403 is written in FORTRAN IV, and is available either in batch mode or as an interactive time-sharing program which has an editing facility that allows the merging, modification, and variation of models. It requires a System/360 with minimum 65K core.

The package predicts the performance of a program by determining mean value and standard deviation of running time and core or channel utilization of programs. System 6403 analyzes a program from a representation of its flowchart on which the time, space, or channel requirements for each step of the program are indicated. Included in the model is information on the probabilities for various decisions and the number of times loops will be taken. On the basis of this input, the system calculates the mean value and standard deviation for every combination of entry and exit as well as probable occurrence of each combination. Price is $8,600. DATA SYSTEMS ANALYSTS, Pennsauken, N.J. For information:

CIRCLE 527 ON READER CARD

macrogenerator

The programming languages of the 70's are supposed to be compiler compilers and assembler assemblers capable of coming up with vocabularies of English words and phrases for non-edp specialists to use in talking to a machine. So far, not many of these have been made commercially available. This one, HELP, is billed as a natural language general purpose macrogenerator. It can be used to extend or alter conventional computer languages, or to create application-oriented procedural languages.

The program processes macro calls which are expressed in a variety of notations, including English if desired.

A repertoire of built-in macro features such as repetitive scanning of definition strings for many-to-one expansions, indexing, conditional generation, noise and cue word parameter recognition and variable punctuation are included. The system is marketed as a package/service, depending on customer requirements, and its pricing begins at $15,000. ADVANCED COMPUTER TECHNIQUES CORP., New York, N.Y. For information:

CIRCLE 528 ON READER CARD

pdp-10 multi-access

Digital Equipment Corp. has improved its PDP-10 time-share monitor for the benefit of the core hungry user. This version permits more than one user to access a single program in core. For the core conserver, 10 FORTRAN IV programs being compiled need only one copy of the 8K compiler and 10 2K data buffer areas—a 28K chunk of core as compared to the 100K needed with the old single user monitor. The monitor can be used with all the PDP-10 languages. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 529 ON READER CARD

job accounting

IBM 360 users with the Disc Operating System are given the same kind of handles to perform their job accounting tasks as are made available to users running under OS, if they contract for JOB LOG. The macro-generated program allows the user to define his own accounting fields in the job card and to write the information contained in them, along with the data available through the DOS supervisor, to a temporary disc file. A second program is used to retrieve and process the disc-based data.

The package adds about 2K to the 10K size of JCL routines and uses about 100-150 msec with each JCL call. It is priced at $500 for the first copy with $100 and $200 discounts for the second and third.

Exits are provided for user verification of the accounting data; partition information as well as multiple cpu usage is logged with unique system codes. CHILTON COMPUTER CO., Dallas, Texas. For information:

CIRCLE 531 ON READER CARD

cobol preprocessor

CALM (Cobol Automatic Language Modifier), a COBOL preprocessing system, allows a programmer to write lengthy COBOL statements in an abbreviated form. For example, COMPUTATIONAL-3 may be abbreviated to C-3; and VALUE SPACES, to VS. According to the company, coding will be reduced by as much as 60% in the Data Division and up to 30% in the Procedure Division. Also, the Identification and Environment Divisions are automatically generated.

The CALM program is then fed to the CALM processor which expands the abbreviated symbols, provides some standard COBOL editing, and generates certain entries. The CALM output goes directly to the COBOL processor in expanded form, and from then on the procedure is the same as ever.

Written in assembly language, CALM runs on any RCA (under TDOS and TSOS) or IBM (under DOS, TOS, and OS) computer at I/O speed using 16K bytes of core. IPC says CALM is so simple to learn that they don't even hold any classroom training; they just distribute the documentation and maintain the package. Purchase price is $2,500. INFORMATION PROCESSING CORP., Dallas, Tex. For information:

CIRCLE 530 ON READER CARD

communication analysis

A package of five models called TALK (Trade-off Analysis based on Linecost and Knowhow) has been developed to help users discover which communication network is best for them. The MPX program is for designing an optimum multiplex of leased lines; MPM is used to design a message switching communications system; the other three programs in the package are models of the Centrex, WATS, and Telpak networks for all 50 states.

The programs are written in FORTRAN IV for operation on PDP-10 computers. They can be used in either batch or time-share mode and require from 16K to 36K words of storage, depending on what programs are used.

TALK developers are selling the five programs as a unit for $50K or separately at prices dependent on which model or models the user wants. The package is also available on a service and consulting basis, either on an annual retainer contract for $12K or on an individual problem basis for which the customer pays cost plus one month of savings resulting from use of the package. INTERACTIVE SCIENCES CORP., Braintree, Mass. For information:

CIRCLE 532 ON READER CARD

management reporting

SUMIT (Standard Utility Means for Information Transformation) is a stan-

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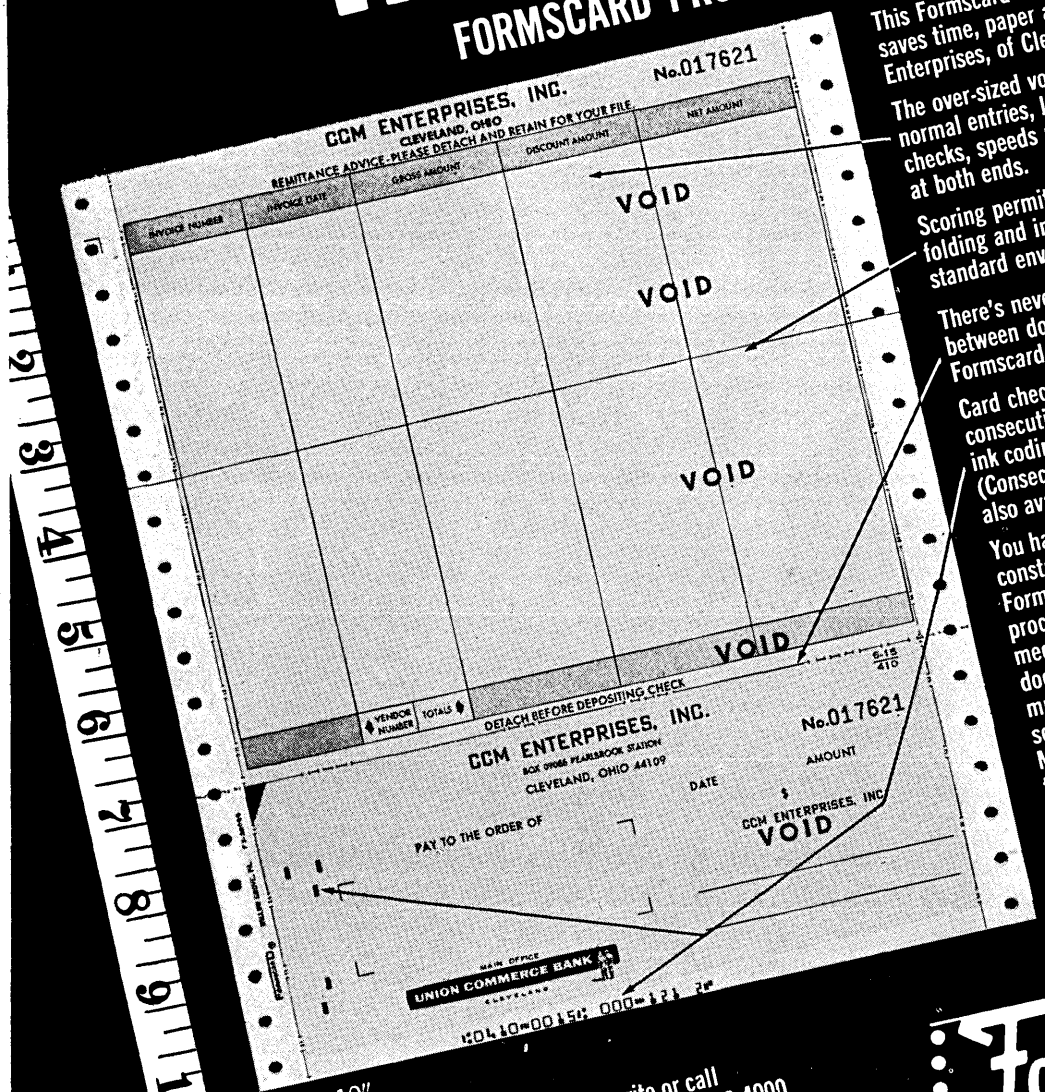

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dard program that can be modified with control cards to perform many functions for those one-time programs (a single data file manipulation requirement, for example). SUMIT's functions include file creation or deletion, change format or location of data fields, accumulate totals, insert new data fields, and any combination of these conditional upon data in the record. The functions can be performed in any sequence desired, limited only by the amount of core storage available. (SUMIT requires 6K bytes of core storage plus 4K for execution.)

The skeleton instruction routines to perform the functions are assembled and located in the program. As the control cards are read by the computer, a table is built that identifies the routine to be performed, the location of the data to be operated on, and any condition or output functions required.

SUMIT is written in assembly language and is designed to run on any IBM/360 under DOS, TOS, or OS; and on any RCA Spectra 70 using TDOS. The company says that SUMIT can be used without modification and can be continually used as hardware requirements change. The package, which includes documentation, sells for $2,500. INFORMATION PROCESSING CORP., Dallas, Tex. For information:

CIRCLE 533 ON READER CARD

file maintenance

Production of operational programs with minimum manpower, computer use and time is the object of Maintenance Generator System. The package uses a generalized approach to creating edit verification and file maintenance programs. The experienced programmer can then manipulate the generated modules to produce any type of program. Essentially all programs become standardized and changes can be made by any programmer, not just the one who wrote the program.

The supplier claims input to the package is simplified so that clerical personnel can write the file description. Completely operational, documented programs are generated from this file description in 10 minutes, they say.

All programs are produced in COBOL. Minimum systems configuration for the package is a 360/30 with DOS and 32K storage, plus a printer, card punch/reader and three tape drives. The price of the program is $6,500. Use of it to generate a single system costs $900 per run. SCORPIO DATA SYSTEMS, INC., Tallman, N.Y. For information:

CIRCLE 534 ON READER CARD

terminal monitoring

IBM 360 users with terminal support requirements can turn to the Device Independent Monitor, a program package which operates under PCP, MVT, MFT or MFTII. The monitor can be used to control or to simulate various terminal devices, including presently the IBM 7770 audio response unit, the IBM 2260 crt terminal, or card-based IBM 1050's. Parameter cards are used to clue the system that it is operating with "this many" of "these kinds of" terminals.

One use of the monitor—in addition to simply monitoring the operation of the terminals—is to fool IBM's Operating System into thinking that a terminal is there and judging how well it operates in the user's environment. Obviously, this is helpful in choosing terminals and in choosing the mix of terminals on a single system.

The package is application program independent, the vendors claim, provides file protect and error recovery, partial or full error trace, and keeps routine housekeeping functions out of core except when needed. It requires a varying amount of core depending upon its application. In a configuration with 48 lines into a 7770 and 18 2260's using 940-byte displays, the system requires 50K bytes of core. The monitor is offered for $20K. The I/O access routines are priced separately for each type of terminal at $2K each. Training is included, and I/O routines for other terminals are in the works. CHILTON COMPUTER CO., Dallas, Texas. For information:

CIRCLE 536 ON READER CARD

plotting program

A program for plotting three-dimensional surfaces in perspective can be used with any of the PDP-8 family of computers in their minimum configuration. Using less than 3% of core memory in a 4K 12-bit computer, the graphics program requires no mass storage devices attached to the computer, and plots can be output to any plotting device through appropriate interfacing. The program is based on DEC's conversational FOCAL language and uses only 15 lines of code. It allows true-perspective plots and Euler Angle rotations to be performed and can work with the company's KV graphics option. The software will also

new software...

permit stereoscopic pairs to be generated for more refined visual investigations. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 541 ON READER CARD

mft job accounting

Keeping track of how well a system operates under OS/360 MFT can be accomplished with this job accounting routine. The proprietary program will record initiation and termination time and date, cpu time, highest priority of execution, completion code, core allocation, allocation of peripherals, job and step names and programmer supplied accounting data. The Job Accounting Routines—5 assembler language routines on mini reels of tape—are available in source format at a fixed price of $2,500 per location, regardless of the number of computers at the location. The price includes maintenance for one year and is refundable within 90 days if the program doesn't perform up to specification. DIVERSIFIED DATA SERVICES AND SCIENCES, INC., N.Y. For information:

CIRCLE 537 ON READER CARD

simulate s/360

System/360 programs can be used with 1440 or 1401 disc files with the LIOCS Simulation System. The package simulates the operation of the 360 Logical Input/Output Control System and enables 360 software to read 1400 data and produce data acceptable to the existing 1400 programs.

The system consists of a set of modules for simulating S/360 sequential, index sequential, and direct access processing using 1400 files; a set of 24 imperative macros that handle input/output operations; and a set of declarative macros that define the specification of the file being used.

The developers of the LIOCS simulation claim immediate use of higher level languages, increase in operation speed over 1400 emulation, and use of 4K less core store among the pulses for the package. A more leisurely conversion to S/360 is also a benefit and final conversion is accomplished by removal of the simulation interface and use of the native S/360 Logical Input/Output Control System.

The simulation LIOCS has almost all the features of the real thing—including index sequential key search operations and direct access search multiple operations. A special outline is included for preparing 360 labels to match the 1400's labels.

The software package, a sample program for training, an instruction manual, 20 hours of customer training and installation assistance costs $5,875. AUSTIN SYSTEMS CO., INC., Hingham, Mass. For information:

CIRCLE 538 ON READER CARD

documentor

If your program documentation is minus, get "PLUS." Program Library Update Systems provides storage and maintenance of source language programs on tape or disc. The programs can be intermixed regardless of language and test data decks, object decks and job control language decks can also be included. Output from the package is a job stream file with job control set-ups to compile or assemble modified programs. Three reports are also generated: (1) a library index report for each run includes a table of contents of the PLUS program library, version numbers for each version of a program, and a modification number for every change made to a program; (2) a report of change which itemizes changed statements and is an historical record of all maintenance activity; and (3) job schedule report, a listing of job control setups. PLUS also produces all or part of any source program, either in hard copy or on tape or

card files. Documentation, installation and training for PLUS—it operates on 360/30 or similar computers with COBOL—is $1500. CULLINANE CORP., Boston, Mass. For information:

CIRCLE 539 ON READER CARD

inquiry and reporting

For unscheduled or one-time reports, as well as for recurring documentation, the user can fall back on the INQUIRY & REPORTING SYSTEM, a package designed for the IBM 360 and RCA Spectra 70. The system features an abbreviated language which can be learned by non-programmers—even—and which provides for extracting information from files, manipulating it, and producing card, printer, tape, and disc output.

A minimum configuration under DOS or OS operating systems would be a 360/25 with 32K bytes of core. For the Spectra 70 a minimum configuration would be a 32K byte model 35 operating under either TDOS or DOS. Prices range from $15,000 to $20,000, including installation, training, documentation, post-installation support and a performance warranty. SIGMA DATA COMPUTING CORP., Bethesda, Md. For information:

CIRCLE 540 ON READER CARD

debugging

Are your programmers frustrated by debugging 360 COBOL or BAL jobs? Well, get them DEEP/360. The DEEP stands for Data Exception Error Protection for the System 360 and the package "permits uninterrupted testing when data exceptions occur," according to its creators. The program prints the address of the erring instruction, "corrects" it in a predictable manner, and notifies the user what correction occurred. It then re-executes the interrupted instruction and proceeds with the program. A bypass option is available when programs are particularly buggy and messages become repetitive. An error count by instruction location is produced at the end of the job. A BAL source listing and a job stream for cataloging DEEP/360 is included in the $225 price of the package. MACRO SERVICES CORP., Boston, Mass. For information:

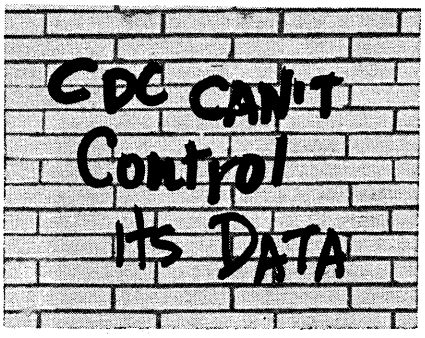
CIRCLE 535 ON READER CARD

lower phone bills

Keep down the phone bill. Telnete (Telephone Network Evaluator) can cut it in half, according to the vendor. The program package, which works on any computer system with FORTRAN IV, analyzes Inward WATS networks for optimum area coverage and economy. Given the locations of local offices and estimates of monthly calls, the program can calculate the number of calls generated by every metropolitan and rural area, check the network for completeness (indicating areas not covered), allocate cities and rural areas to local offices on basis of economy of line cost, and calculate the cost of the network. A management report detailing line connections and cost for each center is part of final print-out.

The Telnete package is available for $9,000. The company will also perform the analysis for $500 plus computer time per evaluation. WORLDWIDE COMPUTER SERVICES, INC., Hartsdale, N.Y. For information:

CIRCLE 542 ON READER CARD



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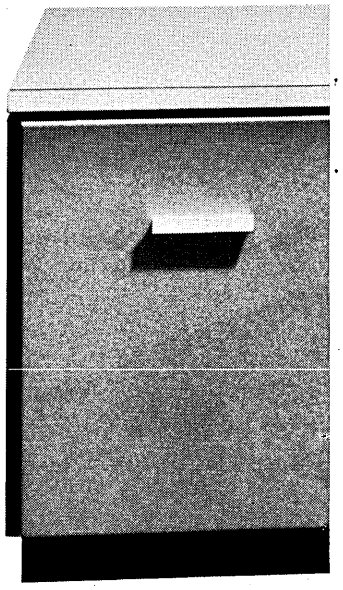

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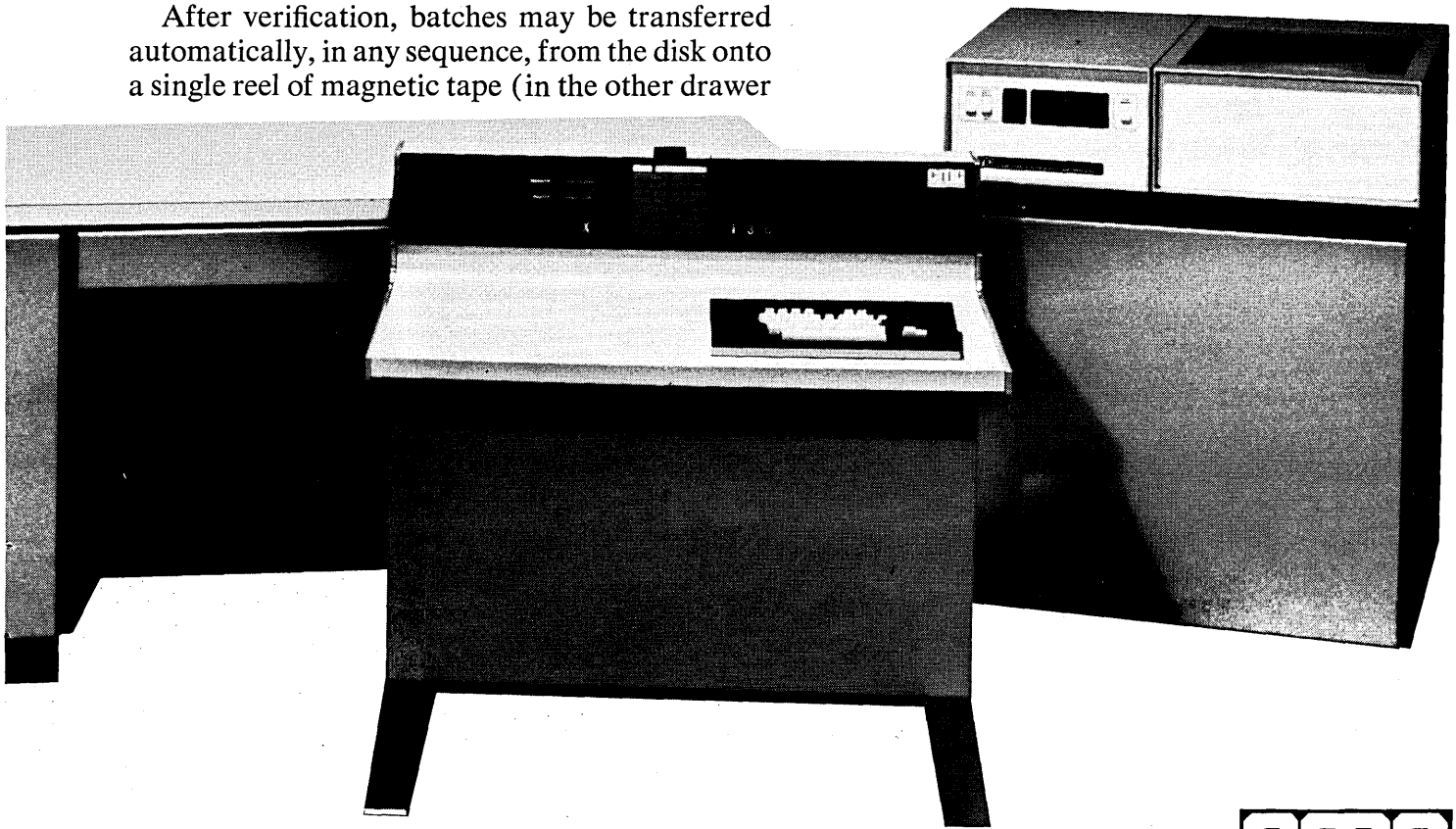

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new literature

POCKET DICTIONARY: 47-page dictionary of basic automation terms (200), in handy-carry size, lists basic words and principles in comparatively large type. Even includes some historical highlights and illustrations. HONEYWELL INC. Minneapolis, Minn. For copy:

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INTERNATIONAL UNITY: An introduction to the International System of Units is given in an 88-page booklet detailing the standardization arrived at by the International Committee on Weights and Measures with participation of the U.S. Unit definition includes electrical, light and photometric, and an electromagnetic radiation chart. Conversion factors and slide-rule settings are provided. CUBIC CORP., San Diego, Calif. For copy:

CIRCLE 501 ON READER CARD

MACHINE TOOL CONTROL: Description of the POSITOOL 90 numerical control system for machine tools fills 8-page brochure, includes accessories, standard features and specifications available from one to four axis models. One page explains programming, with diagrams. AUTONUMERICS, INC., Westbury, N.Y. For copy:

CIRCLE 502 ON READER CARD

MATRIX MATH: A 42-page guide to MATAR, a matrix calculation program, allows the user to make computations without knowing programming languages, beginning from simple I/O of matrices. A sample user-program conversation (through a typewriter-like terminal) is provided. FORTRAN program listings are also included. N69-18954. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

MAGNETIC AIDS: 24-page catalog itemizes magnetic control boards, strips, sheets, rolls, reels, roll-ons and magnetic accessories, also offers magnetic flow chart symbols, layout and visual control kits. MADISON A-V CO., INC., New York, N.Y. For copy:

CIRCLE 507 ON READER CARD

TERMINAL CASES: Kit of brochures describes specific applications of automatic and keyboard data terminals (Models 33, 35 and 37) with case histories of an automobile accounting firm, a food chain and a major research corporation. Optional features for individual requirements are listed with each model, along with standard features and specs. TELETYPE CORP., Skokie, Ill. For copy:

CIRCLE 504 ON READER CARD

SONG ALBUM: The British Secretaries in America sing their way through computer history, hard and high times, including many of the IBM Country Club's old favorites, in a record album called PAEN. The title is an anthem of the distributor company; the accompaniment is tinkling piano, the speed 33⅓ LP. Cost: $3. ADVANCED COMPUTER TECHNIQUES, 437 Madison Ave., New York, N.Y. 10022.

DIRECTORY: Computer Education Directory totals 400 pages covering history, state-of-the-art, occupational descriptions, manufacturers, schools, training aids and glossary of terms and definitions in dp education. Hardbound; 8½ x 11. Cost: $15; 10-day examination privilege. DATA PROCESSING HORIZONS, INC., P.O. Box 99 P, South Pasadena, Calif. 91030.

DOCUMENTATION: 12-page brochure describes DOCUMATIC, automatic documentation system for IBM System/360 Report Program Generator language, annotating RPG programs in everyday English, so the manager and accountant can understand what's going on as well as the programmer (almost). Details of six forms of documentation are illustrated: system pictorial, input narrative, input record layout, processing description, and output narrative and record layout. DATA USAGE CORP., Fort Lee, N.J. For copy:

CIRCLE 503 ON READER CARD

TEACHING AIDS: How to use a wide range of digital computer devices for teaching or in the lab is detailed in a 16-page guide. Descriptions of more than 20 trainers and associated equip-

new literature . . .

ment for instruction are given in all phases of digital computers, including transistor circuitry, logic, core memory, maintenance, transistor pulse circuits, integrated circuits and fluidic logic. Test instruments and instructor demonstrator units are included. DIGIAC CORP., Plainview, N.Y. For copy:
CIRCLE 506 ON READER CARD

DIGITAL DATA: 35-page bulletin describes baseband data sets comprising the DigiNet 500 wideband system for communications to 250 kilobits/sec, with repeaters, modems, specs and interfaces. Applications include long-distance xerography. GENERAL ELECTRIC COMMUNICATION PRODUCTS, Lynchburg, Va. For copy:
CIRCLE 505 ON READER CARD

REMOTE BATCH: Four-page bulletin describes RITS (Remote Input Terminal System), batch service which gives access to large third generation IBM computers through terminals located in-plant. Besides citing speed and storage benefits, the bulletin lists some of the 2000 programs available through RITS which cover a multitude of specialized problems. WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa. For copy:
CIRCLE 508 ON READER CARD

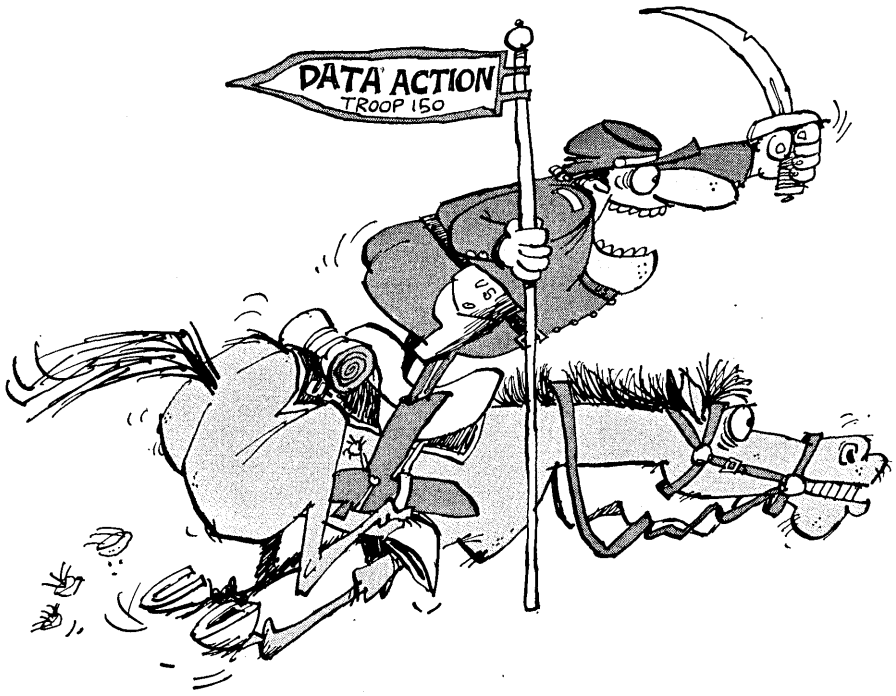
INFORMATION RETRIEVAL: Proceedings of the 6th Annual National Coloquium on Information Retrieval contain 31 papers on new techniques, technology and applications—medical, urban, educational, general business, and library. Data security and privacy are also discussed. Cost: $13.50. COLLEGE OF PHYSICIANS, Medical Documentation Service, 19 S. 22nd St., Philadelphia, Pa. 19103.

SUPERMARKET SYSTEM: Electronic ordering from market to warehouse is explained in a four-page brochure detailing the system's two equipment modules and their operations. Transmission of data is by ordinary telephone through an acoustic coupler. The recorder/transmitter is cart-mounted and powered by rechargeable battery. The receiver needs no operator to receive data and can accommodate up to 100 store transmitters. MARKETING SYSTEMS INC., Montclair, Calif. For copy:
CIRCLE 509 ON READER CARD

GEOMETRY PROGRAM: 55-page COGO (for coordinate geometry) manual aids time-sharing civil engineers to solve problems in airport and highway design, city planning, bridge-building, land survey and construction layout. It contains descriptions of 68 commands, with diagrams to show both known and unknown points. The manual is also color coded to distinguish user input from computer output, and includes sample problems. Cost: $2.50. TYMSHARE INC., 525 University Ave., Palo Alto, Calif. 94301.

DOCUMENT HANDLING: Six-page brochure illustrates automatic document handling system applicable in hospitals, banks, insurance centers, manufacturing plants and general offices. Documents travel in an upright position within guide channels, which can handle up to 1200 containers per hour. Inclines can elevate to 25°. CHAINVEYOR OPERATIONS, Los Angeles, Calif. For copy:
CIRCLE 511 ON READER CARD

CIRCUIT BUILDING BLOCKS: 54-page catalog details and diagrams integrated circuits compatible with all major logics—decoders and encoders, multiplexers and demultiplexers, counters,



adders, parity devices, comparators, function generators and latches; memory and interface circuits are also described. Performance, reliability and cost of medium scale integration are discussed. FAIRCHILD SEMICONDUCTOR DIV., Mountain View, Calif. For copy:

CIRCLE 512 ON READER CARD

CONVERTING VOCABULARIES: 138-page booklet explores intersystem compatibility of terms in subject vocabularies, describes development of a term conversion algorithm, and application to 11 source vocabularies (for the National Agricultural Library), reaching conclusions about quantity and use limitations. A list of possible routes through the algorithm, plus a glossary of conversion terms, are included. PB-184 144. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

ACQUISITION AND CONTROL: 16-page brochure details ADAC (analog and digital data acquisition and control system), including design features, basic components, specs and applications (seismic studies, biomedical research, wind-tunnel testing, nuclear reactor monitoring, petro-chemical process analysis, telecommunications control, spacecraft checkout). Accompanying software packages are also listed. ASTRODATA, INC., Anaheim, Calif. For copy:

CIRCLE 513 ON READER CARD

THIN FILM: Three papers presented at IEEE and EIA symposiums set forth the role of thin-film hybrid microcircuits, hybrid microcircuit design and network processing. Methods of producing microcircuits by combining chip devices, both semiconductors and passive, are detailed. Design rules are given enabling make up of preliminary specifications for a circuit. Types and properties of network resistor materials are listed, illustrative figures included. HALEX, INC., Torrance, Calif. For copy:

CIRCLE 514 ON READER CARD

DRUM MEMORIES: Six-page brochure provides essential information about drum memories with storage range of 0.56 to 71.6 megabits. Design summary, specs, dimensioned photos and digital interface lines are included. VERMONT RESEARCH CORP., North Springfield, Vt. For copy:

CIRCLE 515 ON READER CARD

PAPER FOR SCANNING: A three-page spec chart on all popular optical scanners is included in this 16-page booklet, "Selecting and Evaluating Carbon Paper for Optical Scanning Systems." Remaining pages are devoted to scanning mechanism principles, input parameters, examples of acceptable and unacceptable documents, illustrations of current optical readers—all this and a glossary, too. PORT HURON PAPER CO., Port Huron, Mich. For copy:

CIRCLE 510 ON READER CARD

PERFORATOR TAPES: 20-page catalog depicts perforator tapes in oiled and unoiled paper, mylar laminates and photoelectric varieties, shown in roll and fanfold formats. Related accessories such as motorized winders are also included. ROBINS DATA DEVICES, INC. Flushing, N.Y. For copy:

CIRCLE 517 ON READER CARD

CIRCUITS AND TRANSISTORS: 48-page catalog lists TTL integrated circuits, compatible MSI arrays, thin-film hybrid circuits and transistors, with specs and package outline drawings. SPRAGUE ELECTRIC CO. North Adams, Mass. For copy:

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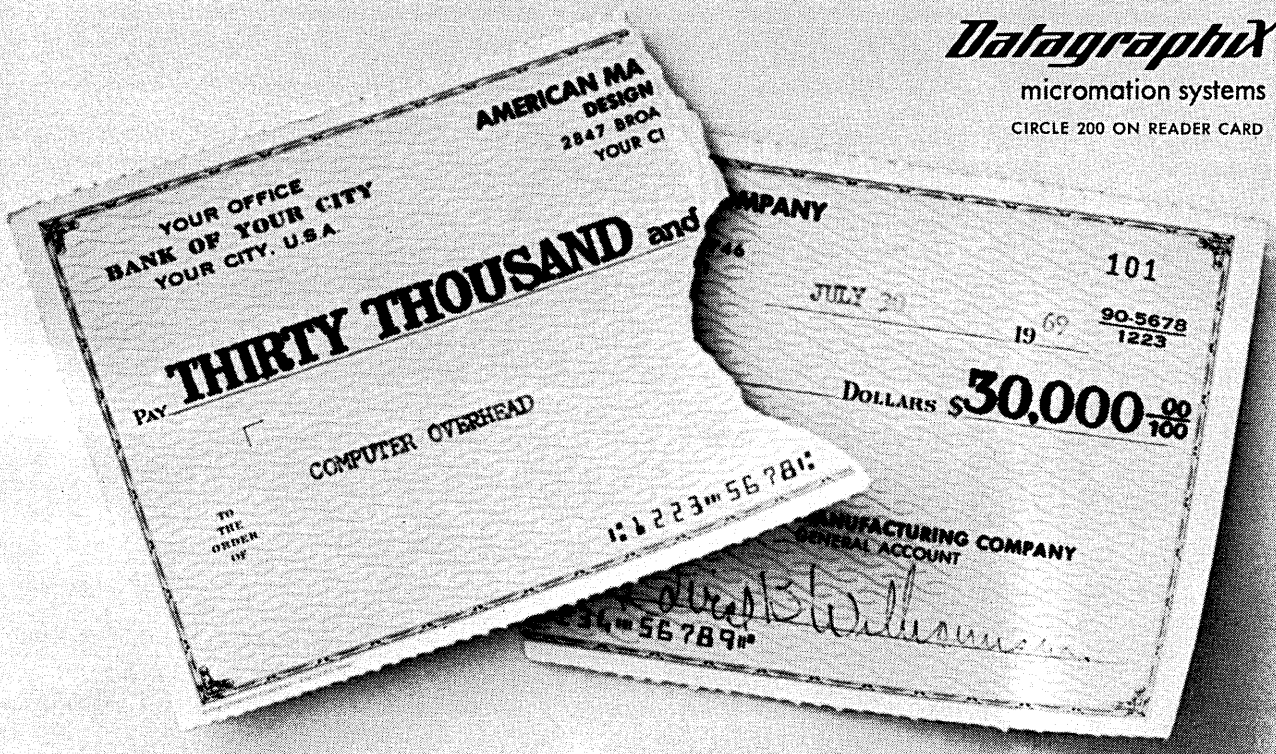

Stromberg DatagraphiX Inc., a General Dynamics subsidiary, P.O. Box 2449, San Diego, California 92112 (714) 283-1038 TWX: (910) 335-2058

new literature ...

POWER PACKAGES: Characteristics and applications of digitally controlled power sources are described in a 22-page brochure, detailing digital-to-analog converters and features of storage, isolation and feedback. Interfacing with computers and other digital controllers is explained and diagrammed, the whole concluded with specs in a back pocket. HEWLETT-PACKARD CO., Palo Alto, Calif. For copy:

CIRCLE 518 ON READER CARD

CLOSING THE LOOP: Digital automation systems using a closed-loop control to check stepping motors in real time are explained in a six-page folder. A shaft encoder is added directly into the motorized drive train to feed on-the-spot information, so each control command is monitored. Basic system components are described, including actuators, master controllers and accessories. ELECTROGLAS, INC., Menlo Park, Calif. For copy:

CIRCLE 521 ON READER CARD

SCHEDULING: Sixth in a series of technical applications bulletins describes a scheduling system which combines priority rule technique with integer programming without resorting to complex mathematics. Included in the six-page explanation is a for-instance: a consulting engineering firm employing 2,000 professionals on 14 projects is taken through a two-pass approach, resulting in optimum use of manpower for time allotted, with running identification of potential bottlenecks or shortages. COMPUTER APPLICATIONS INC., New York, N.Y. For copy:

CIRCLE 519 ON READER CARD

T-S APPLICATIONS DIRECTORY: The *Time-Sharing Applications Directory* is a quarterly publication which covers remote access applications, including time-sharing, remote batch, and special systems, with a variety of cross-references. It describes applications according to vendor, computer, and language, in addition to having an "Applications Wanted" section and a list of vendors, plus advertising of services and products. Price is $130/year with a $15 discount if payment accompanies the order. TIME-SHARING ENTERPRISES, INC., King of Prussia, Pa. For information:

CIRCLE 523 ON READER CARD

BUNKER-RAMO'S new BR-700 information system...

A low cost solution to source data automation and local data management

The BR-700 is a self-contained information system that provides significant local storage without interaction to a computer system for operation — yet allows optional communications to a computer system. Interfaces are available for serial or parallel communications to external devices.

The BR-700 provides for effective data composition, simplifying the tasks of manipulating, formatting, viewing, disseminating and updating data elements for multiple users. This combination of capabilities is achieved by flexible local data base storage and retrieval, accurate data entry controls and three modes of data display.

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H. A. Kirsch (213) 346-6000 or write:

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CIRCLE 199 ON READER CARD

world report

LEASCO BLANKETS EUROPE WITH NETWORK OF T-S SYSTEMS

The ability of Leasco to raise cash on demand for its European ventures provides constant amazement to less successful fund-raisers and competitors. In less than 18 months since opening and taking over systems and software houses in Belgium, France, Germany, Holland, Italy, Switzerland and the United Kingdom, the group has taken on leasing contracts worth $50 million and plumped for a network of 10 time-sharing systems to offer the cheapest per-hour system in Europe. Over the next 12 months these will be installed in Amsterdam, Birmingham, Dusseldorf, Gothenberg, London, Milan, Munich, Rotterdam, Saarbrucken and Stockholm.

The service will start with modular one processors from Computer Technology of Britain and a Hewlett-Packard 2000A. Initially the time-sharing centre will offer standard teleprinter terminals and a new low speed keyboard-printer from Detloff, a German peripheral manufacturer bought by Leasco at the beginning of the year. Curiously, Computer Technology was formed two years ago with capital from a group of investors including Robert Maxwell of Pergammon Press. Two months ago Maxwell sold a majority stake in his scientific and technical publishing empire to Leasco for a combination of cash, stock-swap and a seat in the boardroom of the computer company.

Since coming into Europe in the spring of last year, Leasco has acquired companies such as Systems and Research (Nederland) N.V., offering a broad range of service bureau, software and management information consultancy, and Nordisk ADB, Sweden, specialists in computing for civil engineering.

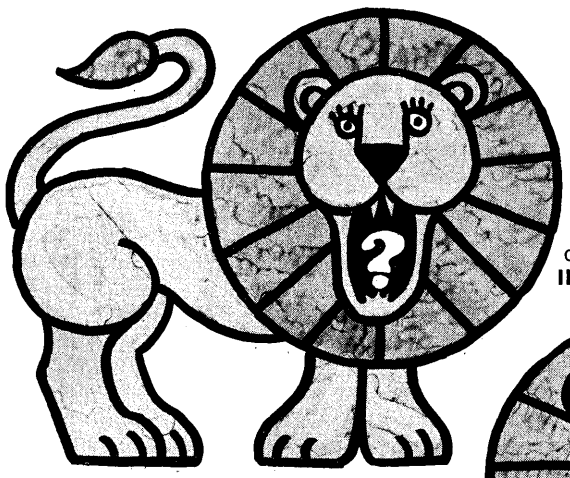
ENIGMA VARIATIONS

The perennial movement to halt the American invaders of the European computing community has slipped into a new gear. For more than 12 months a battle has raged in the UK to persuade the British Post Office to choose ICL machinery for a big $10 million on-line system for Customs and Excise clearance at London Airport. In practice the system is to go into premises run by the British Airports Authority but to be used by Customs and Excise for rapid clearance of the freight, which is off-loaded for local distribution or forwarding to either the States or the rest of Europe.

The Post Office was given the job of master minding the contract—or to be precise, the National Data Processing Service was handed the task and the NDPS is a wing of the monolith that overlords the nation's telephone, telegraph and mail services. In principle, the installation looked like going to Univac on a plate because no one else could meet the 18-month hardware delivery set for a working system (with IBM slated as usual as an alternative). Ignoring the Post Office's own terms of tender for a quick delivery with some nasty penalty clauses, the postmaster general, Mr. John Stonehouse, has succumbed to appeals from ICL and decided on System 4-72s rather than a choice of offerings of 1108 or 494s from Univac.

(Continued on page 239)

Got Paper Tigers by the Tail? Let LI/ON Sic 'em.



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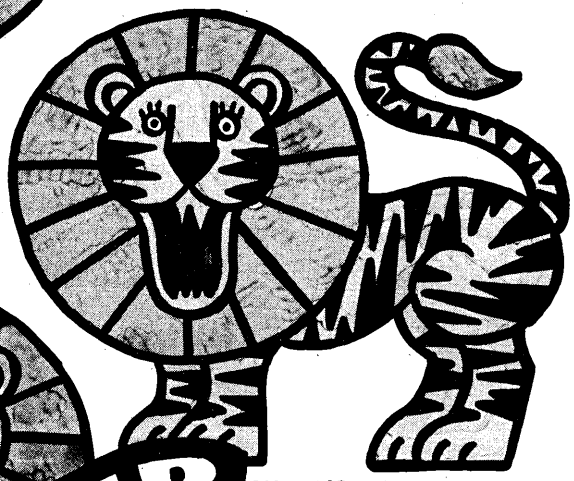

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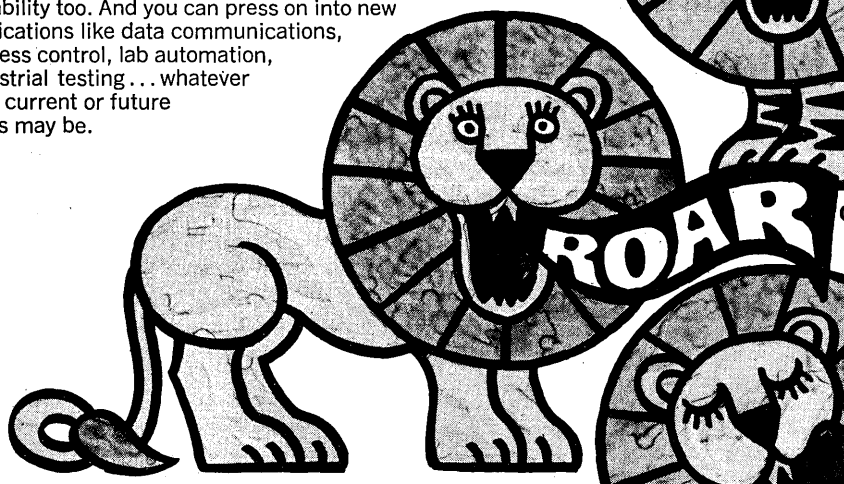

OUR LI/ON IS READY TO ROAR. How do you measure economy? No matter how sophisticated your application, LI/ON can be installed at a cost that is so considerably less than that of any other so-called multi-purpose 1130 interface system that you have to see it to believe it. Plus, LI/ON offers a combination of off-the-shelf availability and flexibility that no other system can match.

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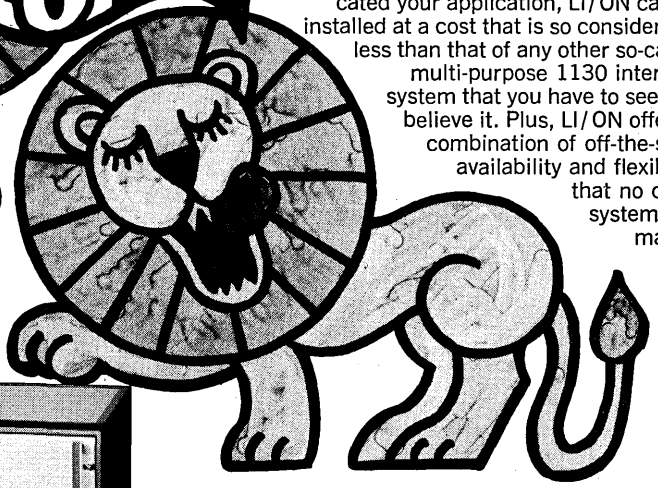
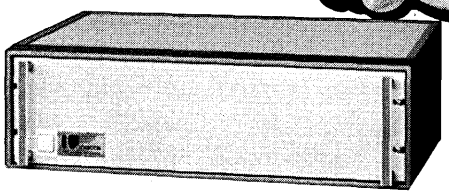
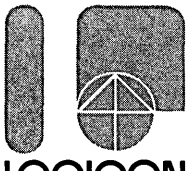




So if you feel caged, call Lee Eckert collect or write him today.
Get a LI/ON and be a tiger.



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CIRCLE 124 ON READER CARD

The sugar on the pill is a contract to Computer Sciences International—CSC's European offshoot—for the monitor and systems implementation by early '71. This is the new date for the installation which should be the first for ICL's new time-sharing processor in the System 4 range. In fact, the decision involved a split in opinion between the Post Office and the Ministry of Technology.

Ironically, the MinTech has been accused in the past of fostering buy-British. For this is the Government department that coughed up $40 million to merge the ailing companies which now form the UK monopolist ICL. No sooner had the word got round of the terms of the Airport deal than the local software houses hollered foul. Consternation being caused by the allocation of the first massive commercial software contract for Government to an overseas bidder—not that the contract had ever been up for competitive grabs anyway. ICL tempted the Post Office with the argument that unless the UK house was allowed to draw blood on a big real-time system, the British manufacturer was never going to accumulate the experience in this burgeoning field.

After the software business was let, the managing directors of the two biggest UK systems and software shops, Dr. Maurice Kendall, Scientific Computing Co., and Alex d'Agapeyeff of Computer Analysts and Programmers, retorted quickly that what went for hardware applied more strongly to software. What was more, both their firms had military and commercial experience on big systems programming jobs for American machines in the UK and other countries.

The only people who have come out of the deal with any satisfaction and lack of recrimination are the suppliers of 500 terminals with prospects for a thousand or two more. The whole scheme could still be stymied by the international airlines if, as threatened, they decided to boycott the system. Part of its success depends on interfacing the Customs and Excise clearance dp unit with the airlines' own installations.

VIVE LA IBM

Politicians may be less sanguine about their speeches after discovering an analysis of the vocabulary used by President de Gaulle in some of his most passionate television oratory. Made by Professor Jean-Marie Cotteret, a political scientist, and Rene Moreau, head of IBM's group for scientific developments, France, the analysis shows that the General's appeals for loyalty to his people were made with a predominance of personal "I's" rather than royal "we's." In fact, "je-vous" (I and you) occurred in one per cent of words in his speeches. And his heart-to-hearts with the people were littered with words like republic, state, me, the people, trust, nation. While the key words of the "balance sheet" speeches were: our, year, economic, world, development and progress.

In radio and tv speeches the General used a vocabulary of 4,000 words in more than 6,000 variant forms. Cotteret and Moreau comment that some 19th century authors used as many words, but Racine used only 3,000 in all his plays and one must go back to Rabelais in the 16th century to find a vocabulary as rich and yet as intelligible to the public.

In all broadcasts, totalling 62,000 words, "France" was the most frequently used noun, appearing 756 times. Runners-up were country, republic, state, world, the people, nation, progress, peace and future. De Gaulle mentioned himself by name 13 times, God three times and the devil twice . . . Is the moral self-evident?

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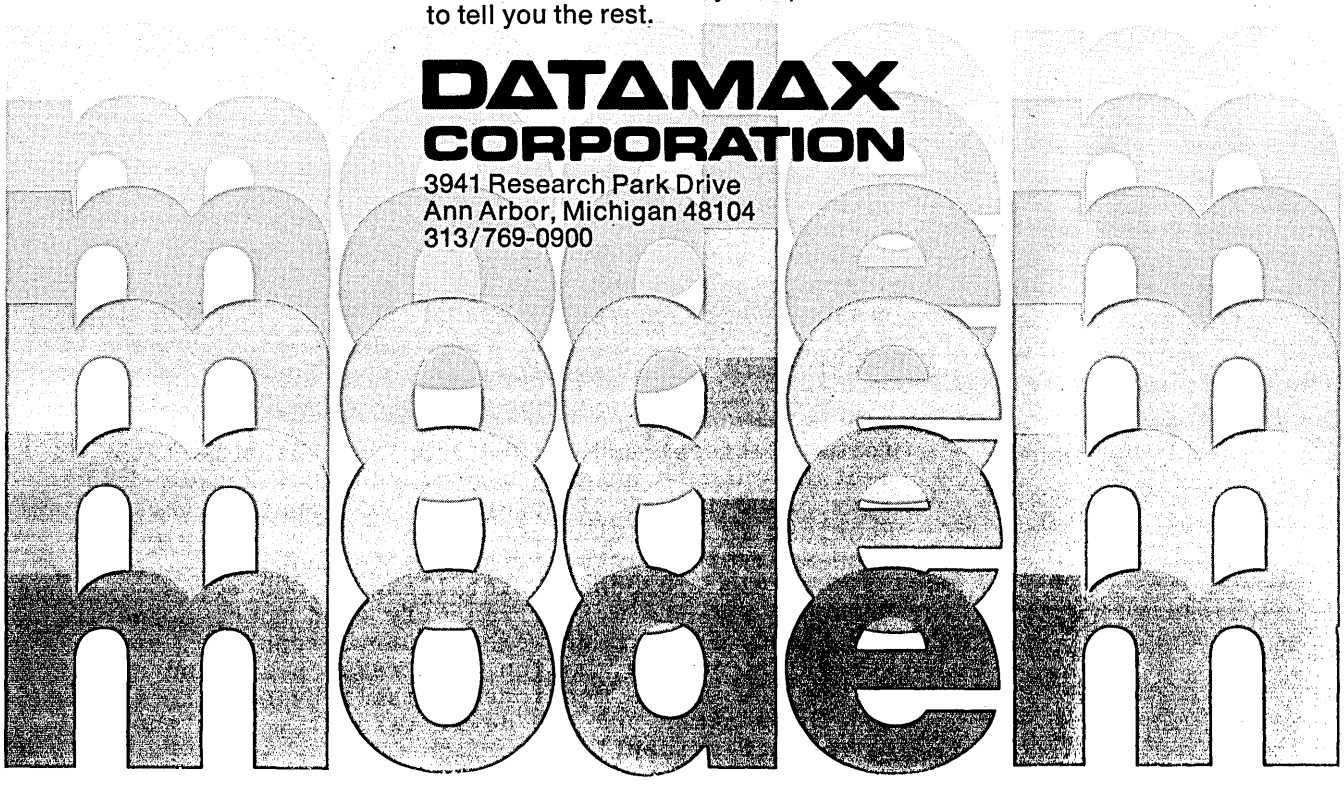

washington report

MCI RINGS BELL, WINS COMMON CARRIER LICENSE

The FCC voted 4-3 last month to grant Microwave Communications, Inc., a common carrier license, ending six years of litigation and giving data communications users substantially greater leverage in their fight with Ma Bell. The decision permits MCI to offer microwave private line voice/data service to Chicago, St. Louis, and intermediate points.

MCI President Jack Goeken told us he plans to begin commercial operation next July. This month, MCI will ask FCC to let it offer service between Chicago, NYC, and intermediate points. Other extensions are in the offing (May, p. 243). Recently, Goeken and his associates purchased a controlling interest in Interdata Communications, Inc., which has already applied for a common carrier license to operate a microwave system between D.C. and NYC.

Ma Bell probably will ask FCC to reconsider the MCI award; that would suspend the effect of the decision temporarily. Possibly, AT&T will take the case to court, which would impose an additional, even longer delay.

Another key question is whether AT&T, Southwestern Bell, and GT&E—MCI's chief competitors in the Midwest—will provide terminal loops to connect MCI customers' terminals with the nearest MCI towers. The FCC decision says, "Since they (the carriers) have indicated that they will not voluntarily provide loop service, we shall retain jurisdiction," which means that if MCI finds the carriers uncooperative, it can complain directly to the FCC's commissioners without having to go through preliminary proceedings.

For data communications users, the MCI decision means that many service features that the established carriers have refused to provide will now become available. For example, MCI will let up to 5 users share a single channel; it will lease channels as narrow as 2 kc, offer reduced rates for less-than-24 hour usage, and permit direct interconnection of foreign attachments. Goeken reported that shortly, MCI will also offer one-way transmission service.

All of these features can reduce a user's costs significantly. Presumably, MCI can demonstrate that the demand for such services is significant, and that they can be provided without bankrupting the supplier or reducing the quality of his service. If MCI does prove all this, users will be in a much stronger position to win similar concessions from Ma Bell.

U.S. COURT RULES ON SOFTWARE PATENTS

The U. S. Court of Customs and Patent Appeals ruled last month that a computer program can change an already patented general purpose computer into a special purpose machine that is eligible for a separate patent. The decision involved a claim filed by Prater and Wei, two Mobil Oil scientists, who developed a computerized spectrographic analysis technique. The Patent Office had rejected the application on the grounds that a change made by Prater and Wei was based on a "mental process," which is unpatentable.

(Continued on page 243)

Moore New Ideas for Data Processing

Great way to save paper

If you can cut out an entire operation, such as punching tab cards, you save not only the cost of key punching, but the relatively high cost of cards, too. Moore has a system that uses pencil-marked documents as direct computer input. It is ideal for public utilities, municipal services, dairies, and similar activities where routemen or meter readers are employed. One utility reports saving $75,000 in forms alone. Ask about Idea No. 211.

People-less billing

A great deal of tax money goes down the drain because of antiquated accounting and billing systems. Moore has a system that any city, county, or village tax department can use to save time and money. Using shared computer facilities, or the facilities of banks serving as depositories, the system can perform all of the computation, billing, and other record-keeping without requiring any clerical time. System is completely confidential. Cost is less than formerly required for forms and envelopes. Ask about Idea No. 212.

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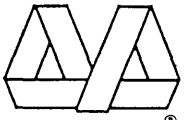
Your own equipment can print columnar headings on computer printout forms—to help in an emergency—or on limited runs. There are various rulings or line tints for easier reading—duplicating masters and carbonless papers, too. Perfect when special reports are needed. Ask about Idea No. 214.

Call Moore for ideas

A call to the Moore office listed in your phone book gives you access to an enormous fund of ideas pulled together by more than 2400 Moore representatives throughout North America. All are in use. All save time and money, improve control. One Moore idea may be what you need.



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The ruling clearly establishes that computer programs can be "unobvious processes," an idea that software firms have been trying to sell to the patent office for years. The court indicated, however, that software developers, to qualify for patents, must limit their claims to machine-implemented processes, and clearly exclude logically identical operations that can be performed manually (for example, by using pencil and paper).

Mort Jacobs, one of the attorneys who participated in the Prater & Wei case, hailed the decision as a "milestone" that "greatly broadens the basis on which software patents can be secured."

NEW TELECOM AGENCY MAY BE FORMED, MAYBE

"Within four months, the White House will decide whether to establish a new telecommunications agency to implement last year's recommendations of President Johnson's Task Force on Communications Policy," says a knowledgeable source. Such an agency would interface with data communications users in at least two ways: It would provide technical support to FCC officials who are trying to regulate burgeoning data communication services, and it would coordinate the standardization of data elements and codes used in computerized information networks. The federal government operates some of these, and funds even more. The agency might also support the testing and certifying of dp hardware and software offered by vendors who respond to federal rfps.

CONFERENCE TO CONSIDER BEST BRIDGE TO BIDDING

The growing need for such a resource is underlined by a conference being held this month in Charlottesville, Va., by the Budget Bureau. Officials of all the major federal dpe-using agencies are attending.

One question the conferees will discuss is whether peripheral and software firms should be allowed to bid on federal dp system contracts, and if so, what contract provisions are needed to ensure that they deliver what they promise. Another question is what action the government should take to encourage the offering of systems containing cpu's, peripherals, and/or software produced by different sources.

Multisourcing offers the prospect of saving money, but since most cpu makers prefer to make, or at least supply, system peripherals and software, they aren't particularly willing to cooperate with competing bidders who supply these items alone. While federal contracts could require cooperation, such a provision would be fought vigorously by the cpu makers and might persuade some not to bid.

CAPITOL BRIEFS

We hear that the Brooks GovOps subcommittee will hold 2-3 days of hearings "sometime this Fall" to review progress in dp standardization and related matters. OCR and data management systems standardization are among the likely topics. Others are still under consideration. Witnesses will include standardizers as well as officials of BOB, GSA, and NBS . . . The anti-trust suit filed against IBM by CDC, DPF&G, ADR, and Programmatics will be consolidated, a federal judicial panel ruled recently. ADR and Programmatics had opposed the move, arguing that their complaint—about IBM's software marketing practices—was not related to the other plaintiffs' charges, which involve hardware. The panel said the two products are "inextricably intertwined." It decreed that pretrial proceedings would take place in a Minneapolis District Court. No date was set.

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accounting package that will give him a daily rundown on patient status, expenses, accounts paid, etc. But he can also have access to a data base full of correlated symptoms, diseases, and drugs—for a higher price and consequent higher royalties to TWCB.

And who but Soliman will own the data base, resident on his own equipment. The data will be on tap, wholesale, for his time-sharing service customers. Twenty-five of them have already applied.

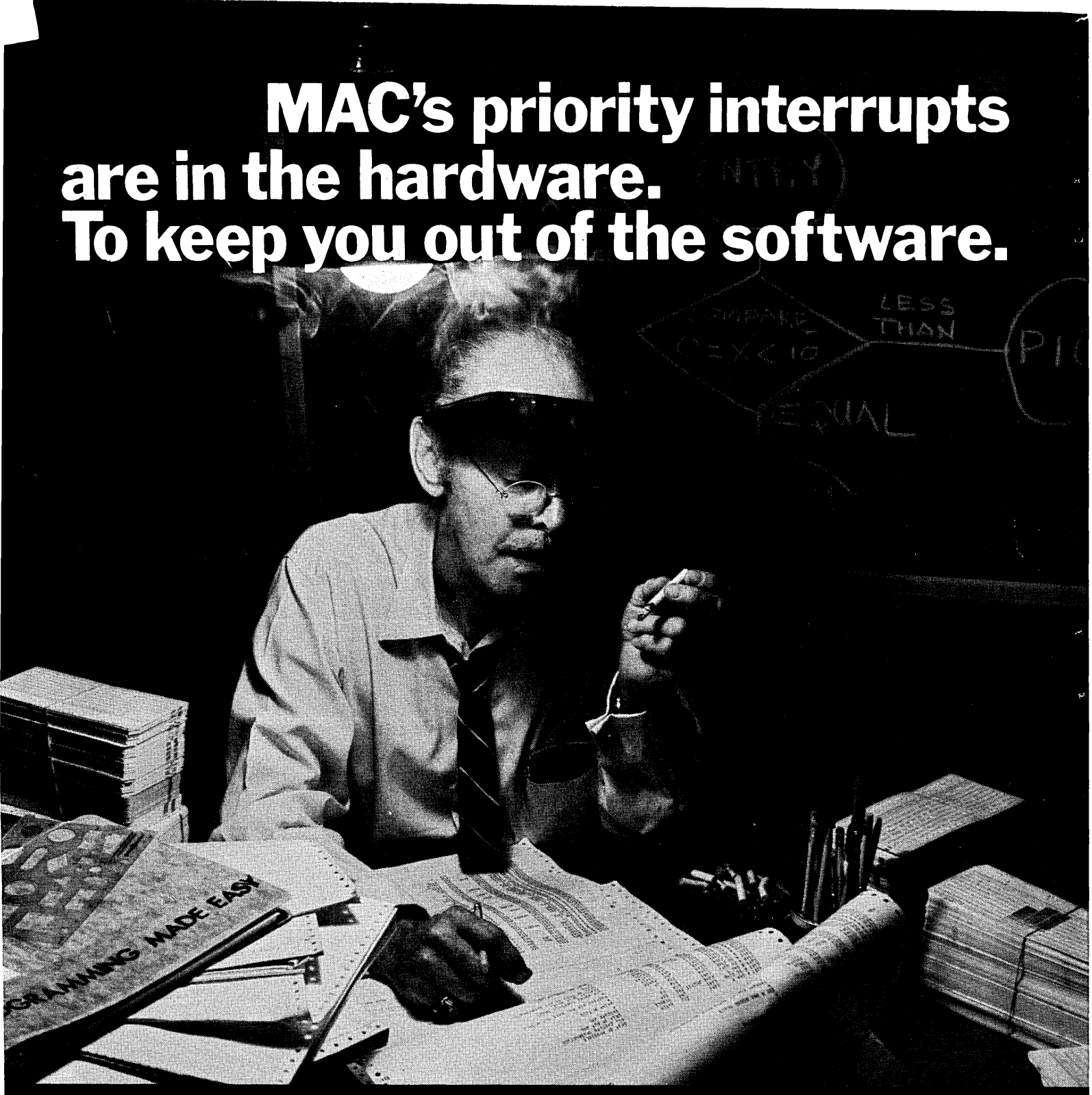
L.A. ASSISTS ASI IN TWIN KILLING

Don Sundeen, pres. of Applications Software, Inc., Torrance, Calif., is flushed with victory now that his file management package ASI-ST (May '69, p. 128) has won a head to head to head benchmark confrontation with two other leading packages (Brands X and Y) and has been bought by the City of Los Angeles' Community Analysis Bureau for installation in the city's Data Service Bureau for city services across the board. The Data Service Bureau operates on a 24-hour, seven days a week basis, and a source close to its operation says the package was chosen on the basis of "execution and capability," with cost not a primary factor (it went for $35K). The source also said that ASI-ST had provided an unexpected by-product by being able to produce as part of its compiler a comprehensive data dictionary, and 24 of the city's 48 high-priority data files have already had such dictionaries written.

RUMORS AND RAW RANDOM DATA

Backed by Tom Bay (former gen'l mgr., Fairchild Semiconductor), and two megabucks, Central Data Systems, Sunnyvale, Cal., enters the T-S hardware race with a 32-bit-memory-oriented system featuring up to 131K 800 nsec core, plus 2314-type disc. Deliveries of the system, aimed at in-house users and OEM, begin early '70. Key people include pres. Bill Bridge, John Ready, Dave Masters, Bob Shepardson, and Dick Bogard . . . Bill Nadeau has resigned as pres. and ch. of the bd. of the Matrix Corp. to head up a new computer services company in Santa Barbara, Compucenters, Inc., a division of Computer Research Corp. there. The new outfit also has offices in Pasadena and Orange County in Calif. and operates with a CDC 6400 in which it is now installing an additional 32K of memory . . . Reports—expressed with great deal of conviction—are about that Viatron will kayo its critics by starting delivery of System 21 in October. This would put the company back on its original timetable and throw out the revisions that put first deliveries into early 1970 . . . Look for Univac to come out soon with a small programmable controller; designed primarily as a concentrator, it will also serve as an interface to peripherals, maybe even non-Univac devices. Also forthcoming: a new OEM printer . . . Raymond Smith, who transformed sickly Control Data Chicago and Pittsburgh districts into leading sales offices, is now district manager of CDC's New York office . . . Look for SDS to change monicker to Xerox Data Systems . . . At presstime, IBM announced its new supercomputer, the System 360 Model 195, which has a basic cycle time of 54 nanoseconds, more than twice the speed of the 85. It was designed in the IBM Lab at Poughkeepsie, N.Y., and will rent monthly for from $165K to $300K, with delivery scheduled for early 1971.

MAC's priority interrupts are in the hardware. To keep you out of the software.



Creating programs to handle every conceivable interrupt should have gone out with brass spittoons. Especially when MAC gives you 4 hardware interrupts for only $11,950.

You'll have to double MAC's price to find hardware interrupts anywhere else. And triple it to find a computer with MAC's automatic store-and-restore.

MAC responds to interrupts and shifts to new jobs in 6 microseconds average. That's fast enough to operate in almost any real-time or time-sharing system.

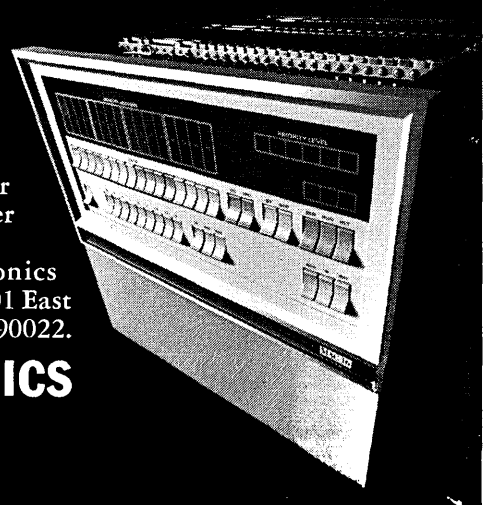
And if 4 interrupt levels aren't enough, MAC's can expand to 64.

MAC's basic 16-bit, 4K memory can also expand. To 8K in the mainframe. To 65K with additional chassis.

With MAC, creating software is a fairly simple proposition. What MAC's hardware interrupts don't eliminate, MAC's internal structure simplifies.

So here's another proposition: either build your system around MAC or order plenty of eye shades.

Write to MAC, Lockheed Electronics Company, Data Products Division, 6201 East Randolph Street, Los Angeles, Calif. 90022.



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D-2

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System 18/30 is a family of compatible GA automation computers designed to work in distributed management information and control systems. The GA worker-level computers permit the user to automate at the primary control loop first, with predictable results and costs — and then add to these automation functions GA supervisory-level computers for total process optimization.

Heart of our new System 18/30 is the 1804 processor, which is software compatible at the binary code level with the IBM 1800 and 1130 computers and will work with or extend existing IBM 1800 installations . . . and do the work more effectively and at a lower cost.

The 1804 acts as a supervisory computer for several SPC-12 dedicated computers. SPC-12 is our primary control loop computer or worker computer. It ties to your machines, devices, communication networks, sensors and instruments through our unique family of mini-controllers to form a primary control loop automation system. With GA unique Product Software, control programs can be accomplished quickly, economically, and on a fixed price basis.

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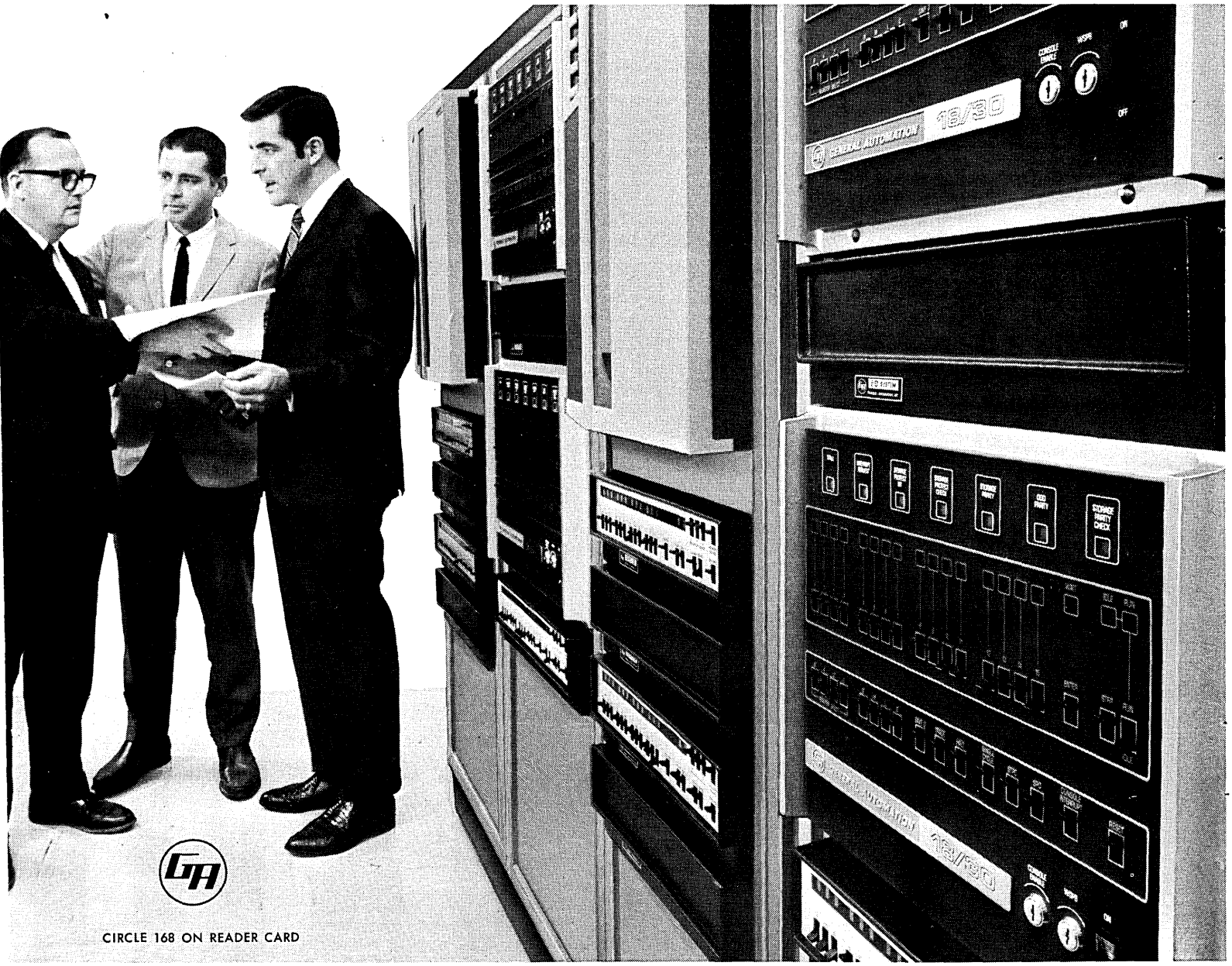
From General Automation



CIRCLE 168 ON READER CARD

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people

A highlight session at the ISA convention in Houston October 27-30 will feature **James H. Binger,** Honeywell board chairman, speaking on systems management, who will be in good company with other highlighters **Col. Frank Borman** and **Dr. Denton Cooley,** of heart transplant fame. . . . **Jerome I. Elkind** has been promoted to senior vp of Bolt, Beranek and Newman, Inc. and given responsibility for the newly-created computer science and systems divisions. . . . International Telecomputer Network Corp., Bethesda, Md., has three prestigious new board members: **James E. Webb,** former NASA administrator; **John A. Perkins,** board chairman of Dun & Bradstreet, Inc., and **Edward J. Schmidt,** formerly with GE. . . . **Samuel Ochlis** has been elected president of G:R Industries, Inc., Newton, Mass., manufacturer of computers and electronic instruments. He was formerly vp at Infotec and co-founder of Rotek Instruments. . . . **John C. Lindley** is new president and director of Realtime Systems, Inc., the Chemical Bank of New York's candidate (through its holding co.) for a share of the t-s market. He was on Adm. "Bull" Halsey's staff in World War II, came from ITT where he was a business development director. . . . **John L. Porter,** former corporate controller for Ampex Corp., now will be responsible for all operations of that company's Magnetic Tape div. as vp/general manager, succeeding **Leonard R. Sainsbury,** who has resigned. Ampex also has named **James S. McKeown** as a planning assistant in its Computer Products div. to "investigate and evaluate acquisition opportunities". . . . IBM has promoted **Sheldon I. Euler** to the presidency of its Information Records div. His previous post as director of manufacturing at corporate hq has been taken over by **Robert B. Dunlop.** . . . **Frank H. McCracken** is the new president of Leasco Data Processing Equipment Corp., succeeding **Bernard L. Schwartz,** who has become chairman of the executive committee. McCracken comes from a vice presidency at IBM, has 23 years' experience in dp. **Thomas C. Sorensen,** ex-vp of the Univ. of Calif. and former deputy director of USIA in its Ed Murrow days, will serve as communications vp. . . . A national authority on urban affairs, **J. Ward Wright,** has been secured as Principal Consultant for Auerbach Associates; and the director of Columbia Univ. Urban Center, **Dr. Franklin H. Williams,** has been added to the board of directors at URS Systems Corp., San Mateo, Calif. . . . Texas turnovers: in Dallas—**William P. Davis** has been appointed president of Millenium Corp., formed last February to engage in computer-oriented R&D for graphic arts and visual aid equipment. **Albert H. Bieser** is new senior vp for General Computer Systems, Inc. D. R. McCord & Associates, Inc., subsidiary of University Computing, has two new vp's, **Jack Brand** and **William W. Jones.** Two more vp's have been named at Financial Technology, Inc., **Dale K. Sievert** and **Raymond M. Bebo** (marketing). **Gayle C. Tinsley** has been elected president of Docutel Corp. after serving three years in its parent company, Recognition Equipment, Inc. He succeeds **G. William Childs,** who is returning to REI. The president's post at Flight Plan, Inc. (computerized aviation service) has been awarded to **Donald E. McArthur** by the parent company, Data Automation Co. **Michael J. Levesque** has been named marketing vp at General Computer Systems, Inc. **Eldon Brame,** former president of Datacomp, Inc., and Dallas Tabulating Institute, has become vp of Computer Management and Research Corp., which absorbed those two companies; **Paul Blackwell** has been named operations vp. In Austin, **Thomas L. Edmonds** has been promoted to vp of Computer Utilization Inc., consulting firm. . . . **Arthur Critchlow,** founder of Mobility Systems, Inc., San Jose, Calif. warehousing systems firm, has resigned. New President is **Phil Smith,** formerly market manager. . . . **John J. Kramer** has joined Memorex Corp. as vp of its international division, which he will direct from San Francisco. He was formerly international marketing director for Control Data. . . . New ways to apply its computer system to the leisure and travel industries will be supervised by **Jimmy D. Woodruff** as vp of Future Systems Planning at AM-EX Express Reservation Services, Inc. Operations of the AM-EX "space bank" (room reservations) out of Memphis will be in charge of another new vp, **Paul J. Long.** . . . **James D. Brown** has joined MISCO as vp/gm of its western region. . . . . **John W. Lazur,** formerly with MITRE Corp. as technical director, is now vp of corporate development at Electronic Communications, Inc., NCR Florida subsidiary. He succeeds **Charles D. Manhart,** who will be vp of midwest ops in Kansas City. . . . Computer Peripherals Corp., San Diego, has appointed **Dr. Rodman A.**

Time was when alphanumeric computer outputs chugged away on the line printer, line drawings zig-zagged on the pen plotter, and creative designs flickered momentarily on the scope face. In fact they still do chug, zig-zag, and flicker.

Something better is called computergraphics, where the computer's tapes can be given to one peripheral that is fast enough, precise enough, and versatile enough to handle all kinds of outputs.

Our FR-80 Film Recorder is a computergraphics system. Give it a personnel listing with corrections to merge and record in one pass. Or a digitized engineering drawing to be recorded and blown back to E-size from 35 mm film. Or a strip chart to be continuously recorded in abutting frames, perfectly registered. Or a directory to be set up in book-quality, like this ad.

FR-80 not only does all of these things to higher accuracy than any other electro-optical system (resolution on 35 mm film: 80 line pairs per mm), it does them in quick succession with a few seconds setup time, accepting tape formatted for any output device by any host computer. Because FR-80 is a programmable system, flexible, versatile, responsive to special graphic requirements, receptive to new methods.

To put it another way, adaptable species flourish, while specialized forms die out. And FR-80 is thoroughly adapted to the age of computers and automation.

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INFORMATION INTERNATIONAL

Computergraphics have come a long way

people...

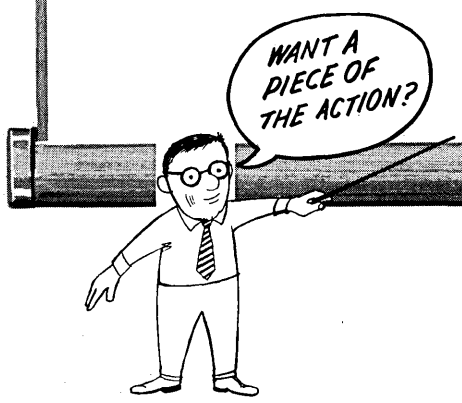
Sharp as president/chief exec officer. A nuclear chemist from Harvard U, he founded Sharp Laboratories, which ultimately merged with Beckman Instruments. . . . **Leonard Kedson** has been promoted to executive vp of Computer Test Corp., Cherry Hill, N.J. . . . **Dr. Sidney M. Rubens** will be director of special projects for Univac Federal Systems Div. He is a member of NASA's advisory subcommittee on Data Processing and Instrumentation. . . . **John M. Hungerford** has been named engineering vp of Newell Industries, Sunnyvale, Calif., new mag tape equipment company. He was previously space electronic systems director at Philco/Ford. . . . **Lord Halsbury**, chancellor of Brunel University near London, will be president of The British Computer Society for '69-70, succeeding retiring President **Basil Z. de Ferranti** at the society's October general meeting. New deputy president will be **Alex d'Agapeyeff**, founder/managing director of CAP. . . . **David A. Musser** has been named administration vp of Standard Computer Corp., Santa Ana, Calif. **William L. Woolley**, former marketing director there, has been elected president of Growth Industry Computing, Inc., a new software package-finder house in LA which will concentrate on searching out already-working applications for clients. . . . **William Wehe**, who launched Ticketron's west coast operations, is now vp in charge of the east coast. . . . The man who developed Digitax Inc.'s computerized tax returns system, **Gary D. Ritter**, has been rewarded with the presidency of that company. . . **Lowell S. Bensky** will be vp in charge of Compata Inc.'s new eastern office in Lexington, Mass. . . . International operations of Computer Sciences Corp. will be directed by **Dr. Stewart E. Fliege**, vp. . . . In Japan, **Robert L. Montgomery** is now vp/gm of Recognition Equipment Inc.'s subsidiary there, with responsibility for the entire Pacific/Asia area. . . . **John W. Cronin** has joined the board of Information Dynamics Corp., Massachusetts producer of a micrographic catalog retrieval system. He was a chief executive at the Library of Congress for more than 40 years. . . . At Litton Industries, **Paul E. Norsell** has become president of the Litcom Div., **James Fitzgibbon** has been named director of computer operations at Automated Business Systems in Carlstadt, N.J., and **A. R. "Stormy" Sult** will occupy a newly created vice presidency at Mellonics Systems Development Div. in Sunnyvale, Calif. The latter will broaden space systems activities in software to other areas, both governmental and private. . . . **Robert B. Boyle** has been announced as vp of Logistic Distro-Data, Inc., NYC data center operator and systems developer. . . . **Stephen O. Handley** is new executive director at Ikon Data Systems, Seattle division of Synergistics, Inc. . . **Lloyd D. Turner** has been appointed to develop programs in computer architecture and systems software for Burroughs Corp., as director of engineering/programming at Detroit hq, and **William D. Bubb** will be manager of systems development for the company's U.S. Business Machines Group. . . . Raytheon has chosen **Chauncey P. Dewey, Jr.** to manage a new organization in the company's Norwood, Mass., plant, consolidating operations in data communications and terminal display systems. . . . **Frank G. Tabb** has been named operations manager at I.R.A. Systems, Inc., Waltham, Mass. . . . The board of directors of Access Systems, Inc., Paramus, N.J., has elected **James A. McFadden, Jr.** chairman. He has served three N.J. governors on financial advisory committees. . . . **Phillip D. Dorfman** has been appointed vp of Meet A Match Internationale, Inc., in Chicago, which is extending its services to include "cultural" events. . . Among users: **Lawrence J. Clark** has become systems and dp manager for Steelcase, Inc., Grand Rapids, Mich.; **Donald P. Young** is now dp-vp for Associated Mortgage Companies, Inc., Washington, D.C., and **Russell A. Brundage** has been named the same for Colonial Penn Insurance Group in Philadelphia; **James A. Smith, Jr.** is dp manager of the Stuart Div. of Atlas Chemical Industries, Inc., in Pasadena; the Chicago Board of Trade has appointed **Russell Dewey** to administrate systems and programming for its exchange, concentrating on computerization of a proposed securities option market. . . . **R. W. Calfee** has been named vp/gm of Data Disc Inc.'s new video division in Palo Alto. . . . **Edmund W. Baker** has been elected president of Universal Signal Corp., a subsidiary of Data-Design Laboratories, Cucamonga, Calif.; he has given up presidency of the parent company to concentrate on program direction and applications of a proprietary signal enhancement device. . . . Programming and Systems, Inc. of NYC has two new vp's: **Arthur Salzfass**, service bureau division, and **Philip Maron**, education division. . . . **Robert J. Deffeyes** has been appointed vp of Graham (Tex.) Magnetics Inc., tape manufacturer. He was formerly a manager at Memorex. . . . **Dr. John M. Hunt** has switched from Singer-General Precision, Inc., to Singer's Friden div. as senior vp/technical director. ■

recruitment advertisers' index

For the convenience of those readers interested in professional opportunities, we have gathered in the following pages the advertisements of these industry firms and professional placement agencies:

ANALYSTS • PROGRAMMERS:

YOU CAN HELP DEVELOP A *total* manufacturing control system



Sooner or later, you'll want to do better. And doing better is what to expect at Sikorsky. The chance to use your abilities in depth. To go and grow—from one absorbing assignment to another.

Consider the intriguing possibilities inherent in 33 sub-systems. A great breadth of action which includes *order entry . . . inventory . . . shop scheduling*—just to start your thinking.

Obviously, we want people who need involvement. People who can kick the bread and butter routine and get excited with us. And who want the personal and professional rewards associated with new dimensions.

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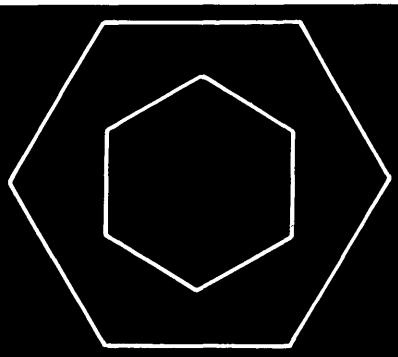
CIRCLE 322 ON READER CARD



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Can you draw the figure shown here without lifting your pencil off the paper?

Another puzzle: How can you escape the boredom of your present job in programming? Move up from behind the man who intends to stay ahead of you? Find new opportunity—new programs, new equipment, new challenges, better financial and personal rewards?

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MACHINES AND LANGUAGES YOU ARE FAMILIAR WITH: _____

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_____

JOB PREFERENCE: _____

GEOGRAPHIC PREFERENCE: _____

SPECIAL INTERESTS: _____

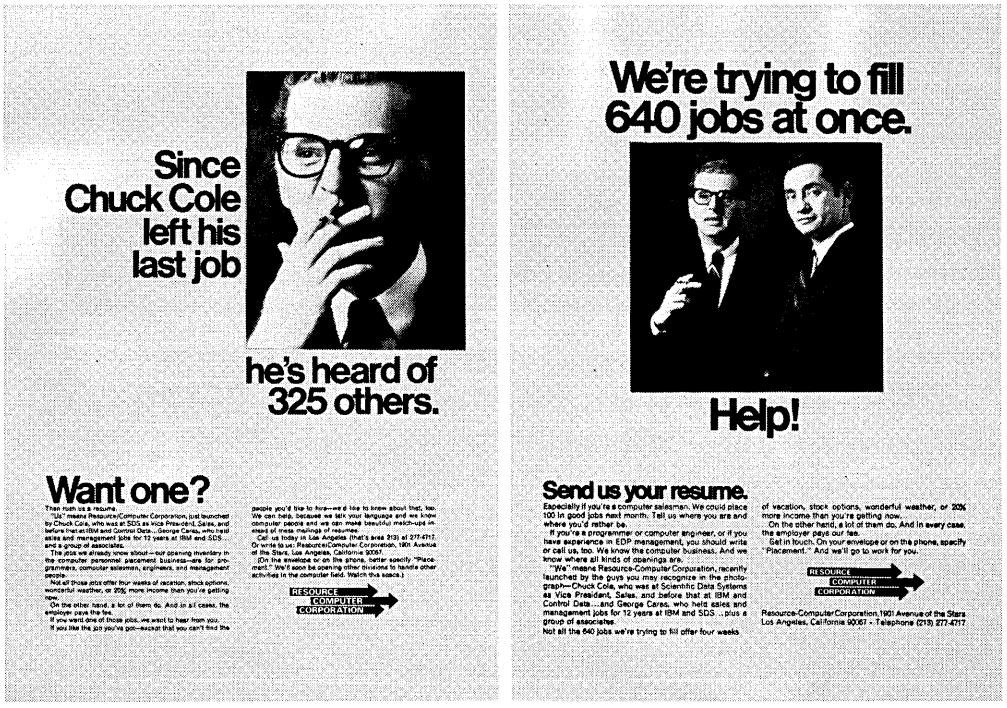
_____

_____

EDUCATION (highest degree achieved) _____

CIRCLE 337 ON READER CARD

If you haven't answered any of these ads, you must love the job you've got.



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books

***Run, Computer, Run*, by Anthony G. Oettinger. Harvard University Press, Cambridge, Mass., 1969. 302 pp., $5.95.**

In 1964 a grant from IBM established the Harvard University Program on Technology and Society, and this book is the first of a series published to present the results of studies carried out under the auspices of that program. The work is identified as an essay, and its subtitle—"The Mythology of Educational Technology"—indicates the nature of its contents. The author describes and comments upon the shortcomings of many different attempts to introduce technological innovations into educational institutions in the U.S.

Among the comments found in this book are the following points.

1. *Systems analysis:* "The widespread belief that there exists a general body of well-defined and effective systems theory that may be applied by powerful computers to the analysis or synthesis of any system whatsoever is a myth." The education environment does not satisfy the minimum requirements for a systems approach to be productive.

2. *Statistics on innovation:* In general, the only statistics available relating to innovative materials or devices in the schools concern the adoption of the materials, or the presence of the device, and give no indication of whether, how, or with what results the innovations are used.

3. *Future funding for education:* Current projections of the amount of money to be available for primary and secondary education in the U.S. in 1975 are enough to maintain the status quo, and to improve a little upon it, " . . . but not enough to revolutionize education profoundly, even if money were all it took to do so."

5. *Educational goals:* The goals stated by educators are largely political in intent, and bear little relation to actual practice.

6. *The people who implement innovation:* Teachers and school administrators operate in an environment which neither trains nor rewards them for successful innovation. "Teachers are rewarded for taking accurate attendance records, keeping their classrooms neat and quiet and their own mouths shut outside the classroom."

7. *Computers in education:* "The massive storage requirements of a large-scale, versatile multiple-access educational system have yet to be realized in any school." Cost justifications are often based upon projected savings in personnel, which have not been substantiated in practice. " . . . time and again . . . glowing experimental results have lost their meaning in the translation from pilot scale to useful operating size."

8. *Companies in the ed biz:* The companies which have announced their entries into the education "market"—sometimes at considerable advertising expense—have operated under return-on-investment and time-frame requirements which preclude major technological innovation, and they have instead concentrated on " . . . highly visible quickie approaches creating the illusion of progress."

In the course of commenting upon these and other points, the author discusses a number of innovative projects: Melbourne (Fla.) High School Trump and Quest Plan, Nova (also Fla.) High School Learning Activity Packages, Individually Prescribed Instruction in the Oakleaf and McAnnulty Schools (Pittsburgh), the IBM 1500 in the Brentwood School (East Palo Alto), and an elementary biology course at Purdue Univ. In discussing the nonuse and misuse of educational devices, he lists 15 operational properties which are particularly important in the educational environment. The author's description of the Watertown (Mass.) High School language laboratory should be required reading for teachers and engineers alike. His 50-page "Visit to Small City" is an incisive portrait of teachers, administrators and students in action, and is itself worth the price of the book. The 10-page "Case Study in Reliability" presents the almost-funny attempts of the author to cope with the shoddy marketing and maintenance practices of one manufacturer of educational equipment.

By way of suggesting what might be done to overcome the problems described in the first five chapters of this book, the author devotes the sixth to outlining one possible direction for events. Pointing out that " . . . a system which is assured basic existence no matter how badly or how unresponsively it performs can benefit from *some* elements of market competition, with careful checks and controls built in," the author suggests establishing a buyer's market in education by funneling the nation's school budget directly to the consumers instead, in the form of coupons. The student can then "spend" his coupons in any school he can get to, and their value would be great enough to motivate every school

to compete for students and their coupons.

To increase the student's choices and, thereby, the competition, public funds would have to be channeled through private or mixed institutions (along the lines of the Communications Satellite Corp.) responsible for trying out a great enough number of diverse approaches to assure that some real progress results. The students would benefit from having more options in selecting schools to attend. Teachers would benefit from having a wider choice of employers. Society would benefit from whatever weeding out of incompetent institutions, practices, and people might occur. Despite its drawbacks, such a suggestion has the merit of dealing directly with today's two major obstacles to innovation in education: the school's immovable resistance to change, and industry's unwillingness to take the required risks. —JAMES L. ROGERS

***The Successful Computer System*, by Joseph Orlicky. McGraw Hill, 1969. 238 pp., $9.95.**

It's a tricky job writing a book intended to introduce computers to managers. The reader isn't interested in the technicalities, but he must be given understanding; he can't be asked for much time, but a wide spectrum of subjects must be covered. There are basically three ways to do it: the technical (starting with "how it works" then building to all other subjects—programming, system studies, personnel—as a consequence); the exemplary (introducing and explaining each subject by means of "true stories"); and the hortatory (lecturing the reader on how he should behave and what the computer does without going into detail). The latter is the briefest approach and has the highest information content but runs the risk of missing the reader entirely. This book, of the hortatory type, shows both the strengths and weaknesses of the approach.

The author is a good, effective writer so his lecturing is more effective than most. His plea for management involvement with the computer is eloquent and convincing, his presentation of what a system study should do is excellent, and his explanation of the various phases of a system development project is thorough and clear. He gives adequate weight to user personnel education and to conversion to the new system; few do. Because of his

evidently extensive experience and his lucid style, then, the author is able to make the lecture style work.

However, the author also falls into some of the traps inherent in the style. He often lapses into "Mother and God" exhortations—managers must become involved, the best user people must be made available full time—but without making it entirely clear why or motivating the reader to comply. Anyway, most managers have been told they "must" do so many things that their hearing aids automatically turn off when presented with another imperative.

Another problem is lack of clarity caused by generalization without adequate illustration. For example, at one point the major types of computer applications are categorized (e.g., "operating support," "accounting-type applications"), and none of the categories seem to cover the most widespread application of all—production of working documents (invoices, work orders, paychecks). Presumably the author means this to fall within one of his categories, but because his definitions are not elaborated there's no way to tell.

A third trap for the talented lecturer is the catch phrase or generalization used mostly because the words sound good. A chapter is entitled "A Machine that Amplifies Man's Intellect"; the computer is variously described as "the universal machine," "man's ultimate machine," and "the supreme technological achievement"; of the typical executive it is asserted that " . . . his essential function is that of evaluating information and processing it, converting it into action." This type of simplistic "gee whiz" writing obscures understanding, and detracts from the generally excellent quality of the author's presentation.

The requirement for combining comprehensiveness with brevity leads to another problem: the necessity of introducing a multitude of terms without the space to define them all adequately. Some of us have chosen to introduce only a limited number in the text, but add a glossary the reader can refer to for any others he encounters. Dr. Orlicky prefers to introduce the terms as he goes along. While his definitions are good ones they are brief and frequent, with the result that whole sections look more like glossary than text. This particularly applies to an appendix entitled "Fundamentals of Computer Design and Technology," which is so brief as to constitute no more than a glossary; it should either have been labeled as such or amplified enough to convey understanding.

Another trap inherent in the desire for brevity is the debatable generaliza-

tion. An example here is an assertion that " . . . the productivity of programmers who are able to test and debug their work through on-line terminals increases from between *three* to *seven times*!" (Italics the author's.) Careful experiments reported in this and other journals don't support this. Another example is the author's belief that organizational centralization is occurring on a general scale because of the computer. Some students of this matter (including this reviewer) can cite substantial bodies of evidence that this is not so; if Dr. Orlicky had produced convincing proof it would be most interesting, but he did not.

More than making up for these failings are several thorough and lucid discussions of matters rarely addressed and of particular current importance. There is a section on structuring and managing a large, one-time corporate-wide system development effort. This reviewer has never seen as direct or useful a treatment of this difficult subject, and will surely use it as a reference. Another clear and useful study is presented of the place of data processing in the organization, and its increasing centralization. As a final example, the presentation of the series of steps in a system development cycle has never been done better and is particularly important to the intended reader.

Like all books dependent mostly on lecturing, then, this one contains shortcomings—some of them difficult to swallow. Like only a few, however, its lucid coverage of topics particularly important to the manager is excellent. The balance is highly positive, and this is one of the few titles one can recommend in answer to the plaintive question: "How can I find out what it's about without getting bogged down in bits and bytes?"

—FREDERIC G. WITHINGTON

book briefs

(For further information on the books listed here, please write directly to the publisher mentioned.)

Semantic Information Processing, Marvin Minsky ed., The MIT Press, 50 Ames St., Cambridge, Mass. 1968. 438 pp. $15.

A group of experiments directed toward making intelligent machines are collected in this book. Most of the chapters are slightly edited PhD theses. The purpose of the book is to make the results of these dissertations more available to scientists and to exhibit the work to students searching for new problems in the area of artificial intelligence. Each program solves its own kinds of problems, including resolving ambiguities in word-meanings, finding analogies between things, making logical and nonlogical inferences, resolving inconsistencies in information, engaging in coherent discourse with a person, and building internal models for representation of newly acquired information.

Practical Programming, by P. N. Corlett and J. D. Tinsley, Cambridge University Press, 32 E. 57th St., New York, N.Y. 1968. 205 pp. $7.50. Available in paperback at $2.95.

This book provides a computing course for students who have access to a computing facility. The course consists of a series of practical computer problems, each of which is explained by means of flow diagrams, demonstrations, programs and commentaries. The language of the programs is ALGOL, and an ALGOL summary is provided, together with introductions to the mathematical topics considered.

***Documentation Standards*, by Max Gray and Keith R. London, Brandon/Systems Press, Inc., 221 Witherspoon St., Princeton, N.J. 1969. 171 pp. $8.**

The purpose of this book is to provide data processing managers, supervisors, and analysts a practical guide for the design and implementation of a standard system of documentation for data processing. It is written on the premise that in order for data processing, systems and programming managers to function efficiently and successfully, they must know who prepares what document, when and how. This is said to be the first book entirely devoted to documentation standards.

***Purposive Systems*, by Heinz von Foerster et al., ed., Spartan Books, 432 Park Ave., New York, N.Y. 1969. 192 pp. $10.00.**

The *Proceedings* of the First Annual Symposium of the American Society for Cybernetics contains 13 papers on the nature of our society and the potential role of cybernetics in solving the world's technical and social problems. Specialties covered include philosophy, anthropology, psychiatry, sociology, neurophysiology, behavioral psychology, electronics and microbiology. ■

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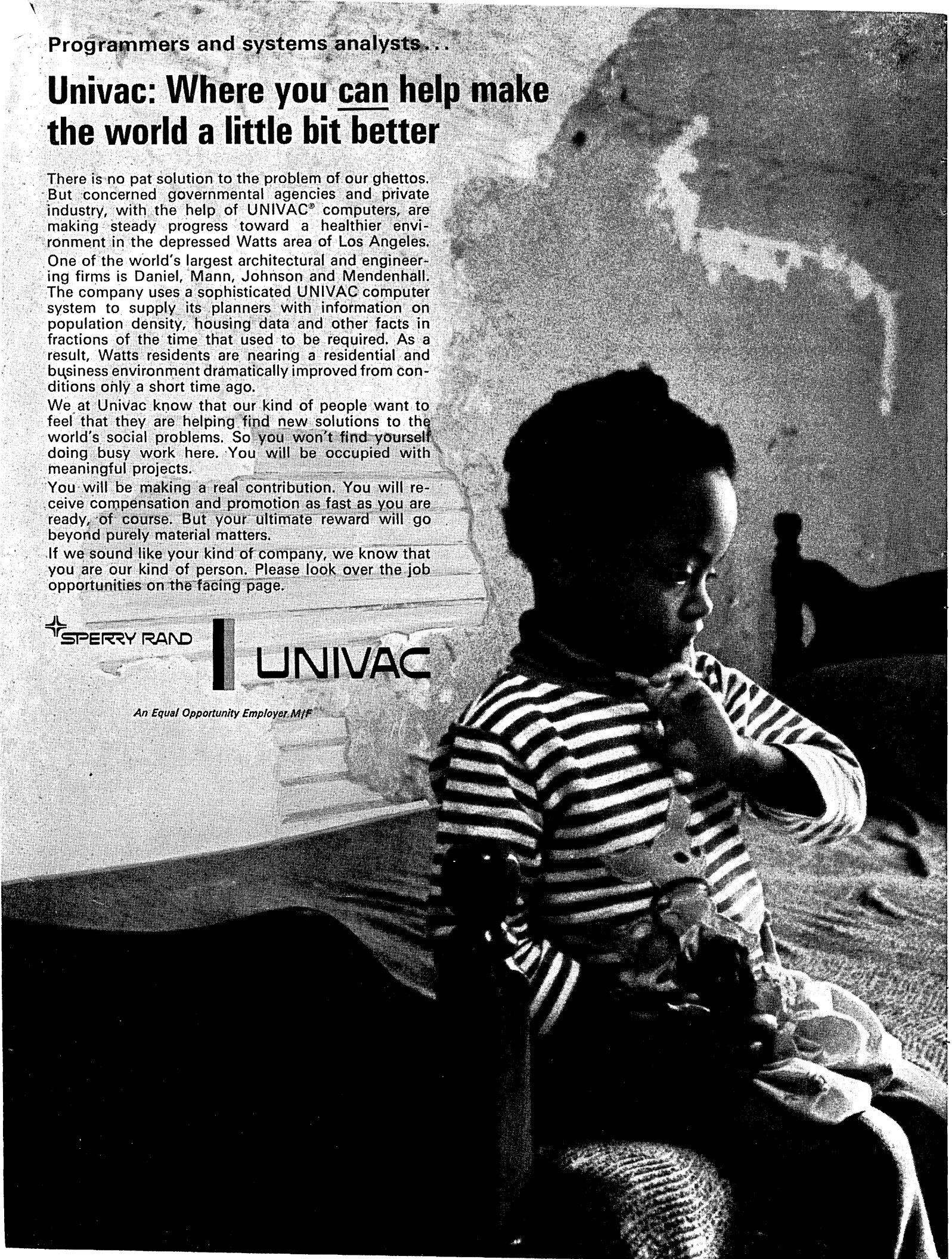

letters...

(Continued from page 29)

uation as they did in evaluating their first computer installation? How many companies address themselves to the very real problem of the programmer with loyalty to the computer industry rather than the company?

The spiraling cost of the "itinerant" programmer will continue as long as the shortage exists.

I would like to believe that our company has at least partial answers to some of these problems; if not I wouldn't be here today. The primary answer is a computer language that is easily learned, efficient in coding, efficient in compile and test, and programmer-independent.

CARLETON F. MATTHEWS
Adpac Corporation
Columbus, Ohio

festus gabfest

Sir:

The July issue is the best illustration yet of why professional journals and meetings should stay out of the arenas of politics, sociology, and international conflicts.

The SJCC report (p. 112) showed clearly that any groups of refugees from a "Gunsmoke" episode can use a technical meeting as a soap box for shouting out man's inhumanity to man (in four-letter words, yet) to the extent that nothing constructive can be accomplished for anyone present. The Letters section of this same July issue contained eleven letters, of which a scant four related to any technical aspects of the computing field.

It is indeed unfortunate that as soon as an individual reads a little and engages in some "polite talk at cocktail parties" he features himself an authority on curing the world's ills. However, such is human nature; and if we are ever to get the *work* done in our technological age, technical people (part of the Eloi) are going to have to proceed with inventiveness while the self-styled social reformers argue over whether Morlocks are stupid or just ignorant. Otherwise, we'll all wind up Morlocks as the technology stagnates.

Furthermore, technical projects cannot be neatly categorized by whether they will lead to desirable or undesirable goals of society. If I remember correctly, it was a converted *military* rocket which lofted the first U.S. satellite into orbit after the failure of the specially designed vehicle to do so.

Let me therefore appeal once more for keeping the political and sociological topics outside the mainstream of computing. Your July editorial "What's it all about, Alfie?" did a beautiful job of challenging the inventiveness to which I referred above.

E. C. WITT
Knoxville, Tennessee

Sir:

I found your July account of the SJCC session on " . . . dialogue . . . " quite fascinating. Most interesting of all was that, of all those quoted in your article, none caught the true significance of what was said by the dissidents at that meeting. By their deliberately antisocial conduct, these men and women were expressing contempt and hatred for their fellow humans. They were giving clear testimony that, regardless of an individual's or a group's cause, hatred, fear, and suspicion will nearly always be found in the list of motivations.

Hate, fear, and suspicion are as much a part of human nature as are love, trust and respect. And aren't hatred, fear, and suspicion some of the things wars are made of? How many of the dissenters are, as the song puts it, " . . . willing to march into Hell for a heavenly cause"? Quite a few, I suspect. Now all we need is another group who sees a conflicting "heavenly cause" and we've got a war.

War, I fear, is part of the human condition. Believing this, I can see no alternative to girding myself against probable enemies. In our age, this means maintaining a credible deterrence and even, perhaps, giving occasional hard evidence of resolve. And this means building bigger and better computers and finding more clever ways to use them. Of course, military activities must be, and are, accompanied by massive efforts to improve human standards of living and understanding. But these efforts cannot be allowed to completely subordinate our quest for simple survival.

I pray with the rest of mankind, including, I believe, even the "Military-Industrial Complex," that one day war will be no more than an historical curiosity. But it's going to take more than rude dissent or even revolution to change human nature. Throughout man's recorded history, no discernible progress has been made toward improving human nature. And this is in spite of some very notable peace-seekers. Certainly no ill-bred, half-civilized loudmouth is going to better the records of those who truly loved, respected, and had compassion for their fellow men.

A. W. VAN AUSDAL
Seattle, Washington

taped proposal

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sis and programming by veterans of the SAGE System, I have many thoughts on methods to cut down the volumes of redundant, wordy documentation that is produced. A good deal of this material is never utilized. Anyone who has waded through the volumes of documentation knows that this is not pleasurable reading. It is sometimes difficult to train new personnel adequately with the material now available. We need a program to enhance their orientation and create a higher level of interest in systems. This problem is particularly true with the military departments due to the three year or less rotation syndrome.

Another problem area in the industry is the communications gap between the user and the developer. Proposals are often sketchy and ambiguous. The user has been maligned and battered by the developers since the conception of the industry. The user is the target of the sophists of the industry, but deserves to receive more than promises and lip service for his money. The user is, in the end, the man that keeps our families fed and clothed.

It has been said that "a picture is worth ten thousand words." Why not employ video tape and cinema techniques to produce proposals and documentation? This technique would be a boon to both user and developer alike since it could better establish a bridge of understanding to span the "user gap." Television experience, man/machine communication experience, linked with management information analysis tells me that this media could be an answer to the user/developer communication problem and advance the "state of the art." The concept would aid the developer by giving him a means to record present work flow and show it to his team for better problem isolation and definition. It would enable the developer to comprehensively present his team's proposal to the prospective user on the same medium, thereby keeping him informed with a readily understandable record of exactly what his proposal means. On the other hand, the user would be more likely to foresee any pitfalls that would not come to light with the forms of analysis presently employed. More important, the video tape technique would draw the user more into the total picture and produce a more usable product for him.

The following is a sketch of the basic steps necessary to accomplish the closing of the chasm that exists between user and developer:

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letters...

1. The developer, via video tape, performs a feasibility study on a manual or automated application. This action is similar in function to a football coach filming his weekly games. The video tape study should be narrated by a user expert in the present application. Additional user experts can view this video tape recording and make any necessary improvements. This type of feasibility study would involve the user from the very beginning of the project.
2. Present the video tape to the developer's work team of analysts and programmers and have them determine any improvements in the application. The ability to replay any portion of the video tape should be invaluable to the developer's work force. In addition, upper echelons of management may be kept informed by viewing the video tapes.
3. Have this team prepare a video tape proposal of their ideas and concepts and send the proposal back to the user. By using cinema techniques, ambiguity should be eliminated, thereby lessening the man hours spent on each proposal. (Commercial television puts the news of the day together in less than twenty-four hours.)
4. Implement the new system with the user's current suggestions, and, at regular intervals, maintain a feedback of information between the user and the developer. This would enable the user and the developer to review the system and find any weak links in the chain. Video tape could be used also for final documentation that could be readily edited and changed if necessary.

Being in a preliminary phase of writing a paper on this subject, I appeal to your readers for aid. Please submit any comments or articles that may help. I will return the favor by assuring you that my efforts will be made known.

CHARLES J. BRUNO
2004 Leonard Road
Falls Church, Virginia

promissile missive

Sir:

This is in answer to D. D. McCracken's anti-ABM letter in the July issue. In the annals of science, there are considerable examples of scientists and workers of excellent caliber having been "used" by various parties and interests on the behalf of organizations, enterprises or other facades that had purposes and objectives other

letters . . .

than commonly supposed or presented. From the recent history of science, Albert Einstein has been an often cited example. He—along with many others—has been understandably excused for such human errors; yet, the collection of these mistakes do stand as testimony to the risk such a worker takes whenever he conjectures outside of his own field or technology.

A related aspect of this phenomenon is when a person, under his own volition, extends his expertise into other and often unrelated fields of endeavor. One does so, perhaps, with the unconscious belief that their competence is universally applicable and transferable to any subject matter. Consider, for instance, the forays of Drs. Linus Pauling and Bertrand Russell into the sociopolitical realm; their commentaries and writings, therein, border on an almost child-like naivete.

Were it not for the human characteristic to readily accept such pontifications—out of awe or respect for the person involved—the matter would be of little consequence. However, triviality is certainly not the case with Mr. McCracken. Having, in effect, joined what I call the "Spock Club" (the set of eminent men who have allowed their technical excellence to become confused—however well intended—with their emotions, intuition, apprehensions, et al.), he is treading in what could be very dangerous waters for our country. This is particularly true for Mr. McCracken due to his acknowledged computer expertise, and his sphere of influence in Washington and the U.S. Senate.

Mr. McCracken is certainly entitled to state his professional *opinion,* i.e., the computer related software for the proposed ABM cannot be developed in the time frame required (*Electronic News,* July 14/69), as such judgments are certainly matters for serious consideration. Unfortunately, Mr. McCracken, like others, does not stop with this, but goes on to oppose the *concept* due to the inadequacy of the *technology* involved.

Apparently not so obvious, the *primary* criterion for justifying an ABM system—or any other—is NOT its technology or cost effectiveness per se; rather, it is to be determined by its need in a complex geo-socio-political context; and depending on the outcome, a necessary and sufficient technology may or may not have to be developed. That technologists are apt to dogmatically extrapolate their narrow perspectives into such complex dimensions indicates that the current limitations of their intelligence and logic are not shared by their egos.

In the retrospect of a decade, I stood—as a tyro technician—awed by the pontifications of the, then, mighty technologists who with comparable credentials were diametrically opposed to whether or not Polaris, satellite systems, Ranger, Surveyor and Apollo—as well as others—could, would, or should "go." Well, the results are in—and speak for themselves.

I do hope, now, that our present goals for either peace or defense will not be seriously limited by our current technological orientations; rather, our objectives must be established and defined; and the technology required to make them a reality developed—as they were for Apollo and all related successes.

ART ALLIONE
Palos Verdes, California

again

Sir:

The mania for devising mnemotechnic ways of remembering pi extends to the French as well.

I can recall only the first line of a long poem, but it has sufficed me under most conditions:

3 1 4 1 5 9 2
Que j'aime a faire apprendre un
6 5 3 5
nombre utile aux sages . . .

ANDRE WILLIAMS
U.S. Dept. of Commerce
Washington, D.C.

Sir:

The complete version of the rhyming mnemonic for pi was, I believe, given in a letter to the Editor of *Nature* many years ago.

The version given by Ralph Townsend (June '69, p. 31) lacks the final three lines—the full version is as follows:

Sir, I send a rhyme excelling,
in sacred truth and rigid spelling.
Numerical scribes elucidate,
for me the lexicon's dull weight.
If Nature gain
not you complain
tho Dr. Johnson fulminate.

B. RANDELL
Newcastle Upon Tyne, England

mensa room

Sir:

Readers of Mr. Klugh's letter (July, p. 29) may wish to know that they can contact Mensa at 50 E. 42nd St., New York 10017. We're looking for more "Eloi," and have a hunch that many of the "Morlocks" would turn out to be Elois (Eloi-im?) if given half a chance.

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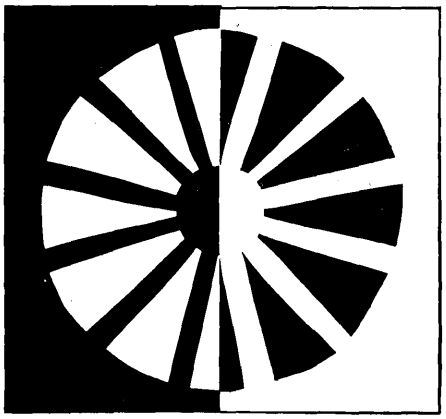

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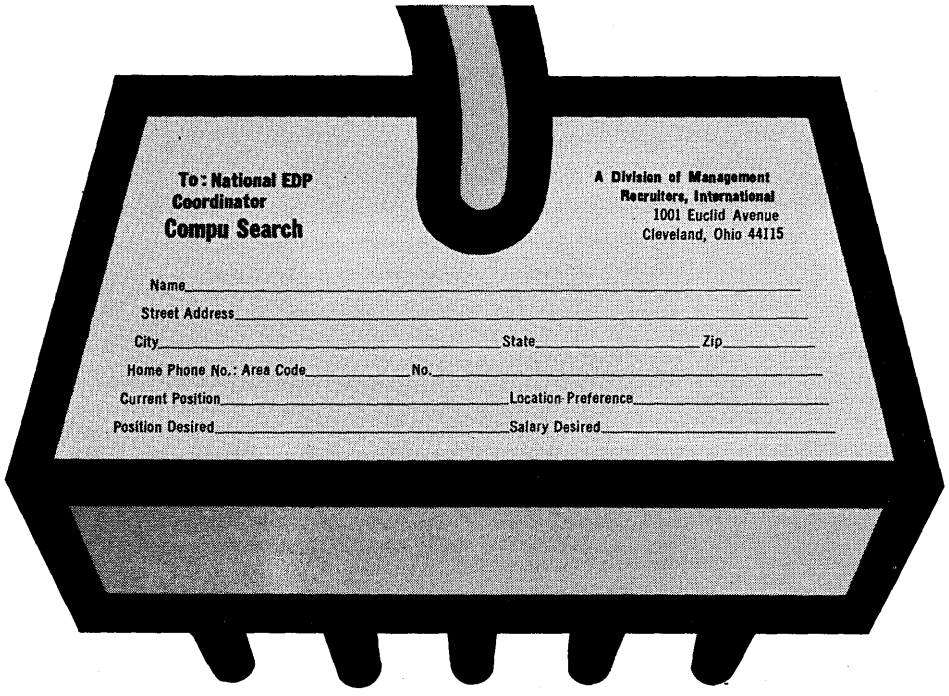

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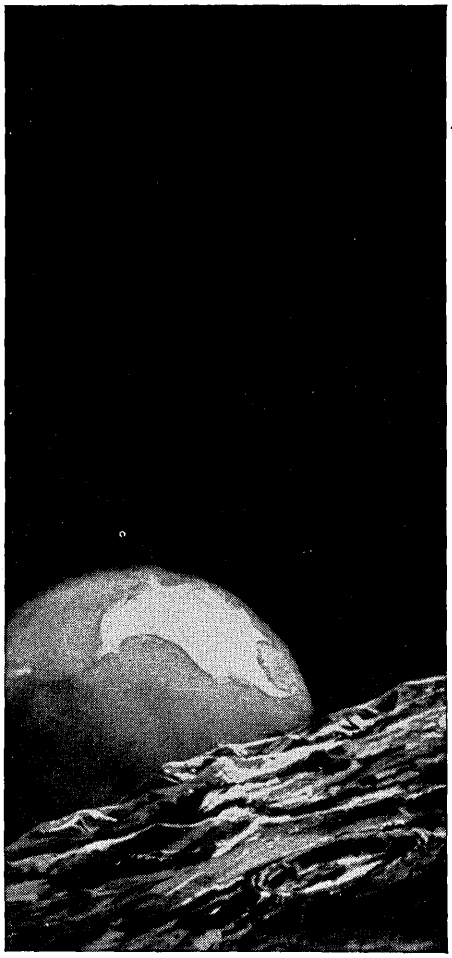

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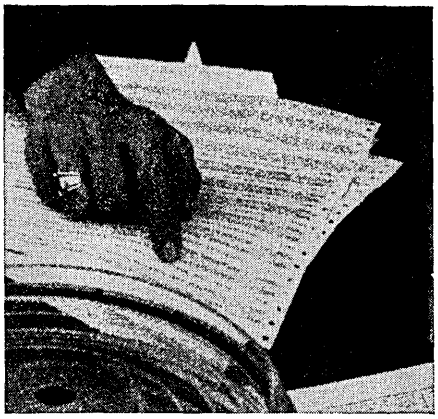

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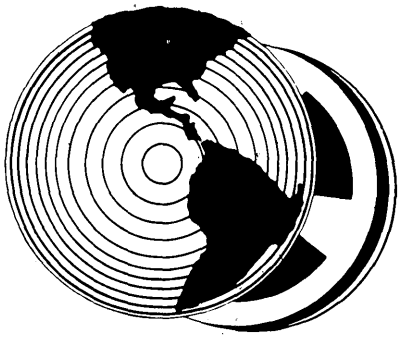

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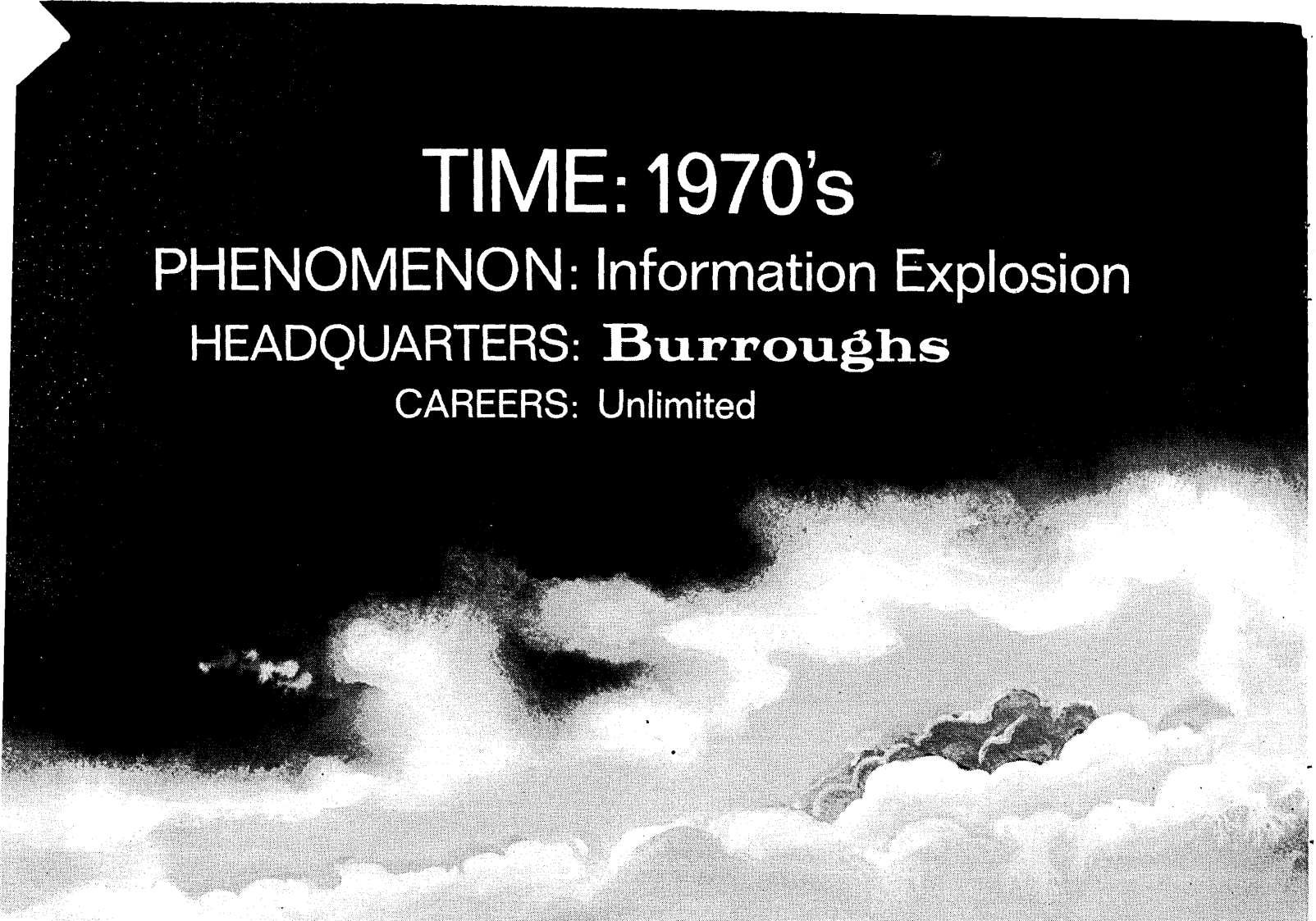

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IBM, JUSTICE, AND THE INDUSTRY'S STRUCTURE

The lawsuit filed by the Department of Justice against IBM and the continuing succession of a raft of "me-too" suits should be a cause of great concern to everyone involved in the computer industry. We seem about ready to alter a structure which, while not ideal, has produced a highly profitable profession with continuing growth in less than two decades. Changes being contemplated can have a lasting effect not only on our industry but on the government's role in controlling the free enterprise structure of an industry.

Several weeks ago I had occasion to meet with officials of the Justice Department who are pursuing prosecution of the government's case against IBM. While it was obvious that these men were legal professionals, it was equally obvious that they lacked knowledge of the data processing industry—how it grew, how it is constructed today, and where it is projected to go within the next two decades. It was initially disturbing that these men were not willing to discuss the validity of the lawsuit. The government contends that it is improper, unwholesome and even, perhaps, un-American for one company to control such an important segment of the American economy without regulation. From this conclusion, with which many of us may wish to argue, two alternatives are drawn. The government can either regulate IBM as AT&T is regulated, or it can consider IBM monopolistic and proceed to dissect it.

The concept of regulation is hideous to most of us since not only AT&T ends up being regulated but so do the several thousand independent telephone companies end up under regulatory control. Thus, any regulation placed against IBM would be placed, with equal stringency, upon the rest of the industry. Thus, having abandoned alternative #1, we come to alternative #2 which is not "whether" but "how." The "hows" generally include functional pricing separations and divestiture of certain functions. I contend that a third alternative exists which will permit the industry to evolve toward a more competitive state, that is, IBM should be restricted from penetrating into those areas forecast as prime areas in 5-10 years. Each of these alternatives will be discussed more fully later.

The profound impact the decisions in this area will have on the computer industry and its customers demands an open forum on this subject today. The issues are too important to wait a few years and then complain about the decisions reached.

First, let's discuss briefly how we arrived where we are today as an industry. Despite what many may think, IBM did not always exist as a dominant force. They grew, and in growing, accumulated a massive array of resources which provided them a technological and marketing lead and depth which cannot now effectively be separated without forcing the industry to compete against multiple-IBM's operating in artificially separated segments.

At the time I joined IBM in the mid fifties, the company was still steeped in the tradition of paper collars, IBM song books, Tent City 100% clubs, and a Horatio Alger environment. Most of us were trained to sell tabulating equipment. I became a whiz at wiring 403 control panels. Our only competition of note at this time was Remington Rand which had a sporadic marketing ability, unattractive equipment, and was facing the increased popularity of the IBM 80-column card instead of its 90-column card.

Computers at this time were limited in number and in sales appeal. Most appeal existed in the aerospace and scientific communities. A few insurance companies, oil companies, and others were beginning to find tabulating equipment incapable of handling their increasing processing problems. Only the IBM 650 computer with a "large" 2,000 word drum was having wide appeal. An interesting side note—IBM priced the 650 to make a profit on a sales forecast of thirty. Eventually more than 3,000 were installed. The IBM 1956 announcement of the 305 RAMAC brought in-line processing to the industry. As the number of competitors grew, IBM shifted the Electric Accounting Machine Division to a renamed Data Processing Division built on a fledgling industry marketing orientation for its sales and support forces. Great emphasis was placed on internal and customer education. Training programs sometimes spanned two years for sales types, and overall averaged 25% of an individual's time. Uses of the equipment became more complicated and it became apparent that to sell to the banking industry, for example, one needed in-depth knowledge of what solutions that equipment was to provide. This need placed industry marketing in the dominant role of setting IBM's marketing strategy.

Meanwhile, during the late fifties, corporate relationships were established to combat IBM's growing strength. ElectroData was sold to Burroughs. In another, General Electric would manufacture and National Cash Register would market computer systems. Even this relationship fell of its own weight. Remington Rand grew into the Univac Division. RCA made an abortive attempt in the late fifties and did not recover from the shock of failure until the mid sixties with the Spectra Series. Even today their breadth of penetration in the industry is questionable.

By the early sixties, most IBM people were betting that GE, after restarting in the computer industry with its own marketing organization, would be number two in size within a few years and be a real threat to IBM. They had the resources, technological talent and the desire—they were first in time-sharing, tops in process control, active in

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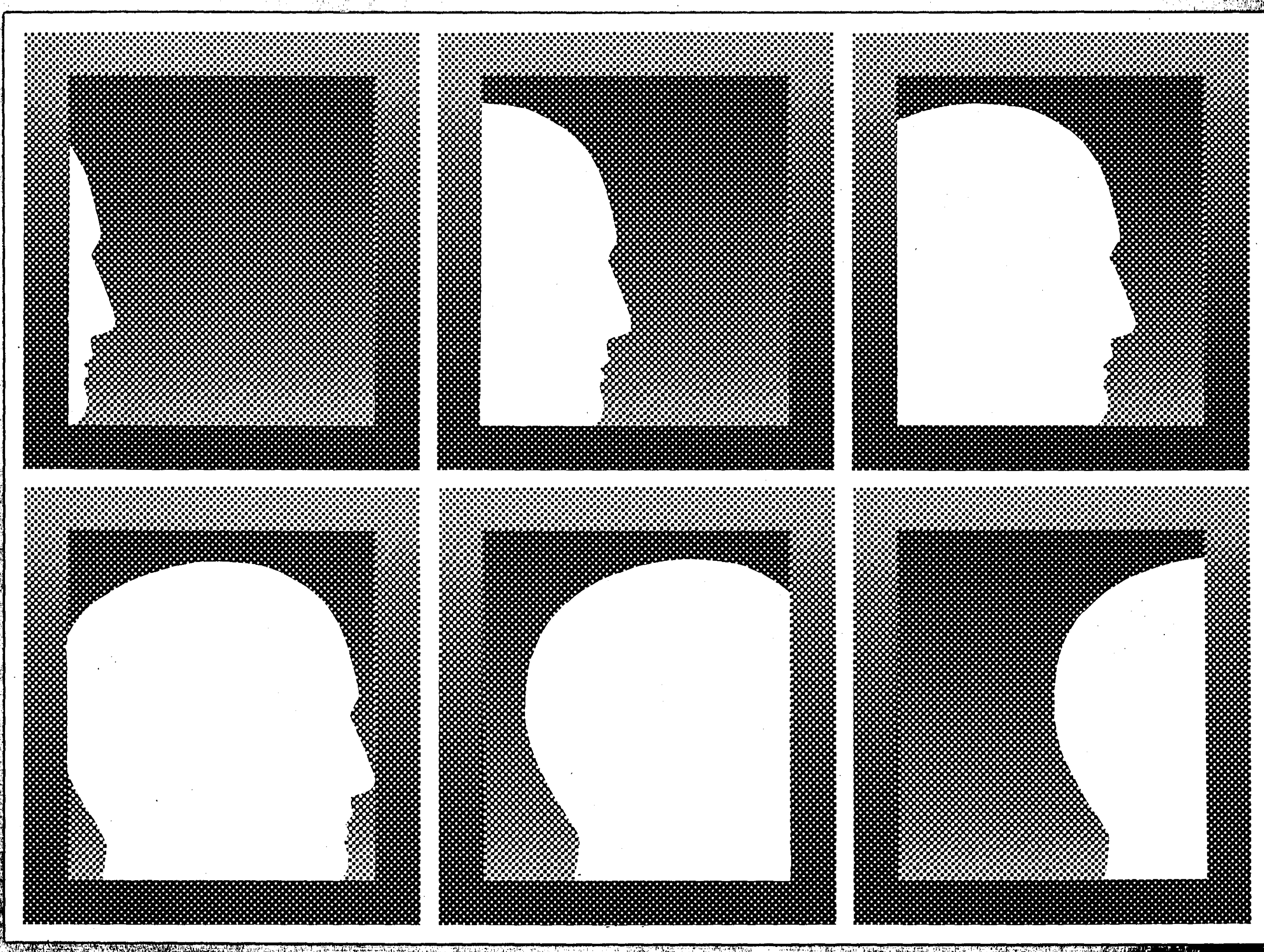

communications, strong in industries such as manufacturing and banking—and yet, again—questionable success.

So, every so often, the industry would turn around and make certain self-assessments. It was relatively easy to sum up as some did by referring to the industry as "IBM and the Seven Dwarfs." But this analogy was deceptive since a few of those dwarfs were giants. Yet, those companies dedicated to the computer industry and run by competent computer management were profitable. Those being run as divisions by managers from non-computer divisions were not. Control Data, Scientific Data Systems, Xerox, Digital Equipment Corp., and more recently my own company, Systems Engineering Laboratories—as well as non-hardware companies, such as Computer Sciences Corp. and University Computing—have all managed to prosper and grow. Meanwhile number two, Univac, remained the constant exception of a three-quarter computer company achieving a marketing problem in the throes of product success.

One must ask, therefore, whether the government is intending to alter IBM to help "small" growing profitable firms such as CDC, SCC, DEC, and Systems? Or, will a new industry structure simply aid undernourished giants like General Electric, RCA, and the revitalized Sperry Rand, all of whom are best equipped to take immediate advantage of a government imposed realignment.

Let's examine some of the suggested ways in which the industry might be realigned, keeping in mind that in this writer's opinion, some of the "me-too" vs IBM suits are intended more to influence Department of Justice actions than to win substantial dollar damages.

Separate pricing of software and hardware. The IBM announcement separating computer and support prices cannot yet be properly assessed. It appears that for most customers, the total cost of computing will increase. The 3% reduction in equipment charges is hardly adequate to meet a typical customer's cost of education, systems support, and newly priced software systems. IBM's comment that existing programs are in the public domain can be interpreted in several ways, and it was not clear whether IBM, in fact, did offer such software to anyone who requested it. Over-all, however, it is doubtful that the recent announcements will help create a highly competitive state in the industry—a situation deemed very desirable by the Justice Department.

Separate maintenance prices for leased equipment. IBM's recent announcements also indicated that they would not separate prices for leased equipment. Several smaller companies, including Systems Engineering Laboratories, have priced equipment separately for several months. Leasing companies have long agitated for this separate pricing to be able to take advantage of IBM's size and maintenance coverage which permits it to have substantially lower costs than others in the industry. The solution does not appear to be separate pricing. Rather, consideration should be given to divestiture of the Field Engineering Division into a separate company. This would permit the only true type of profit-oriented organization to exist.

OEM sales of all peripherals. IBM's dominance has created a forced standardization within the industry. In other industries that have grown rapidly and in total open competition, no

standards developed. Chaos soon existed. Today, half-inch magnetic tape in normal 556 or 800 bpi is *the* standard. Removable disc packs—IBM-compatible—are approaching acceptance in many areas. FORTRAN and, to a lesser degree, COBOL (reluctantly accepted by IBM) permit machines manufactured by different firms to communicate. Tapes, discs, printers, card equipment—all at some time in the past have bolstered a weak computer systems proposal and enabled IBM to secure the order. IBM peripherals are outstanding. Yet any manufacturer that has attempted to interface his computer to an IBM peripheral has gone through engineering (and profit) nightmares. First, local IBM offices have little desire to support this effort. Second, electronics manuals cannot be obtained without extensive delay and, when received, they often do not reflect several levels of engineering changes previously made to the equipment. IBM is just plain difficult to do business with on an OEM basis. These delays mean cost, and except where necessary, this interfacing is avoided. Yet a specification requiring a 1403 type printer or 2314 disc storage unit can in no way be met by any other similar product in the market.

Conclusion: Establish IBM's peripheral manufacturing facilities as a separate corporate entity forcing it to sell on an OEM basis to the entire industry. Thus, new peripherals would be designed with a simplified interface. Today's IBM peripherals and their controllers have a complicated electronic interchange. For example, our firm recently attempted to buy 29 keyboards from IBM. A similar competitive product was $85 each. Yet from IBM, the price was $360. Why? You could not buy the keyboards without the electronics and power supply. "It just wasn't manufactured any other way." And it took three weeks to get that answer. The local IBM Industrial Products salesman only had a price book—nothing else.

Yet even these changes only chip away at the problem of creating a more competitive industry. IBM's dominances are financial . . . a huge installed base of leased equipment; marketing . . . intelligent, trained industry specialists; manufacturing . . . highly automated manufacturing techniques; and development . . . large investments in pure research. It's safe for a customer to stay with IBM. If anything goes wrong, it's IBM's fault. If he has ordered anyone else's equipment and problems result, his neck is out—way out! What, then, to do? The government claims any action they take will not have an effect for 3-5 years. Therefore, I suggest their action be designed to create a totally competitive environment in 5-10 years by the following:

1. Divestiture of the Field Engineering Division, Service Bureau Corp., Information Records Division, Office Products Division, and all peripheral equipment manufacturing. Divestiture of any single division would create only a small wave since all IBM divisions except the Data Processing Division are relatively small and separation would not achieve the government's goals. What would remain after this separation would be primarily the development, manufacturing and marketing of digital

computer systems—which IBM has claimed to the Justice Department *is* their business.

2. Forced restrictions upon IBM from certain marketplaces. These marketplaces would be those which industry leaders foresaw as being the ones that will dominate the industry in the 5-10 year time span.

Time-sharing. Divestiture of the Service Bureau Corporation with its recently acquired Information Processing Division would keep IBM from actively marketing Time-Sharing services. This market is expected to grow from a $1 billion to $4 billion market in the next decade. Prohibiting IBM from sharing this growth on other than an equipment sale basis would create a horserace from which a profitable competitive state could evolve.

Real-time market. Every industry projection being made agrees that much of tomorrow's computing will be connected to real-time events originating with an analog-type signal. Many of tomorrow's biomedical applications, factory applications, and some government and educational applications will emanate from a pressure, flow, or temperature-type signal. Defining IBM as a digital computer company can thus exclude IBM from selling systems which require analog interfacing. Thus the remainder of the industry can pursue this market aggressively and without IBM's dominance.

These are just two suggestions—looking at our industry 5-10 years from now. Others could include aspects of the consumer market or computer assisted instruction. Aren't all these changes severe and autocratic? Yes! They are offensive to basic free enterprise. Remember, this article began with the premise that the government intended to do something severe. And, if the wheels of change move slowly then best to forget the structure of the industry today and rather set up a structure for a competitive situation tomorrow.

Good fortune, good timing, intelligence, and aggressiveness sired IBM today. And the industry can be thankful that if this dominance exist, it is from an IBM whose ethical strain helped breed our industry. I ask that a competitive industry be permitted to evolve by projecting the future marketplace and attempting to make *that* marketplace competitive, not autocratically establishing half-solutions today in an artificial fashion which some of us will come to regret.

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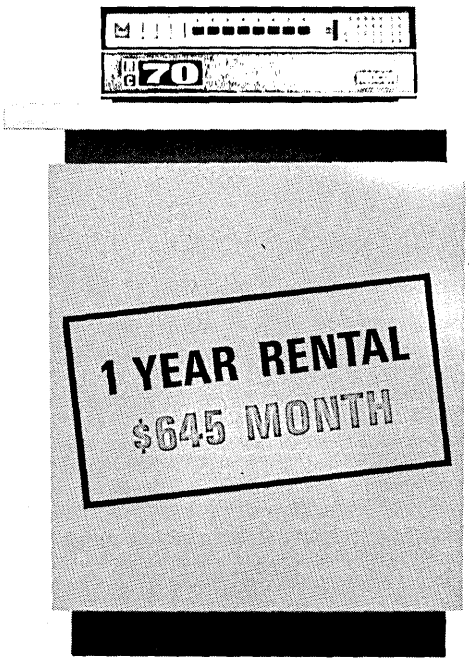

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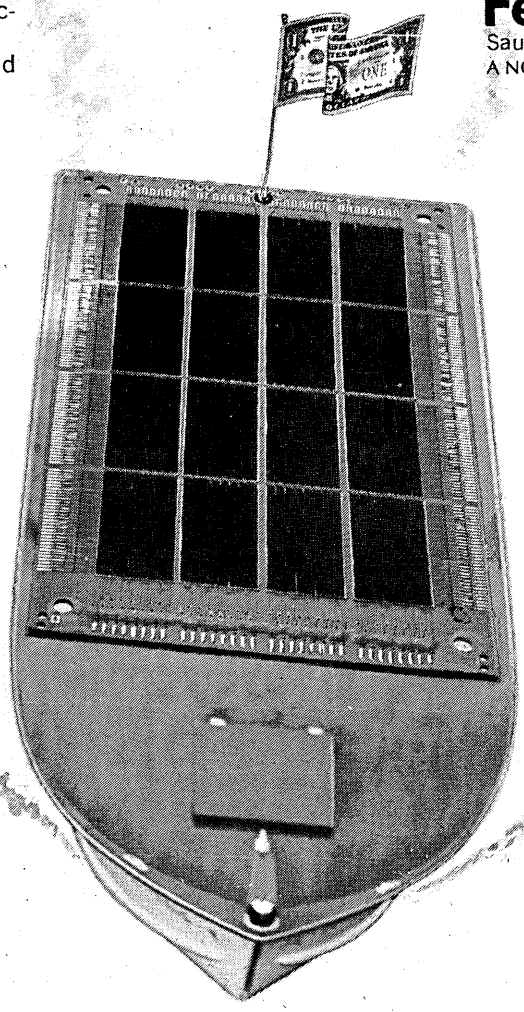

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