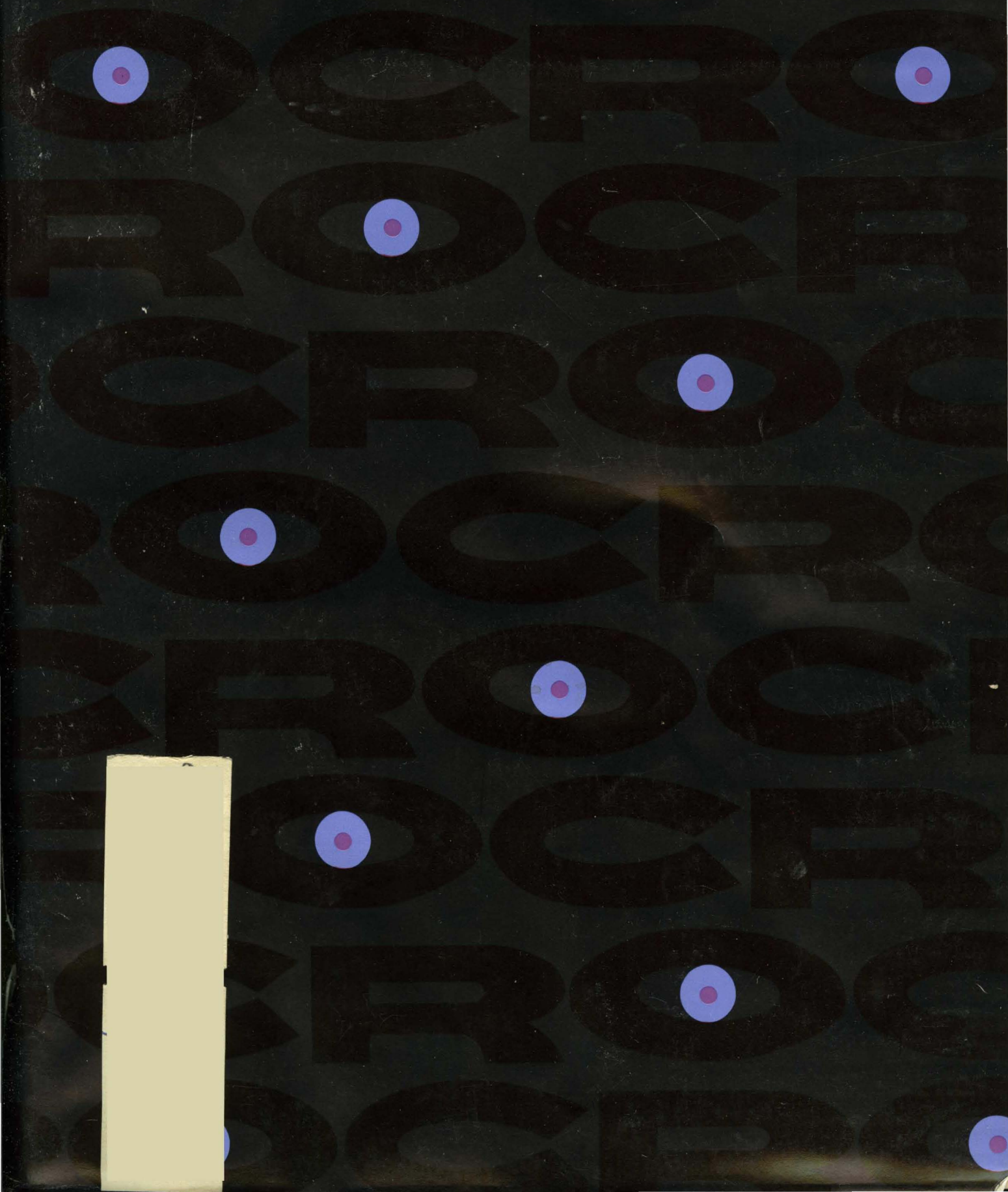
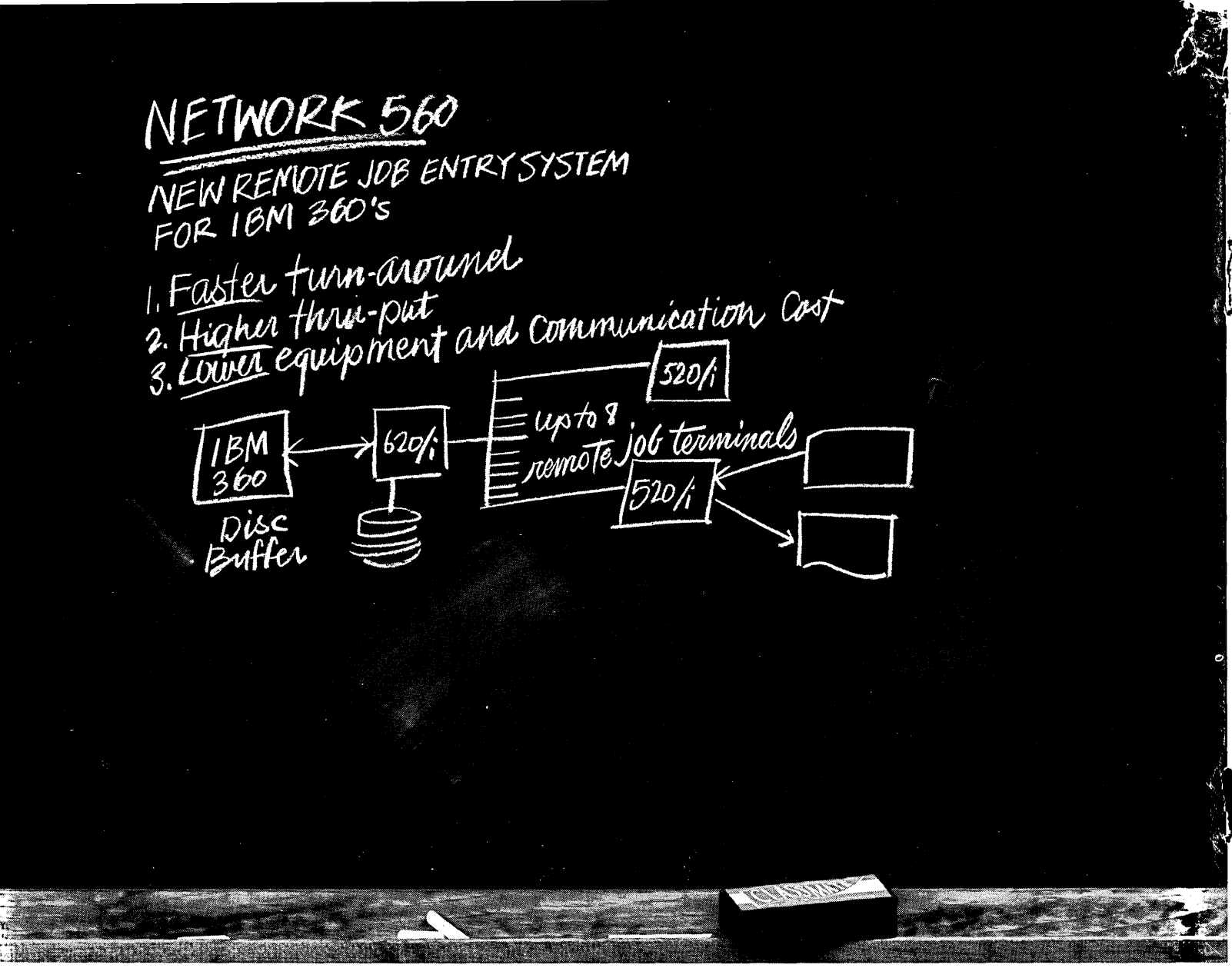
DATAMATION®

69

July





Now try to erase that from your mind.

Not that you'd want to. Because Varian Data's new Network 560 Remote Job Entry System offers demonstrable advantages to every user and seller of 360 computer time.

This batch terminal package, as indicated above, is a complete turnkey system using standard full duplex telephone lines. Just plug it into your 360, and you're in business. All hardware and software are included, so no changes are necessary to existing programs, operating procedures or hardware.

And, since the Network 560 is as compatible to a 360 as one of its own tape units, the new system can be installed virtually overnight.

So if you agree that greatly increased earning capacity and equally lower equipment and communications costs make sense, then it's time your 360 and the Network 560 got together.

Why not call today or write for the new brochure?

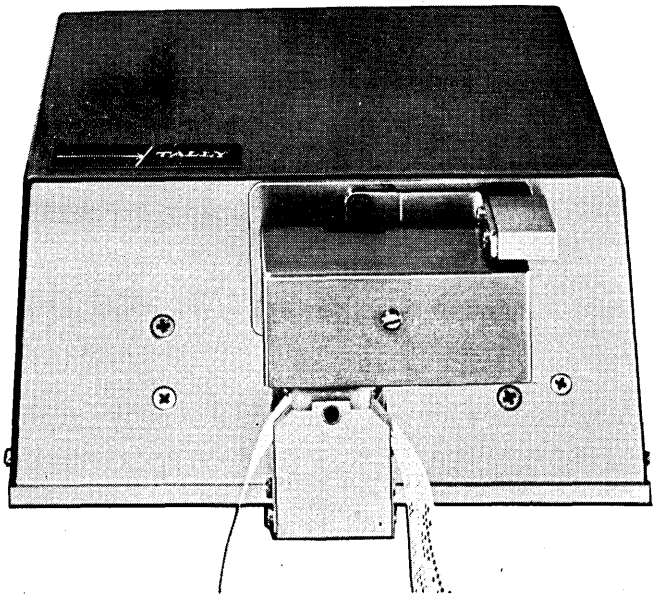
varian data machines

a varian subsidiary
2722 Michelson Drive / Irvine / California 92664
(714) 833-2400

SALES OFFICES: U.S., San Diego, Santa Monica and San Francisco, California; Vernon and Westport, Connecticut; Chicago, Illinois; Houston, Texas; Fort Washington, Pennsylvania; Washington, D.C.; Waltham, Massachusetts. INTERNATIONAL: Australia, Belgium, Canada, France, Germany, India, Italy, South Africa, Sweden, Switzerland, United Kingdom and Ireland.

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
England: 6a George St., Croydon, Surrey (01) 686-6836

TALK TO TALLY®

CIRCLE 54 ON READER CARD

the second revolution in computer time sharing begins NOW

▲ The AL/COM interactive time sharing network will electrify every sophisticated computer user in the United States.

AL/COM now gives you more interactive computing power with faster response time, than any other time-sharing system . . . 32,000 36-bit words per user. Cycle time one microsecond. Your access to this increased computer power is instantaneous and direct. Through your telephone. Privately. It's a "tough-job" system and it has the best price/performance ratio there is.

▲ AL/COM has a policy about insoluble time sharing problems. We solve them.

We're after the tough jobs, the big ones. We're talking about price/performance ...good response time...and freedoms that time-sharing hasn't granted you before. Things like:

Core Capacity – AL/COM gives you 160,000 characters (32,000 words) in active core per user.

On-Line Storage – AL/COM has a billion characters of disc storage.

Large Files – AL/COM gives you 1,250,000 characters per file.

Fast Access – AL/COM can search a 2.5 million character bank in seconds.

The things you can do with AL/COM time sharing are limited only by your imagination.

AL/COM has the bugs worked out. We've been up for 3 years. We can connect you with teletypes, line printers, CRT's and multiplexers. We speak eight languages . . . BASIC, FORTRAN IV, COBOL, etc. We're adding others. AL/COM solves problems in science, engineering, and banking. It's for operations research, marketing and statistical analysis, and bridge building . . . for management information, investments, and manufacturing. We even do little problems well.

When comparing time sharing services, you can't include AL/COM with the others.

AL/COM service stands out because we've interlaced a string of multiprocessing AL-10 systems, with one computer backing up another in each system, and a second dual system backing up the first . . . and we'll soon have ten. They're all side by side, but as close as your local phone. Think about that... central files... back-up... speed . . . reliability . . . distributed nationwide by the AL/COM Time-Sharing Network.

When you select AL/COM you get a nationwide network of computer software professionals.

We bring AL/COM to you through a nationwide network of professional software organizations. We're more than reps, dealers or branch offices. We're AL/COM Associates; local, independent firms, among the best in the industry. Systems and applications expertise is an integral part of the AL/COM network. This means you have the largest group of independent computer software experts to help you solve problems more efficiently, right at your elbow . . . through AL/COM. Two new "Associates" are selecting AL/COM each month. Why don't you?

In just 30 seconds, you can arrange for a demonstration of the world's best price/performance computer time sharing service.

Experiencing AL/COM is believing. We'll benchmark AL/COM against your present system. Compare the response, the speed, the cost. Do you have a problem you can't solve on your present system? Try us. We're after the tough ones.

It takes guts to start a revolution

Revolutions are started by people dissatisfied with the way things are. Success depends on a change for the better. That's what AL/COM is all about . . . and it's revolutionary.

Contact us for information or demonstration

AL/COM

The Revolutionary Time-Sharing Network

AL/COM is a service of
APPLIED LOGIC CORPORATION
One Palmer Square
Princeton, New Jersey 08540
(609) 924-7800

Call me ☐ Send data ☐

Name _____ Title _____

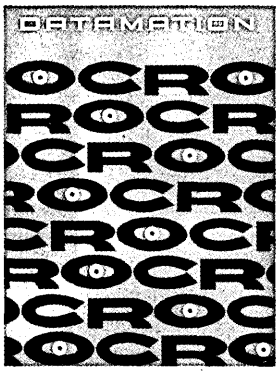
Company _____

Address _____

City _____ State _____

Zip _____ Tel. _____

CIRCLE 6 ON READER CARD



july 1969

volume 15 number 7

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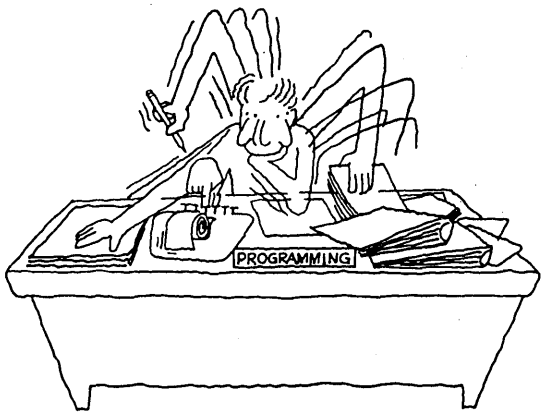
Instead of a faster computer, why doesn't somebody develop a faster programmer?



Announcing the next best thing: Data Check Express, the first generalized proprietary system designed to save valuable programmer time now consumed by data editing.

The Hidden Bottleneck.

One of the first things you learned about computers was "GI-GO." Garbage in equals garbage out. And that's why data editing is so necessary.

The front end of every job is the great data-editing bottleneck: time is needed for coding, compiling, debugging and testing a custom editing program. It's a *hidden* bottleneck because costs for editing are hidden on your time sheets in all phases—problem definition, coding, testing, and (all too often) re-running an entire job fouled by bad data.

Our best estimate is that about 20% of every programmer's time is now used up on data editing. Valuable programming time that could be used to get new jobs in the works... if. *If* there were an alternate to present data editing methods.

The Alternate.

DATA CHECK EXPRESS is the first generalized proprietary software program for data editing. It performs checking, validation based on complex relationships, error correction, file restructuring and file updating. DATA CHECK EXPRESS can free your programmers for more productive work by (1) eliminating the need for original programming to edit new data; (2) getting new jobs started faster (an editing program normally written in 20 pages can be cut to 3 coding sheets which cuts debugging and testing time as well as coding time); (3) allowing junior programmers to perform the editing function; (4) providing a standardized, self-documenting procedure (instead of each programmer doing things his own way).

Why didn't somebody think of this before?

Probably because there hasn't been a company like Express Software Systems before. We're a three-year-old software company that believes high quality proprietary programs provide the best answer to your rising programming costs and the shortage of skilled programmers. And we live by our belief. We concentrate all our efforts in developing and marketing proprietary software in a single area—Data Management. And Express Software Systems backs it up with a staff of highly skilled application specialists to provide technical support and systems maintenance.

DATA CHECK EXPRESS is our second baby. Our first, EXPRESS III, a general purpose tabulation and summary reporting system, is doing very nicely, thank you, at several national companies.

Next Tuesday.

DATA CHECK EXPRESS (and EXPRESS III, for that matter) is fully tested and ready to install. Tomorrow afternoon if you'd like. At the same time we'll teach your people how to use DATA CHECK EXPRESS. (There are only 18 commands to master so even low level programmers can become expert in about 2 hours.) By next Tuesday, your programmers could be churning more information out of that computer of yours with faster turnaround. DATA CHECK EXPRESS machine needs are IBM 360/30 and up, OS or DOS, or any equivalent computer.

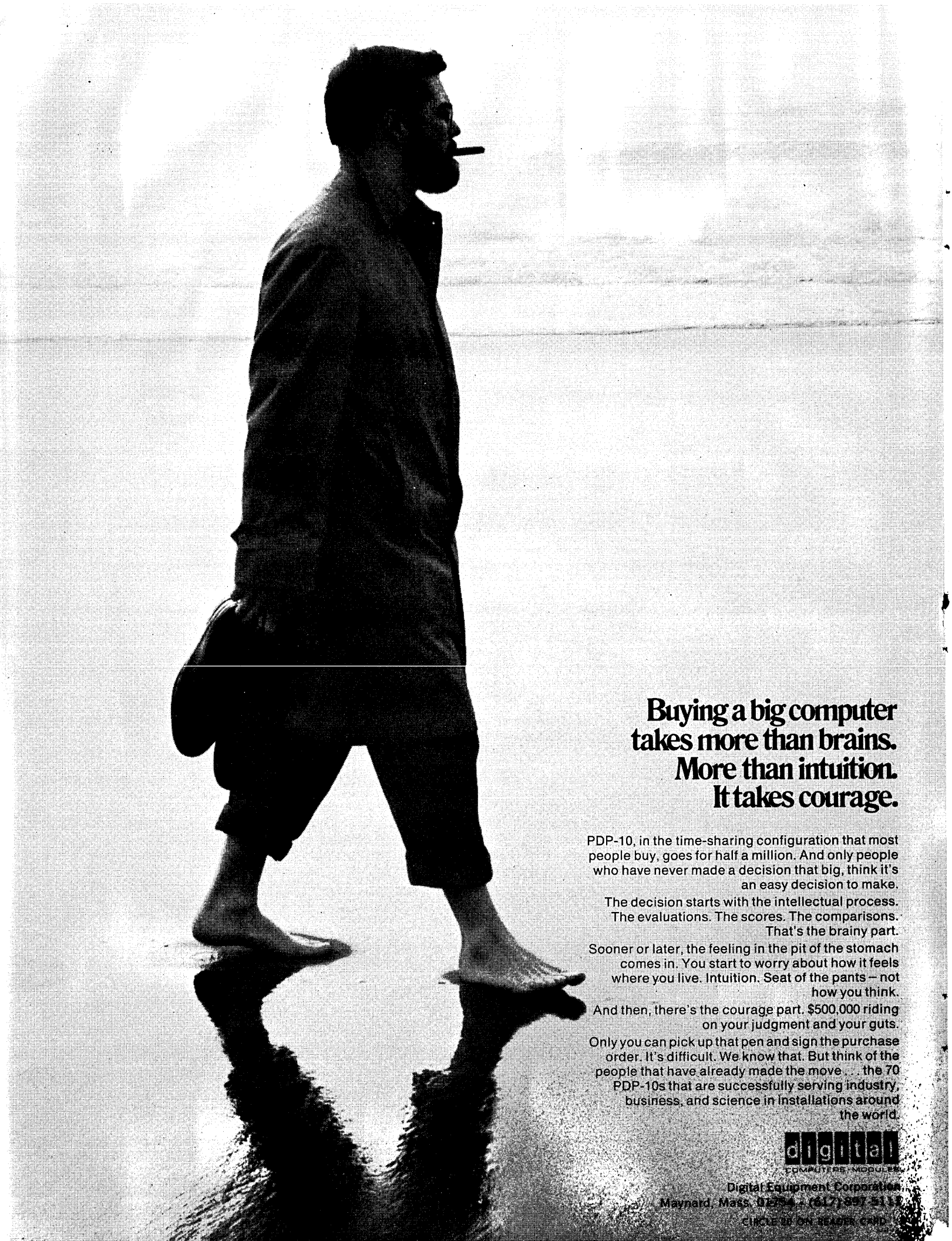
Fine. But how much?

If you go along with our estimate that data editing now uses up about 20% of every programmer's time, then DATA CHECK EXPRESS is one of the biggest bargains in town. The one-time cost equals about one-half of what you now pay one programmer for one year.

Interested? Get more details by attending one of our seminars or by having one of our people call on you. Write, wire or phone us:

Express Software Systems, Inc.,
342 Madison Avenue,
New York, N.Y. 10017. (212) 682-0011

CIRCLE 160 ON READER CARD



Buying a big computer takes more than brains. More than intuition. It takes courage.

PDP-10, in the time-sharing configuration that most people buy, goes for half a million. And only people who have never made a decision that big, think it's an easy decision to make.

The decision starts with the intellectual process. The evaluations. The scores. The comparisons. That's the brainy part.

Sooner or later, the feeling in the pit of the stomach comes in. You start to worry about how it feels where you live. Intuition. Seat of the pants – not how you think.

And then, there's the courage part. $500,000 riding on your judgment and your guts.

Only you can pick up that pen and sign the purchase order. It's difficult. We know that. But think of the people that have already made the move . . . the 70 PDP-10s that are successfully serving industry, business, and science in installations around the world.

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CIRCLE 28 ON READER CARD

DATAMATION 69®

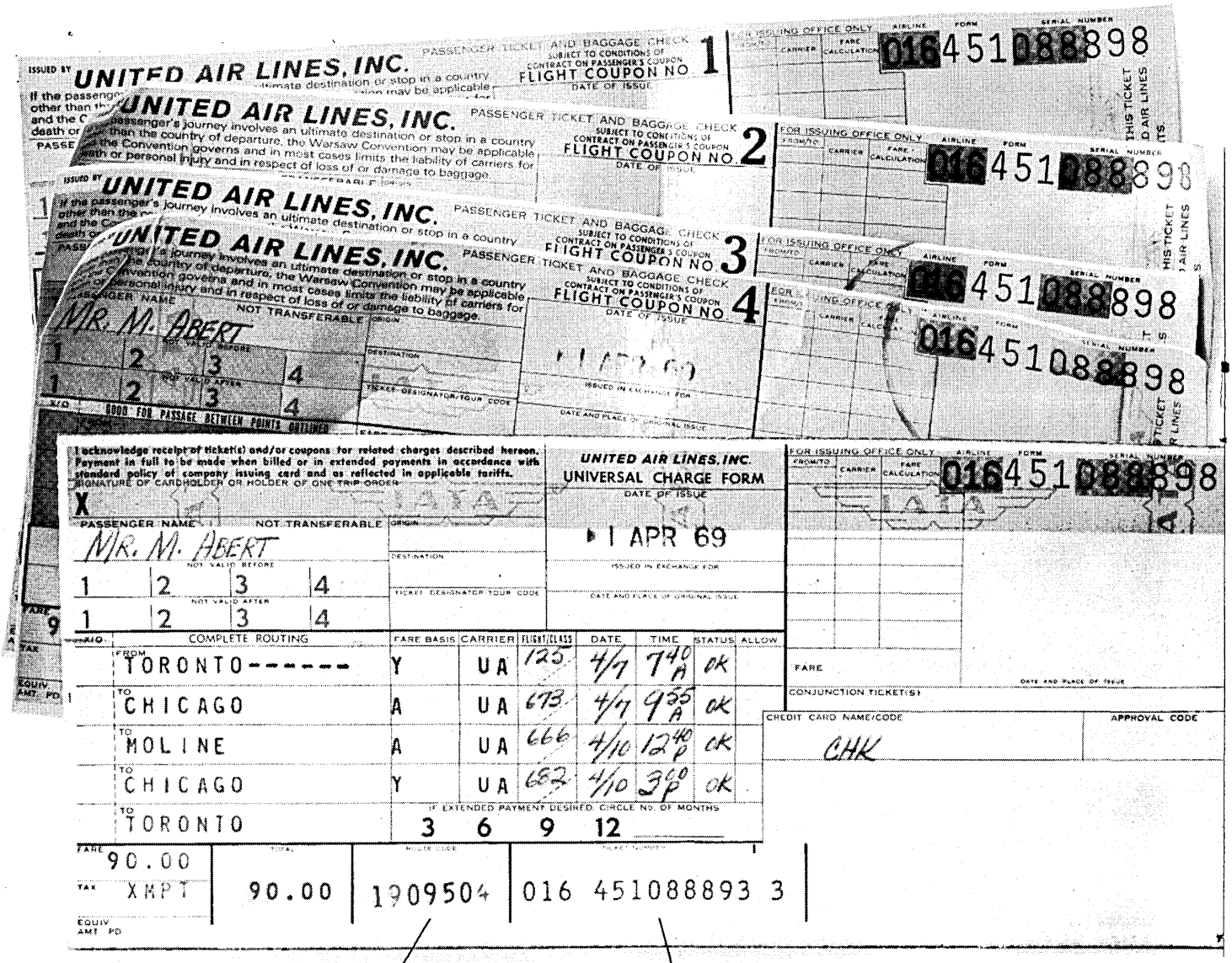
july
1969

volume 15 number 7

datamation departments

How United's computer

United Air Lines used to have a problem keeping up with revenues. It was impossible to process all the tickets that poured in from thousands of airports, United offices and travel agents every day. So they only sampled five percent. But airline tickets were still coming in faster than punched cards were going out. And passenger volume was growing over ten percent a year.



Imprinted number (carbon impression)

Preprinted number

learned to read airline tickets.

Then United tried something new. The Electronic Retina* Computing Reader. An optical reading system that could process *all* the tickets just the way they came in. (Smudges, tears, weak strokes, wrinkles, misaligned characters and all.)

Nothing has been the same since.

United's data center breezes through airline tickets like the morning paper. Today's tickets are processed today. Over 2.5 million a month.

The system reads preprinted ticket numbers and imprinted route codes from auditors' coupons sent in at the time of sale. It records the data directly on magnetic tape in computer language. Which updates the unearned revenue data in the computer.

When the tickets are actually used, the system processes passenger coupons sent in for each leg of the trip. And appropriate amounts are automatically transferred from unearned to earned revenue. And now United knows exactly how much money it's making. And when.

Since the system was installed, United has found more than a dozen other jobs it can do. From processing airbills to reading and sorting bank drafts and checks. (It reads MICR optically better than MICR readers do magnetically.) United uses its reader more than 400 hours a month. It saves them $20,000 to $25,000 a month in input preparation costs.

Similar systems are also cutting costs for American Airlines, Pan Am, TWA and Air Canada. But you don't have to be an airline to benefit from an Electronic Retina Computing Reader. They're being used by banks, oil companies, credit card companies, the Library of Congress, the U.S. Army, the State of Michigan, and dozens of other organizations from Los Angeles to Liverpool. Every week our systems process over 100 million documents—more than all other OCR equipment in use combined.

And every week, the Electronic Retina Computing Reader proves an important point: There's nothing in the world quite like it. It reads complete upper and lower case alphabets (plus numbers). Any type face from any typewriter or office machine in the world. At speeds up to 2400 characters a second. It handles anything from flimsy, carbon-backed airline tickets to card stock. And it's the only system that comes with a full-time resident field engineer. And there's a good chance it's the only one that can do something permanent about your input bottleneck.

Write us on your company letterhead. We'll send you more facts you'll find hard to believe.

Recognition Equipment Incorporated

1500 West Mockingbird Lane
Dallas, Texas 75235 (214) 637-2210

Offices in principal cities throughout the United States. Subsidiaries in Frankfurt, London, Paris, Rome, Stockholm, Toronto and Tokyo.

*Electronic Retina is a Trademark of Recognition Equipment Incorporated

CIRCLE 44 ON READER CARD

machines that make data move

TELETYPE

data's wrong righters

Today's data boo-boo is a costly thing. In time, money, and wasted man-hours. Teletype is doing something about it. Has a host of terminals, accessories and options that deliver data right and right now.

You're looking at the Teletype Model 35 ACS (Automated Communications Set) with a verifier control. A terminal that does an exceptional job filling out business forms on-line with utmost accuracy.

It can verify all or any portion of fixed data (company name, address, etc.), variable data (dates, prices, quantities, etc.). And it verifies character by character. Stops operation immediately when tape is incorrect. When the operator omits a character, adds too many, or types the wrong one. And it enables her to take corrective action immediately.

The result is an error-free composite tape. One that can be used to transmit on-line to remote Teletype equipment, computers, or other ASCII compatible business machines. Model 35 ACS literally keeps wandering minds and flying fingers from goofing up the most complex of business forms.

Control over transmission errors

Teletype also offers a number of solid state logic modules that can be added to Model 33, Model 35, Model 37, Telespeed and Inktronic® terminals to detect invalid vertical parity on low and high speed circuits.

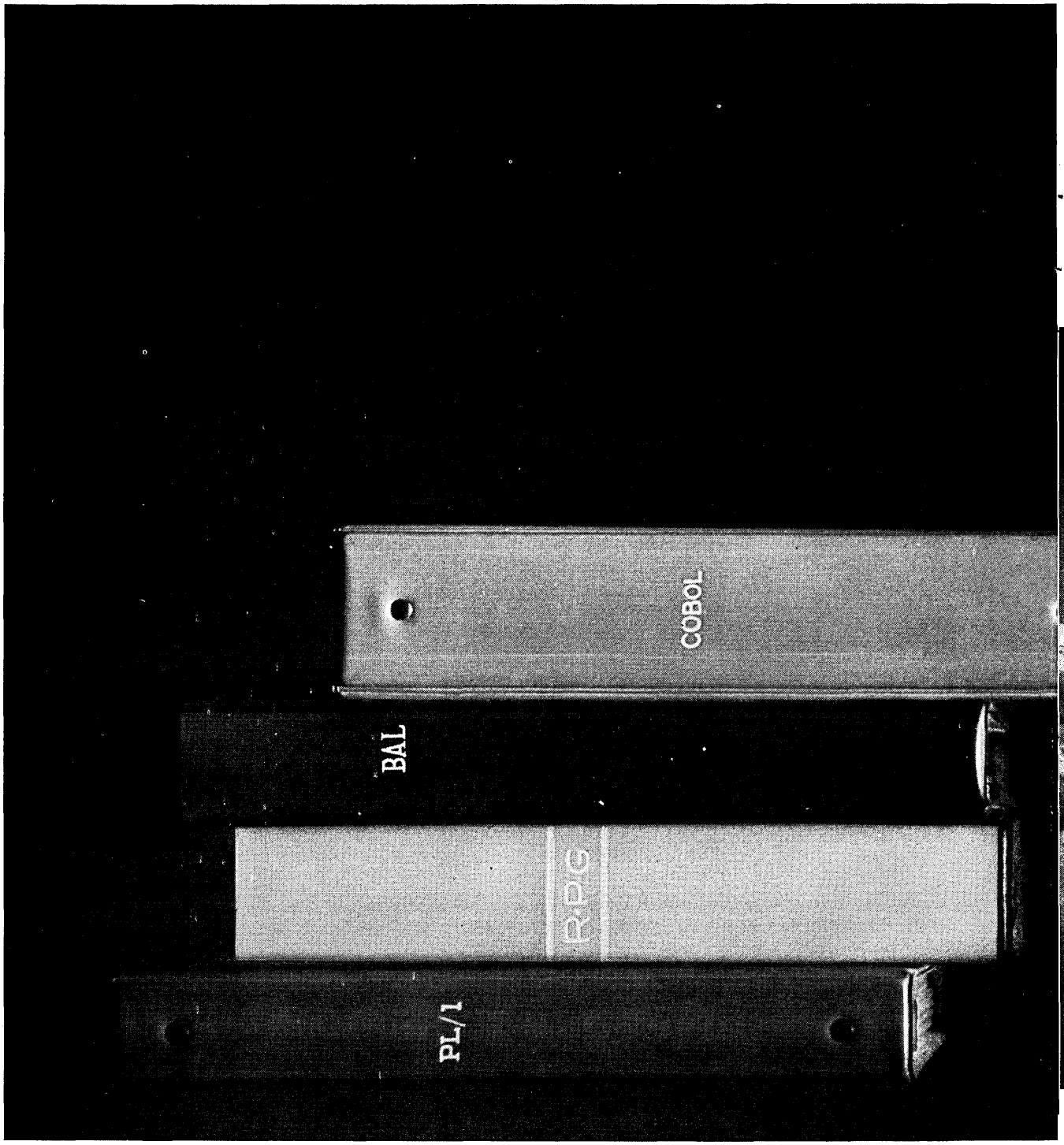
We call them "Stuntronic Accessories." They accept distortions as high as 45% and regenerate the signal with no more than 5% distortion. Minimizing erroneous printouts due to misread signals. Some will even locate individual vertical parity errors in both page copy and paper tape by having the terminal print out or punch a preprogrammed substitute character.

Stuntronic Accessories do much more than error control duties, but this is an important function. Something well worth looking into if you are concerned about errors creeping into your data system.

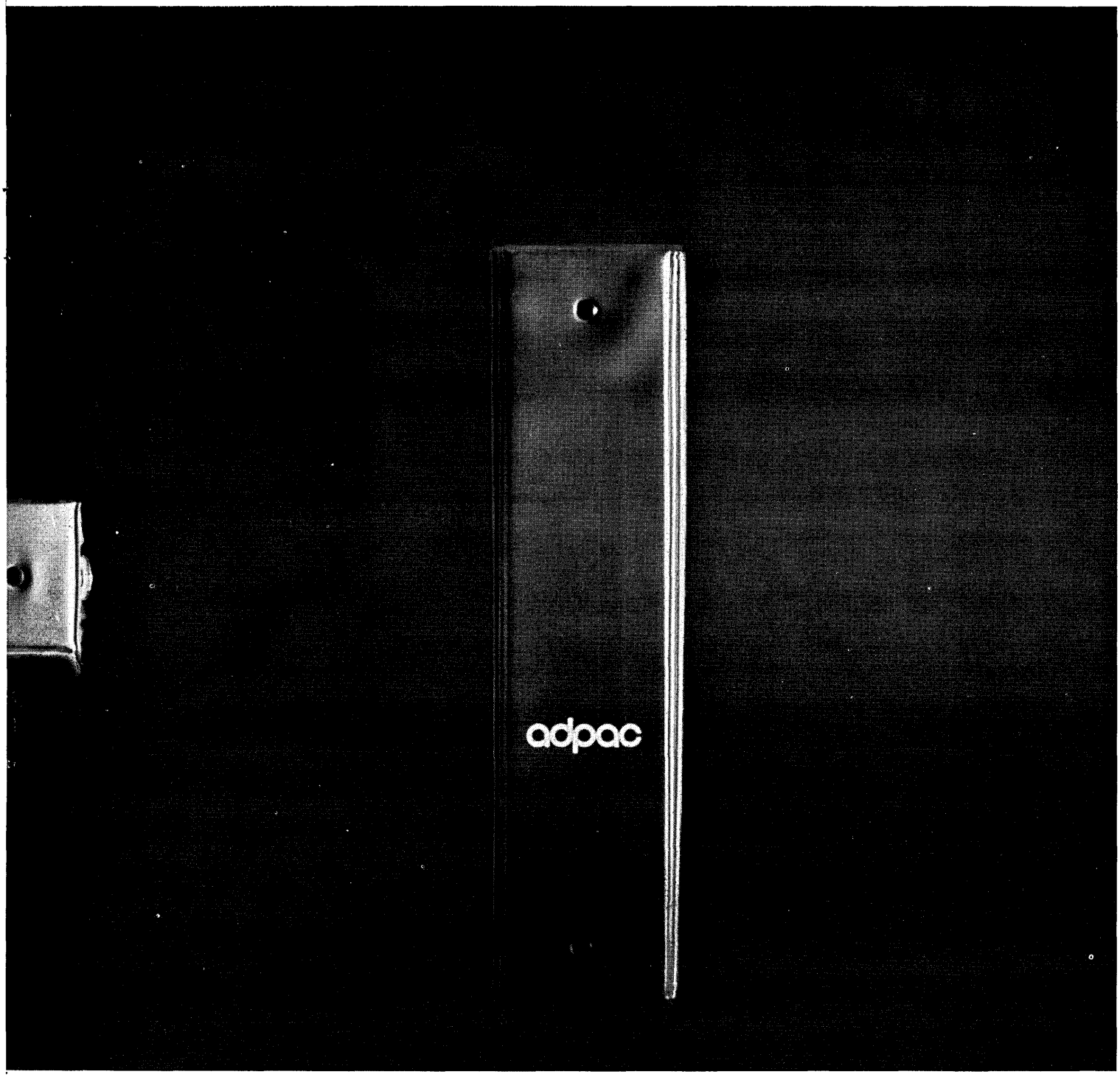
Detecting errors in high-speed tape transmission

For high-speed tape-to-tape transmission, Teletype's Telespeed 1200 EDC set offers exceptional error control. Sends and receives at 1200 wpm. And has horizontal and spiral parity detection. Corrects errors automatically. Adding optional vertical parity detection increases detection and correction capability to 99.99%.

Teletype's error control story is really much broader than this. And if you've been bugged by data that isn't coming through the way it should, contact Teletype Corporation, Dept. 81G, 5555 Touhy Avenue, Skokie, Illinois 60076.



These computer languages are free.

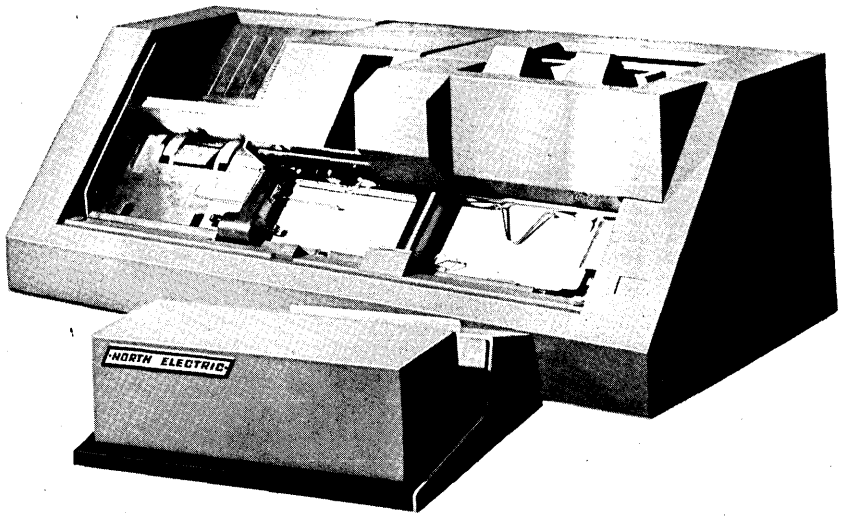


You pay for this one. Gladly.

For $650 a month, Adpac guarantees to double your programming output. Leading corporations who've used it for the past four years say that: 1. Any program can be written two to three times faster in Adpac than in any other language. 2. Adpac programs take 50 to 75 percent less machine time to compile and debug. 3. Programmers learn Adpac twice as fast as any other language. In short, Adpac delivers long overdue results for business data processing. Adpac is a complete programming language for all IBM System/360 computers under TOS, DOS, OS. Installation and programmer training is available in all major cities. For a technical presentation, authoritative case histories or just to see if we're serious, call: (415) 981-2710. Adpac Corporation, 101 Howard Street, San Francisco, California 94105.

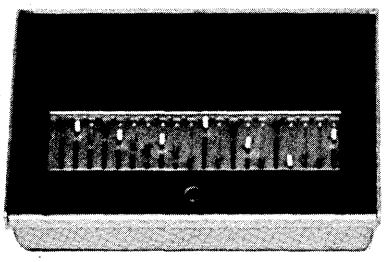
adpac
COMPUTING LANGUAGES

CIRCLE 28 ON READER CARD



this key punch machine is being operated automatically by a shipping clerk

(...and for less than $95.00 per month.)



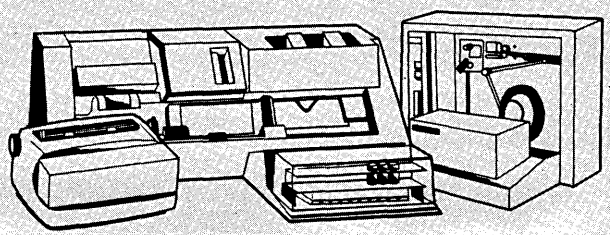
Now with the basic North Electric Message-ComposeR™ System (leased for less than $95.00 per month) an unskilled operator can . . .

- **Use a simplified keyboard to encode and transmit variable and fixed data.**
- **Visually scan the message for accuracy before transmitting.**
- **Transmit over owned or leased lines . . . or, with North Electric acoustic couplers, transmit over the switched telephone network.**
- **Automatically produce punch cards, key tape or typewritten hard copy at any location.**

The North Electric Message-ComposeR System is a complete system usable by any organization that requires punch cards, key tapes or hard copy (the Message-ComposeR may also be used by real time systems with an adapter unit). In addition to the basic system, Card Readers, Time and Date Generators and Tape Recorders are available to expand the system's capability.

The keyboard of the system permits an unskilled operator to encode a message and scan it visually for accuracy, before transmitting.

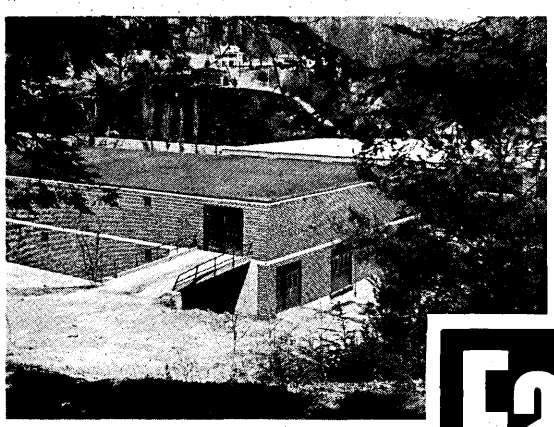
Easily changed overlays serve as a guide to the operator. They are laid out in the language of the job and are coordinated with a program plug that automatically encodes required fixed data into the message.

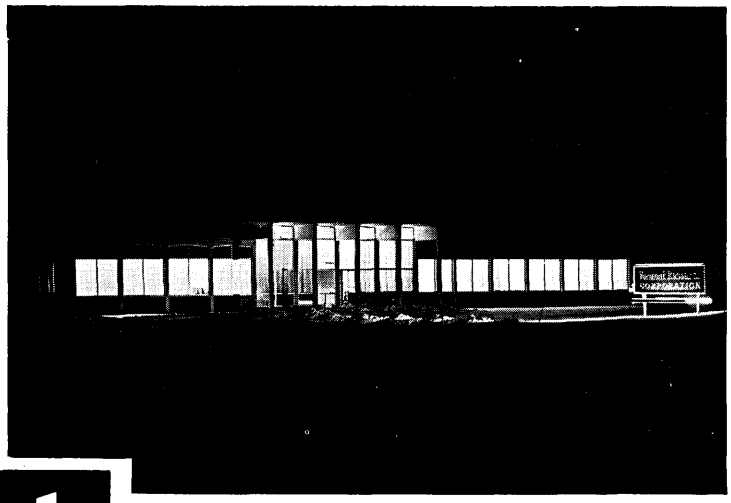


The Message-ComposeR System, can compose and transmit messages to any point of conversion, automatically operating a North solenoid pack to produce punch cards, key tapes or typewritten copy – all three if required.

Truly the most spectacular breakthrough in data entry and retrieval in years!

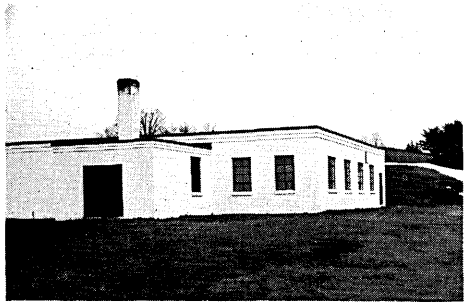
NORTH ELECTRIC Electronetics Division/Galion, Ohio 44833/419-468-8100
A subsidiary of United Utilities, Incorporated





Fact:

DRUM MEMORIES EXPAND THINGS



Drum Memories by Vermont Research expand your computer's capabilities . . . expand the power of your digital controllers . . . expand the usefulness of your timesharing systems . . . and even expand in the field to meet your growing requirements for reliable, fast access storage.

At VRC, our drums have expanded our customer list . . . and our sales. We've had to expand our manufacturing space to fill three buildings.

Have a large drum requirement? Talk to us now . . . while we're feeling expansive.

Computers are known by their MEMORIES...

...so is

Vermont Research
CORPORATION

DRUM MEMORIES • SYSTEMS • DISK PACKS

Box 20d, Precision Park, North Springfield, Vermont 05150 • Telephone 802/886-2256 • TWX 710-363-6533

When it comes to engineering opportunities (and the good life, North Country style), the place to come is Vermont Research Corporation. For specific information, contact: RICHARD A. STOVER, Vice President-Engineering.

A dirty tape can make a computer look stupid.

Dirty tape causes data dropout. And data dropout puts computers down. And that costs money.

That's stupid.

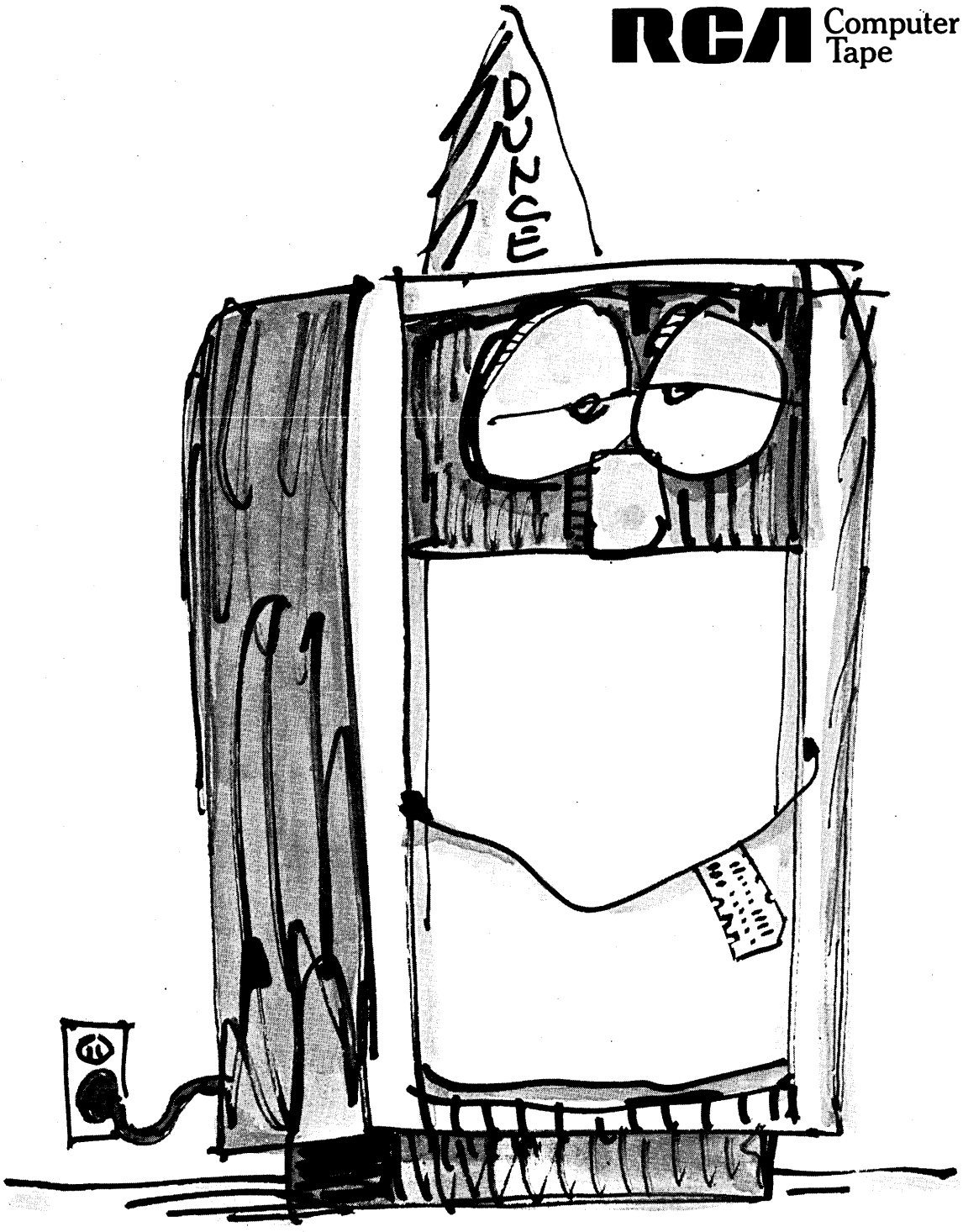
An intelligent solution is clean tape. RCA Computer Tape.

It starts cleaner because every inch of every reel is tested and certified in the most impeccable of white-room conditions. (We don't think statistical testing is good enough.) And it stays cleaner, longer.

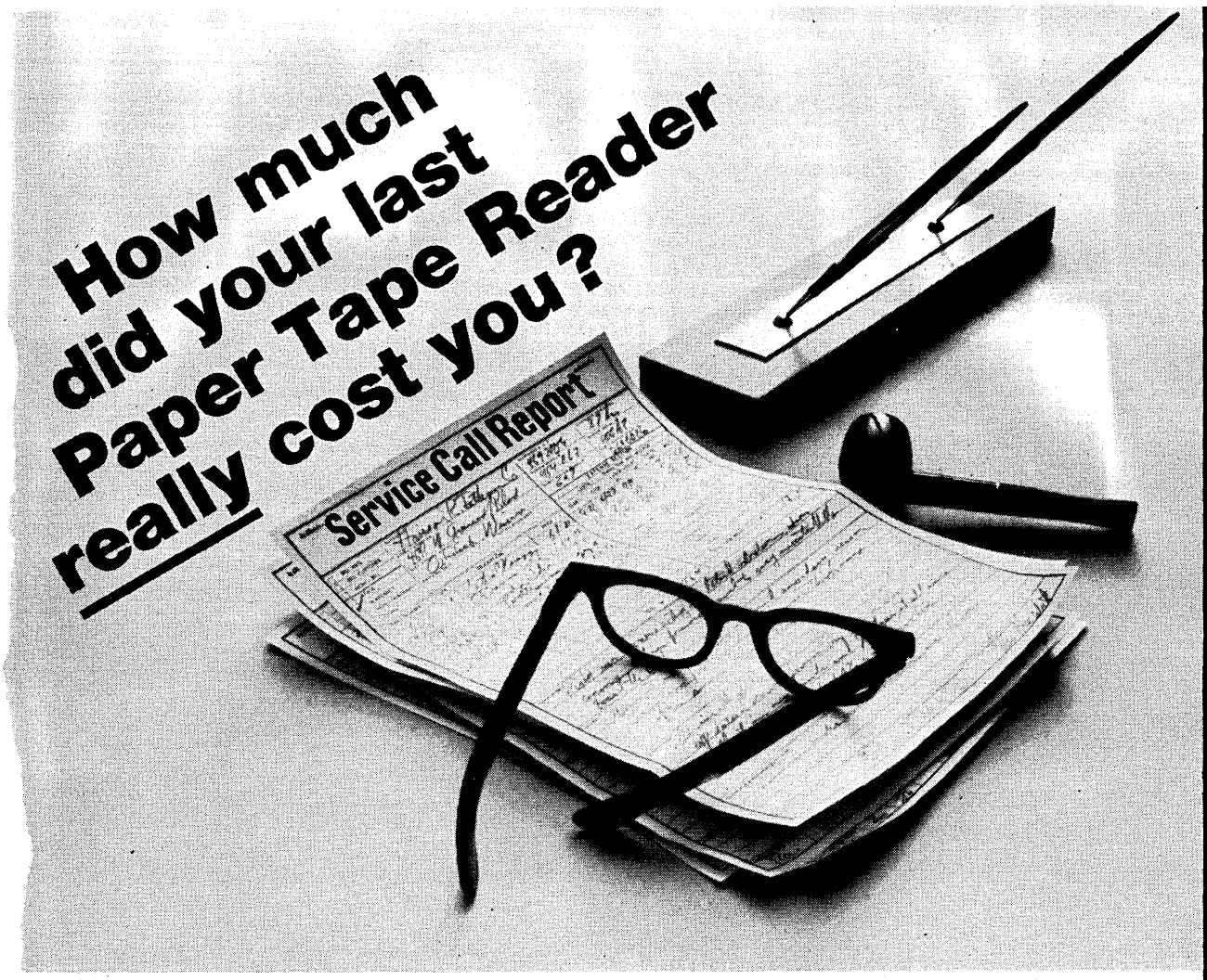
Result: Fewer dropouts and more efficient computing.

Smart computers need clean tape. Write RCA Magnetic Products, 201 E. 50th St., New York 10022. Clean tape is all we know.

RCA Computer Tape



How much did your last Paper Tape Reader really cost you?

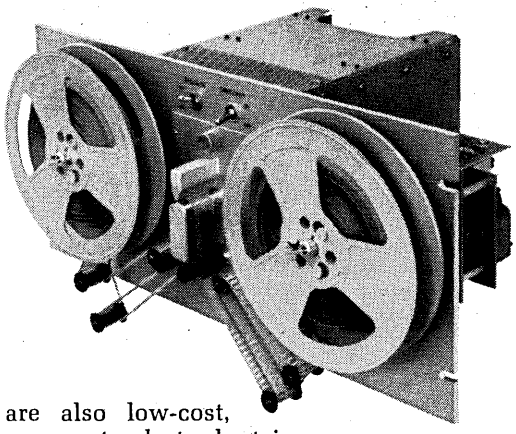


Was it inexpensive or was it *cheap*? . . . Was the price just a down-payment and service the real cost? . . . Are you worried about your reputation because of reader down time? . . . IF SO YOU SHOULD TALK TO THE PEOPLE AT *NAVCOR!* They are computer interface experts and they appreciate the importance of precision and reliability in a reader. These engineers are computer men: first, last and always. They know peripheral systems and appreciate that the reader may be the most likely source of errors. That's why reliability was designed into the Model 1220, Photoelectric Tape Reader shown here.

The 1220 is not just another mechanical gadget designed as an afterthought for an overall system. It is a reliable, flexible, modularly designed piece of precision electronic equipment, built by computer specialists—interface experts—who will define your problems and provide the best equipment to solve them.

The Model 1220 is bidirectional, with synchronous or asynchronous operation. It will read accurately to speeds of 300 characters per second in local or remote locations and can be operated in either in-line or advanced sprocket formats. Completely modular, the Model 1220 can be tailored to fit a variety of applications.

But the Model 1220 is not the whole NAVCOR Paper Tape Reader story. There



are also low-cost, compact photoelectric and mechanical models. These little wonders have the same reliability as the high-performance Model 1220 reader. . . . And soon a high-speed reader will become part of the NAVCOR line. With high-speed efficiency along with NAVCOR dependability, it will be the best value in the industry.

To get the full NAVCOR Tape Reader story, call 215-666-6531 or write, NAVCOR, INC., Valley Forge Industrial Park, Norristown, Pennsylvania 19401.

NAVCOR, INC.

A DIVISION OF KDI CORPORATION

CIRCLE 36 ON READER CARD

NAVCOR INC.

Du Pont invents

A BREAKTHROUGH IN COMPUTER

It's called CROLYN® Computer Tape. It's made by Du Pont and it's unlike any tape you've ever used before.

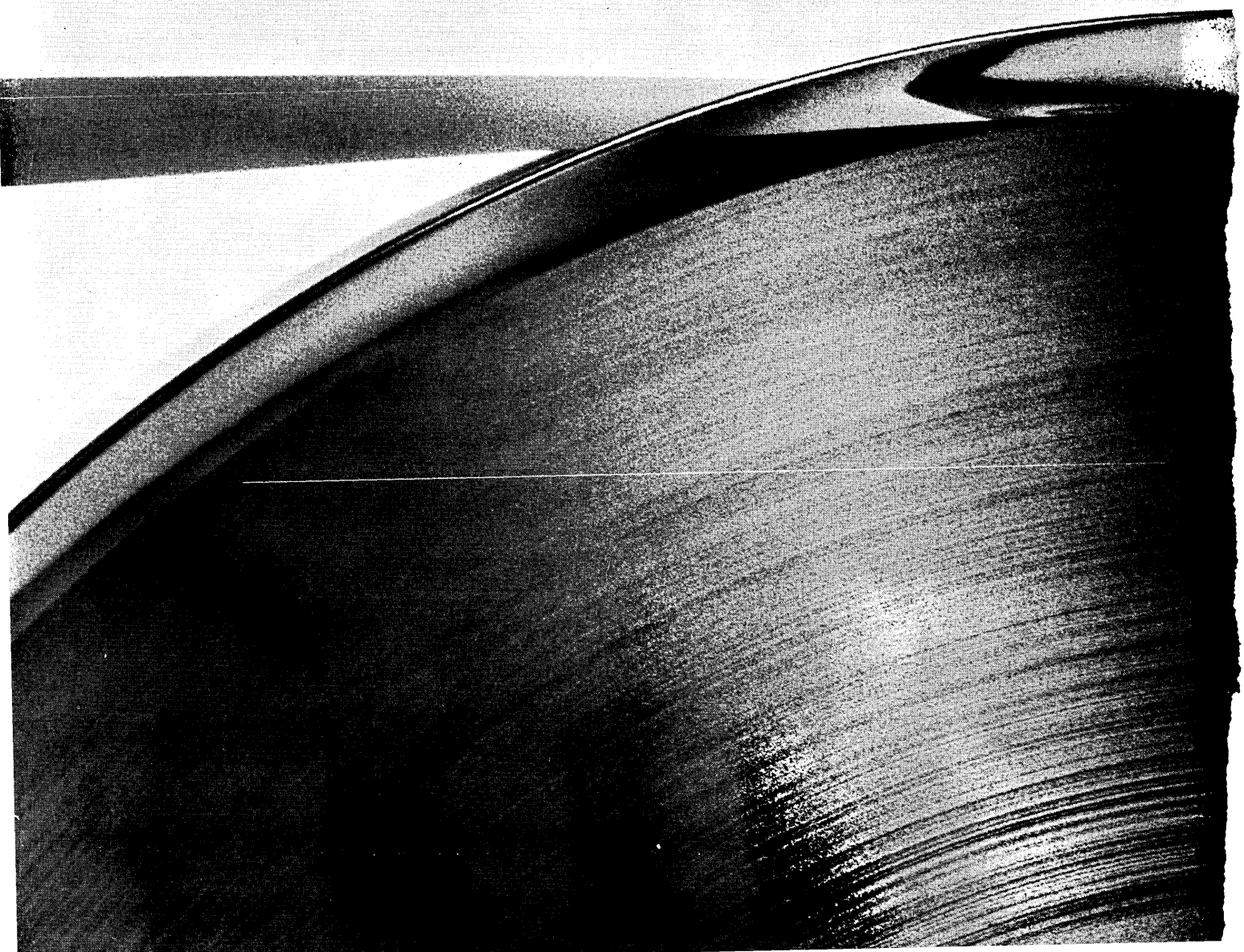
What's chromium dioxide?

Chromium dioxide is a man-made compound discovered, researched and tested by Du Pont that possesses a magnetism 50% greater than that of gamma iron oxides used in conventional tapes. This characteristic of chromium dioxide results in higher signal output at the same degree of resolution and better resolution at a given level of signal output.

Chromium dioxide particles are needlelike and uniform, which means they permit better orientation and can be packed more densely than iron oxide particles. Coated on standard-thickness MYLAR® polyester film, they produce a thinner tape with 25% more footage than on a same-diameter reel of conventional tape.

What can CROLYN do for you today?

For today's computers, CROLYN translates into more efficient operation of a data processing center by improving program per-



chromium dioxide tape.

RECORDING TECHNOLOGY FOR MORE RELIABLE PERFORMANCE.

formance. Its superior resolution provides greater high-density signal strength resulting in fewer reruns caused by multiple-track errors. This high resolution also means less bit shift, fewer reruns caused by skew errors.

CROLYN delivers its most brilliant performance in your most critical and difficult operation areas: long-length sorts, multi-reel master files, transport interchange, systems tapes, back-up tapes.

What can CROLYN do for you tomorrow?

CROLYN has the best chance of surviving the next generation of computer equipment, which will undoubtedly move toward higher recording densities. Laboratory tests have proven CROLYN can be packed with more than 5,000 bits per inch. Even 10,000 bpi may be feasible.

Is CROLYN compatible with all existing equipment?

Many computer centers are already using CROLYN on a wide variety of equipment. CROLYN has been successfully tested on *all* existing makes of equipment.

Send this coupon for additional information.

Du Pont Company
Photo Products Department Room 7343
Wilmington, DE 19898

Please send me more information on CROLYN computer tape.

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Title_____

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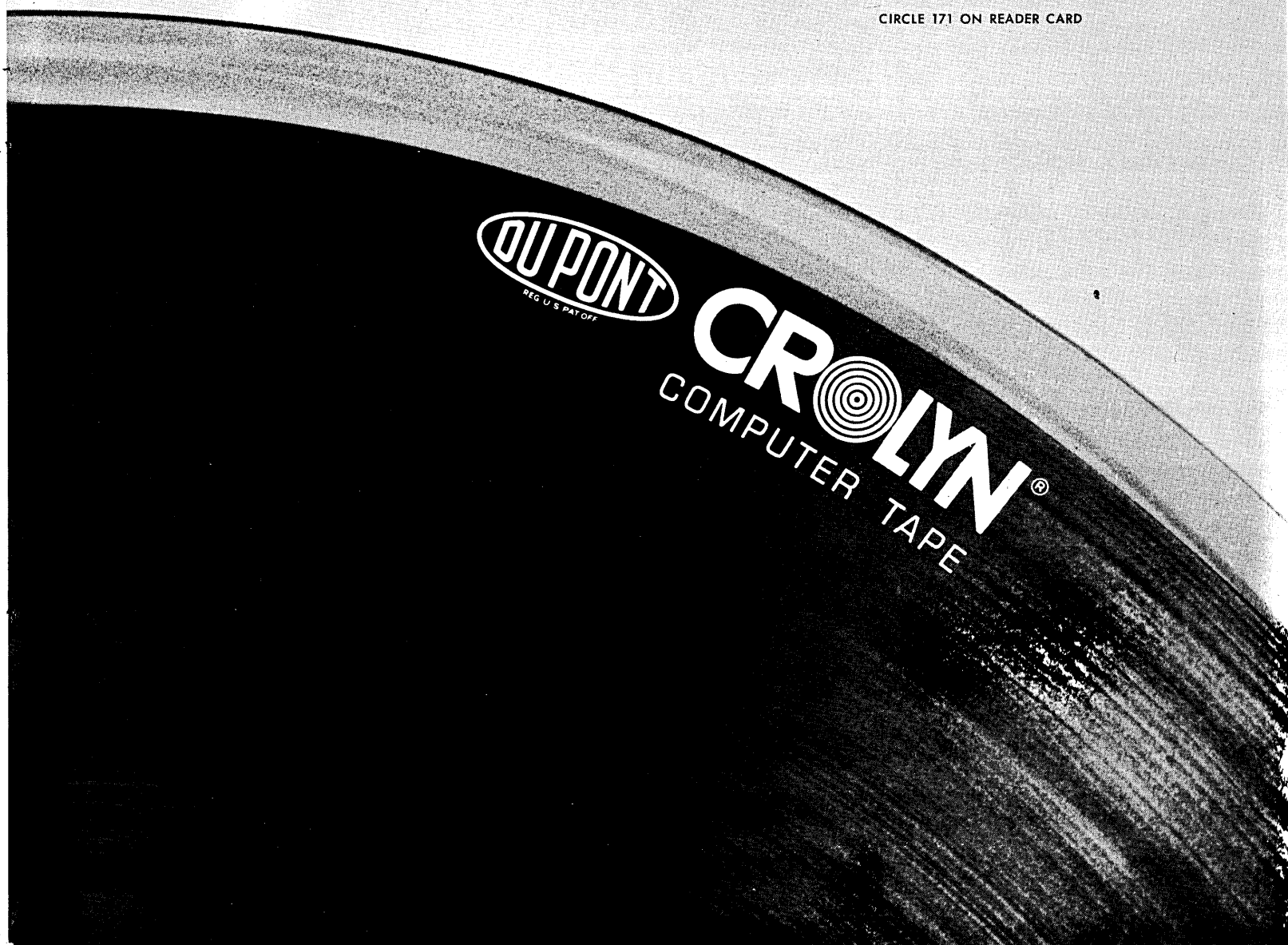
CIRCLE 171 ON READER CARD

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With eighteen years in data processing, Tony has chalked up an impressive record in management posts at IBM, and more recently as Vice President of a software firm. Last year, convinced that fresh approaches were needed, Tony and his associates established their own company. It is a full service corporation with high performance standards and a superior range of specialized capabilities.

Since people are the key element in any successful business, he surrounded himself with recognized professionals, and now has a staff of more than 75 serving an impressive list of clients. Among them are the Crum and Forster Insurance Group, Zurich Insurance, Crown Fabrics, almost a third of New York City's taxi fleets, Wells Fargo and Royal-Globe.

Located in new headquarters in mid-Manhattan, DDSS offers services in all major areas of Data Processing — including an on-site IBM System/360 for systems analysis, programming and time sales. Through subsidiaries, it also has capabilities in the fields of telephony and education; and more to come.

Why not find out how Diversified's growing, wide-ranging capabilities can contribute to more efficient operations for your company? Just send in the coupon below. Or call us.

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CIRCLE 168 ON READER CARD

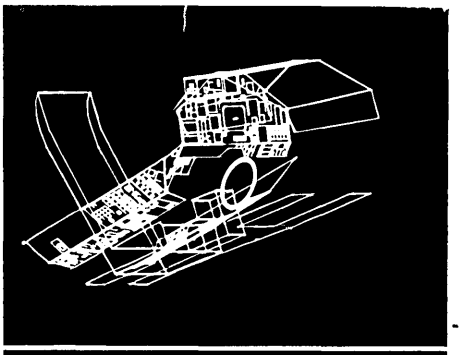
Graphics pays off. Adage graphics.

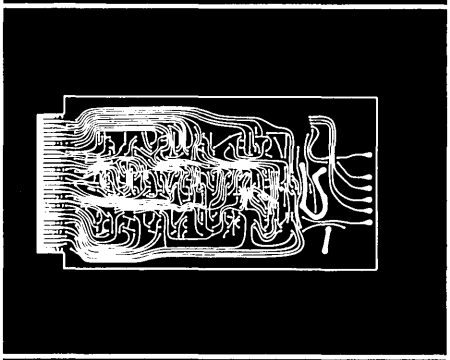
Adage Graphics Terminals are paying off in lots of different ways. Engineers in one aerospace company are verifying and editing PC layouts before committing to machine plotting. Savings in rejects and time have more than justified their investment. In another aerospace company engineers are speeding SST design with an AGT used for aerodynamic simulation and cockpit layout. Seismologists in a major oil company are developing new methods for analysis of exploration data. Biochemists viewing models of drug molecules are freed from tedious, drawn-out laboratory testing required by classical methods. Intelligence analysts tracking signal patterns, space scientists simulating lunar terrain as seen from a spacecraft, underseas specialists simulating submarine tracking and intercept guidance systems, research workers for a film manufacturer developing cheaper and better film developing techniques – these are but a few examples of how our customers are getting jobs done with the Adage Graphics Terminal.

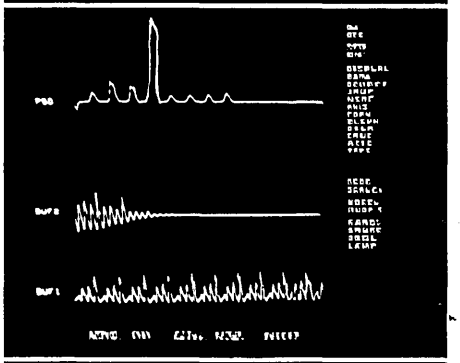
And an AGT can get your computer graphics job on the air faster and more economically than you may have ever imagined. Faster, because every AGT comes with extensive systems software. More economically, because you can buy an AGT /10 for as little as $60,000. (An AGT /10 is field expandable to an AGT /30 or an AGT /50 used for three-dimensional work and unusually complex images.)

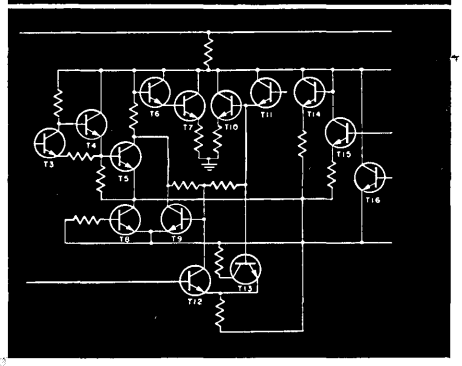
The Adage Graphics Terminals we've sold have been used both as stand-alone systems or tied either directly or via dataphone to central computers. Some of these computers are IBM 360 /50, 360 /65, 360 /67, 360 /75, and 360 /91, Univac 1108, CDC 6600, SDS 940 and 9300, and PDP 10.

If you would like actual case histories of AGT installations, or if you just want more information about our system, write Marketing Services, Adage, Inc., 1079 Commonwealth Avenue, Boston, Massachusetts 02215, (617) 783-1100.









adage
Computer
Graphics

CIRCLE 5 ON READER CARD

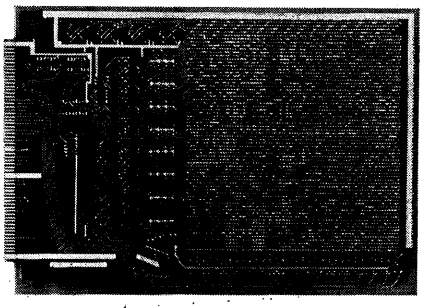
calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
Aug. 11-14	14th Annual Photo-optical Instr. Program	San Francisco	SPIE/Henry Sander 216 Avenida del Norte, Redondo Beach, Calif. 90277
Aug. 11-15	4th Australian Computer Conference	Adelaide, Australia	ACC 69/Dr. G. W. Hill, Univ. of Adelaide, Adelaide, S. Australia 5000
Aug. 19-22	Western Electronic Show & Convention	San Francisco	WESCON, 3600 Wilshire Blvd., Los Angeles, Calif. 90005
Aug. 24-25	Programming Langs. Definition Symposium	San Francisco	ACM/James Painter IBM Research Lab. Monterey & Cottle Rds., San Jose, Calif. 95114
Aug. 25-29	Datafair	Manchester, England	British Computer Soc. 21 Lamb's Conduit St., London W.C. 1., England
Aug. 26-28	Nat'l Conference & Exposition	San Francisco	ACM 69, P.O. Box 2867, San Francisco, Calif. 94126
Sept. 7-11	11th Annual EDP Conference	Los Angeles	NRMA 100 W. 31 St., New York, N.Y. 10001
Sept. 8-9	1st Annual Management Information Systems Meeting	Minneapolis	SMIS/G. W. Dickson, Bus. Adm. School, Univ. of Minnesota, Minneapolis 55455
Sept. 15-17	Prog. Langs. Conf., Numer. Controlled Machine Tools	Rome, Italy	IFIP-IFAC/E. L. Harder, R&D Center, Westinghouse Electric Corp., Beulah Rd., Pittsburgh, Pa. 15235
Sept. 15-20	Int'l Symposium Design & Application Logical Systems	Brussels, Belgium	Dr. J. Florine Laboratoire d'Electronique, Universite Libre de Bruxelles, Brussels 5, Belgium
Oct. 1-5	32nd Annual Meeting	San Francisco	ASIS 2011 Eye St., N.W., Washington, D.C. 20006
Oct. 27-30	24th Annual Conference & Exhibit	Houston, Texas	ISA 530 William Penn Pl., Pittsburgh, Pa. 15219
Oct. 27-31	11th Annual Exposition	New York City	BEMA 235 E. 42nd St., New York, N.Y. 10017
Nov. 18-20	Fall Joint Computer Conference	Las Vegas	AFIPS/P.O. Box 49672, Los Angeles, California 90049

If you're in the market for a mini computer, look at the Micro 800 first.

You'll probably end up with one anyway.

Here's one reason why: Microprogramming



Microprogramming gives you a more efficient system, tailor-made to your requirements, for less money. Since firmware absorbs many functions normally handled by core memory and interface hardware, requirements for both are reduced substantially. On the other hand, standard hardware can be retained even while changing architecture to match your particular demands. With little time and practically no effort, you can optimize computer characteristics for a particular operation without making a single hard wire change.

Here's another: Delivery

We began building 800's before we began selling them, and now we're in volume production. It's only natural then that delivery is off-the-shelf with custom variations taking a modest 30 days extra. Try us. Especially if your requirements are urgent.

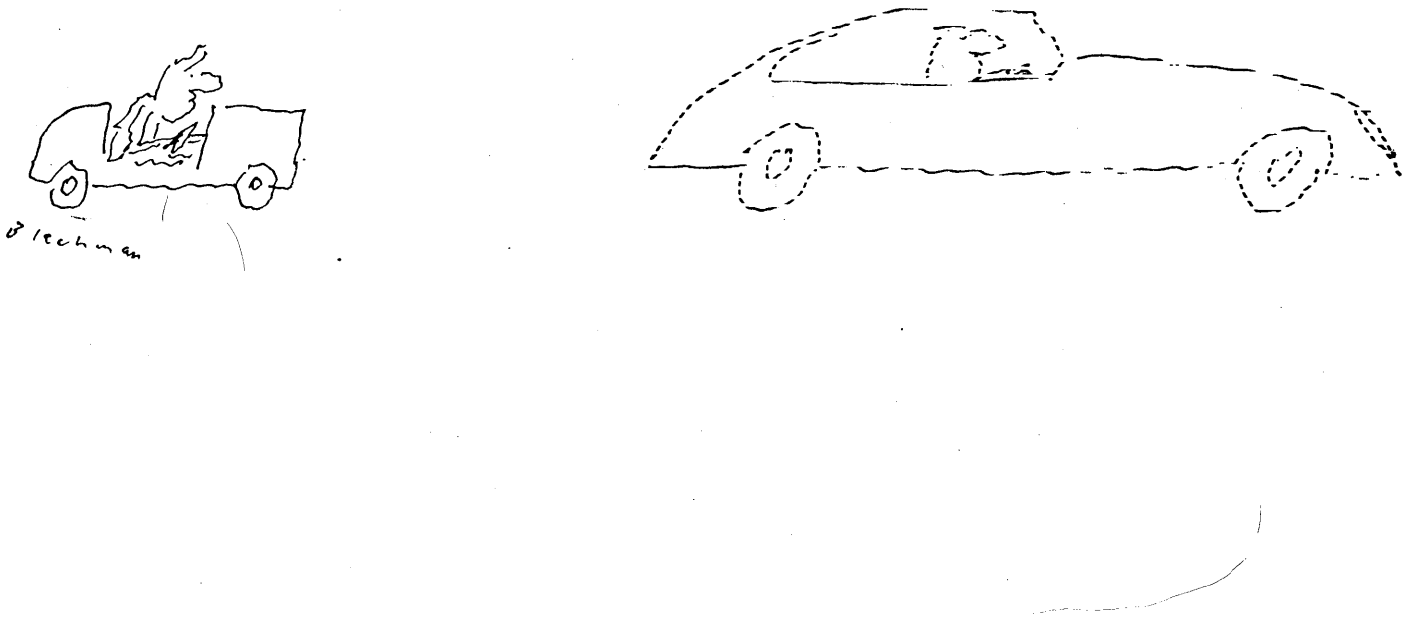
Here's one more: Price

The Micro 800 costs $3200 with quantity discounts ranging up to 40%. For $3200 you get a basic processor with 16 multi-purpose registers, 256 words of read-only store, basic console, enclosure and power supply to function as a micro programmed controller. In addition, you get the fastest digital computer in its class with a 1.1μs memory cycle time and a 220ns micro command execution time. Core memory capacity is 0-32K bytes.

We also sell a microprogrammed adaptation of the 800 with 512 words of read-only store, a 4096-word by 8-bit core memory and a teletype interface. We call it the Micro 811 and it goes for $6300. Our third model, the $6900 Micro 810, is like the 811 except that 768 words of read-only store are used to implement an expanded instruction repertoire, including multiply and divide.

Just about any question you'll have is answered in our new mini-seminar booklet. We'll send you a copy gladly. But we'd really rather have you ask for a call from our marketing representative. You'll save a lot of time if you do because we're sure you'll end up with an 800 anyway. It's irresistible.

MSI MICRO SYSTEMS INC. · 644 EAST YOUNG STREET · SANTA ANA, CALIFORNIA 92705 · TELEPHONE (714) 540-6730



PDP-15 is a Jaguar at a soap box derby.

Lots of companies make medium size computers. Too many. But a lot of them are obsolete, and some of them never did have any horsepower. PDP-15 is different. Half the price of some of the competition. But better than that, software proven in 400 field installations, full monitor control, four versions that fit most applications specifically, and all budgets. Write.

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CIRCLE 21 ON READER CARD

letters

medinet profits

Sir:

Mr. Singer's article on hospital information systems (May '69) depicts MEDINET's service during developmental stages two years ago. The present scope and capabilities have changed substantially. Let me explain.

First, MEDINET has moved beyond the testing stage and has implemented 19 applications in eight hospitals. More applications have been ordered and will be operational shortly.

Second, MEDINET has developed and tested a wide selection of applications, any of which, customer conversions have shown, can be up and running within four weeks after implementation begins.

The list of applications includes admissions and census reporting; inpatient and outpatient billing including automatic pricing features, insurance proration and income distribution; lab test ordering and result reporting; medical records statistics; nurse staff allocation; payroll and personnel accounting; general accounting and accounts payable.

These available administrative and patient related applications are the nucleus of a complete, integrated hospital information service. Additional applications such as medication ordering and control, X-ray test ordering and scheduling, purchasing, and inventory control are under development, and many other areas are being researched.

Third, MEDINET employs a cycle-processing technique rather than real-time processing of all data. Data is accepted on-line, as it becomes available, by means of terminals in the hospitals. The data is processed on regular, predetermined cycles in phase with the hospital's requirements. Processed information is made available to the hospitals on inquiry from their terminals. Actual charges vary with hospital size, the number of applications used, and internal activity variations. Cost for the six administrative applications in a 300 bed hospital will hover close to $1.06 per patient day.

MEDINET, then, provides a timely, comprehensive, economical, hospital-oriented service. It is available now and can be implemented quickly. Offices in New York City and Watertown, Massachusetts, outside of Boston, have been serving hospitals in the Northeast for the past year. New Offices in Philadelphia and Chicago have extended the service into the Middle Atlantic States and Midwest. Further extensions of service are expected to continue at a rapid rate, building a network of centers to serve hospitals nationwide.

HARRY R. WRAGGE
General Manager, Medinet
Watertown, Massachusetts

incapable of code

Sir:

I would concur with Mr. John T. Dwyer's comment (Letters, May, '69) that the only difference between a programmer and a systems analyst is that the latter doesn't write code. I would like to add that in many cases the systems analyst does not write code because he is not capable of it. A "big mouth" may fool people but it won't fool the computer.

RICHARD T. SULLIVAN
Arlington, Massachusetts

anti-abm

Sir:

The "social responsibility of computer professionals" has finally gotten out of the category of polite talk at cocktail parties, and has come to grips with problems in which computer people are deeply involved whether they like to face the fact or not.

I have in mind the current debate on proposed extensions to the ABM system. This system would be useless without a computer, and a very sizable fraction of the readers of DATAMATION would be personally involved in building and programming the system if it were approved with all its follow-ons. This question is far too crucial to be left to the politicians. No programmer can say, "Well, who am I to argue with the U.S. Senate?" There are *senators* saying, "Who am I to argue with a computer programmer?" What I mean is, a great many decisions are being made—and the ABM is hardly the only one—where policy-makers are forced to take the word of technical people on matters that they themselves cannot hope to be experts on.

Personally, I oppose the proposed ABM extensions on the dual grounds that they represent an escalation of the arms race and that they are highly dubious in terms of technical feasibility. Either ground alone would be sufficient, in my view, to invalidate the proposals; taken together, they are overwhelming.

I urge any DATAMATION readers with specific technical qualifications in systems related to the ABM system to write their congressmen, stating their objections *and* their technical qualifications. If some readers would send carbons to me, I would consider communicating with them, with a view to organizing some type of *ad hoc* committee of computer professionals opposed to ABM.

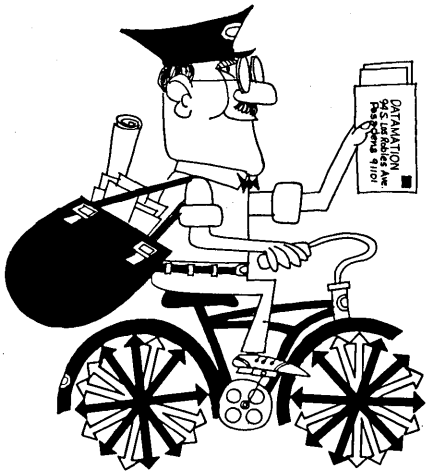
DANIEL D. MCCRACKEN
7 Justamere Drive
Ossining, New York

meter reder

Sir:

In the article "Magnetic Characters for Data Entry" in the May issue, there is a facsimile of a utility bill (Fig. 5) which is the most confusing "typical" example of anything I have seen.

It appears that the meters were running backward (present totals are



less than the previous totals), the consumption of electricity is apparently placed in the gas row with an error in subtraction, and vice versa for the gas consumption, with another error in

Perfect mate for the 1108.

No doubt you've read ads about small time-sharing systems that claim to do everything.

Ours doesn't.

We've designed our MINITS II for one purpose only: to give your UNIVAC 1108 a time-sharing capability. It can cut computation costs and greatly increase the flexibility of the 1108 by adding a new and more economical method of processing engineering and scientific applications. With only one MINITS II time-sharing system, you allow 24 people to simultaneously access your 1108 while you continue to run batch work. Its speed is an impressive four seconds maximum response time.

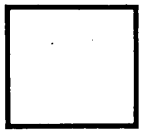
Speed and flexibility are only part of the story. MINITS II provides a time-share capability for approximately the price of one high-speed line printer. The ability to develop and partially debug programs on MINITS II before running them on the 1108 further enhances its time/cost-saving features.

The MINITS II command language is complete, simple, and one of the easiest to use terminal languages available. It's designed to ease your burdens by minimizing the learning curve. MINITS II is fluent in a wide variety of fully conversational languages. Included are FORTRAN, BASIC, Deskalculator, and EDITOR. An 1108 symbiont is provided for direct communication with the 1108 and its mass storage devices.

Take two minutes to learn more about MINITS II, the perfect mate for the 1108.

It can significantly cut computation costs by increasing the performance of your current computer system.

If you're not using the 1108... Our MINITS I time-sharing system is similar to MINITS II, with the exception of the 1108 coupler and associated 1108 software. It is used as a complete, stand-alone time-sharing system capable of serving 24 users simultaneously. Its advanced features make it ideal for companies who desire the security and economy of their own in-house time-sharing computer, or for individuals who wish to enter the time-sharing business on a modest scale.



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Telephone (213) 981-3010

CIRCLE 161 ON READER CARD

subtraction. Even with the correct subtraction, the rates used appear ridiculous to arrive at the amounts due.

Which due amount should be paid, the incorrect addition shown on the stub or the amount shown on the main portion of the bill? I would probably be real ornery and write CONELEC a letter about the foulup in my bill, and as an added touch give them the wrong account number.

CARL C. CLAYTON
Corpus Christi, Texas

Mr. Rolf Haag, of Potter Instrument Co., Inc., replies to Mr. Clayton: Apparently we were a little careless when we created our own electric company, CONELEC, and prepared a "typical" bill.

Our primary concern, of course, was merely to illustrate how easily our new Magnetic Character system would fit into familiar formats.

In spite of our sloppy arithmetic, we feel that the CONELEC bill did demonstrate one possible application of our system. Also, we wanted to show how easily our machine-readable format can be read by people. Since you had so little difficulty picking up our "goofs," we feel we were reasonably successsful.

Thank you for keeping us on our toes.

life and hardin times

Sir:

I strongly protest the perversion of the theory of evolution evidenced in an article by Dr. Garrett Hardin recently published in your magazine ("An Evolutionist Looks at Computers," May '69).

The first part of Dr. Hardin's article is quite amusing and informative, and makes us think about the computer phenomenon in new ways. Unfortunately, toward the end of the article, Dr. Hardin attempts to derive his political preconceptions from his evolutionary theory. In doing so, he makes an underlying assumption which is astounding coming from an evolutionist in 1969.

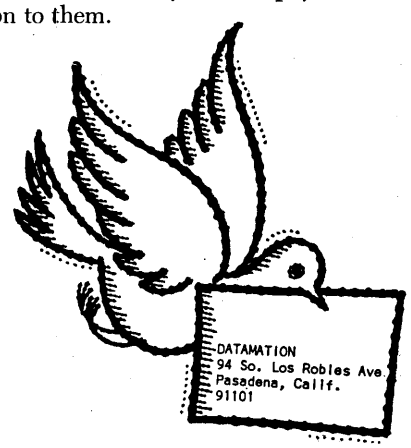
Toward the middle of his article, Dr. Hardin mentions the bifurcation of the population into two groups, as prophesied by H. G. Wells in *The Time Machine*: "the Upper World people, called the Eloi," who "were the Beautiful People" who never worked, and the Morlocks, who "owned nothing and did nothing but work all the time." Later he says: "Because of labor-saving machinery we are moving into a world in which *no* Morlocks will be needed for labor. Because of thought-saving machinery, no Morlocks will be needed either for routine calculations and 'thought' at the lower levels. In fact, no Morlocks will be needed at all . . . "

Precisely! This is the exact position we find ourselves in: having built a world in which millions of unskilled jobs must needs be filled by unskilled, ignorant Morlocks, we have come, through technology, to the point where "no Morlocks will be needed at all"—so what we must do, since we're not going to exterminate the Morlocks (which would be one possible solution) is simply to fuse the two. The children of the Morlocks, in short, must *become* the Eloi of the future. A substantial part of our national resources are, in fact, being devoted to this very goal, led, as Dr. Hardin says, by "the children of the Eloi in large numbers (who) are leaving the parental society and joining the Morlocks" in order to heal the wounds of ignorance and lies which have kept the Morlocks down for so long.

Yet this is not Dr. Hardin's conclusion. In fact, he refers to this leaving of the parental society as "the most frightening aspect" of the situation. And near the end of the article, he gloomily prophesies that "simple necessity requires only a dangerously small minority of Eloi to keep the world going, so few in number that they may be overwhelmed by the Morlocks." The clue to this strange conclusion appears in the next to the last paragraph, where Dr. Hardin says that "we will . . . have to defend the relevance of intellectual training" and "we will have to see to it that the *genetic ability to be so trained* is nurtured and even multiplied relative to the rest of society" (italics mine)!

In other words, not only are the children of the Morlocks inherently incapable of "being so trained," but their children's children, and so on unto the third and fourth generation! (If the "ability to be so trained" is "genetic," what other conclusion can we draw?) This curious viewpoint has persisted down through the ages; even the great, such as Thomas Jefferson, who believed that the races of mankind are separate species, were not exempt. It formed the basis of the institution of nobility in Europe; only the children of nobles (Eloi) could be nobles. Here in the United States, we thought we had it almost exterminated (have we forgotten Horatio Alger already?) and now comes Dr. Hardin, who, from the vantage point of science, sends us back to the stone age.

Morlocks are ignorant, but they are not stupid. They are white, black, brown, yellow, and every possible cross between. They know that they have a chance in this world, and they are not going to be told otherwise. A news brief in the same issue, "Montreal University Counts Computer Center Losses" (pp. 146-148), reports that "two months later, people at Sir George Williams University, Montreal, are still contemplating the wreckage wrought by the sit-in which culminated in vandalism and fire destruction of the entire computer center and most of its contents, and are trying to figure out how things stand." Nowhere in the entire article was even one word devoted to why this computer center was destroyed. It was destroyed because students at Sir George Williams were being exposed daily in the classes of one particular professor to views quite similar to those of Dr. Hardin. They protested; they got nowhere; and they finally reacted, in a way in which they were sure the university would pay attention to them.



They were wrong, of course. They are often wrong. A small minority of black militants, for example, is against population control. They refuse to believe that people are sincerely trying to reduce the total population of the world, and hence its total misery; they fear that the real aim of population control is rather a relative decrease in the number, and hence the power, of black Americans. In this context it is extremely disturbing to find an evolutionist indirectly confirming these fears by remarking, as Dr. Hardin does earlier, that "by chance or design the Morlocks might be inveigled into breeding less rapidly than the Eloi" and that "if this came to pass, the problem would eventually solve itself."

In short, Dr. Hardin's article is regrettably out of place in today's world, and symptomatic of some of the real causes behind today's pressing problems.

W. D. MAURER
Berkeley, California

Sir:

It's a pleasure to find in DATAMATION such aids to grasping the Big Picture as Dr. Hardin's "An Evolutionist Looks at Computers." However, his

(Continued on p. 209)

Before you get the wrong idea, we'd like to make one thing clear.

The important difference isn't the price. It's everything else.

Compatible, yes. Alike, no.

We call our new high speed remote terminal the CP-4. And it's directly compatible with the IBM 2780.

But the similarity ends right there.

In the first place, the basic CP-4 is a four-wire, full-duplex system (as opposed to a limited half-duplex system). So it can manage four operations at once.

1. Read cards.
2. Transmit.
3. Receive.
4. Print out.

These multiple activities are handled by state-of-the-art MOS/LSI memory and processor systems that won't quit.

Which means the best mean-time-to-failure ratio of any remote terminal. And a sharply reduced parts inventory.

Data compression. We repeat: Data compression.

As you might expect, the CP-4 transmits and receives at high speeds. Up to 2000 bits per second on a switched line. Up to 4800 bits on a private line. And up to 240,000 bits on microwave.

However what you might not expect, at least from a terminal under $125,000, is data compression.

On the 4th generation CP-4, data is compressed simply by placing a format header card in front of the data cards to be sent.

That's all there is to it.

No computer control is necessary. And the data packs and unpacks itself automatically.

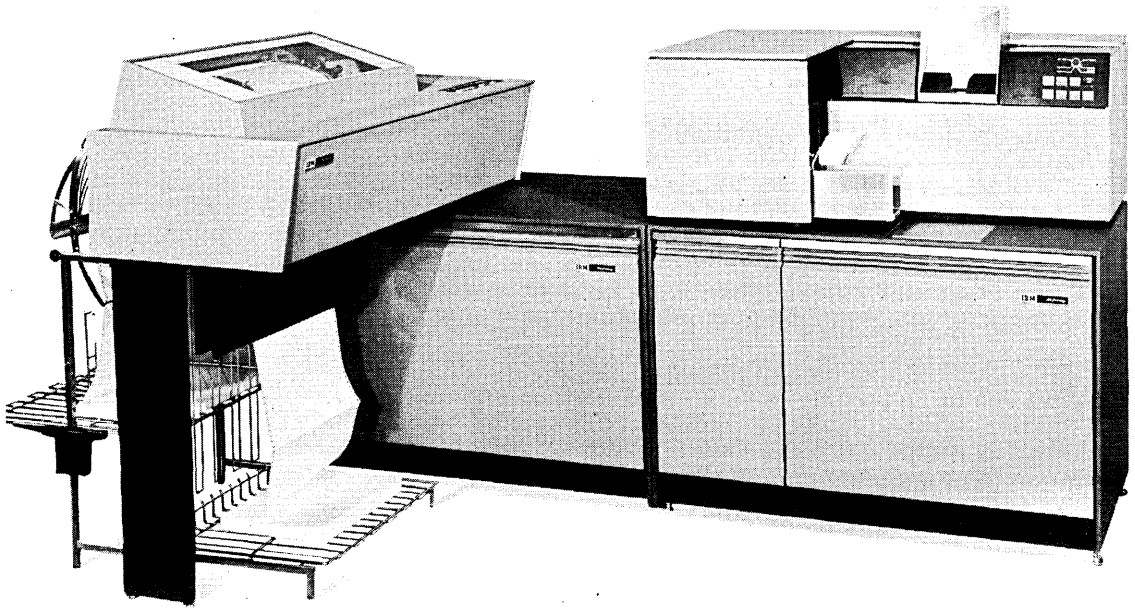
With data compression, throughput time can be drastically reduced (at least 2:1). Likewise expensive central computer input/output time and core storage. Along with not-so-cheap transmission line time.

At the same time, the CP-4 requires no costly computer program loading, programs, programmers or skilled operators to operate.

Multi-coding. Multi-formatting.

For the basic CP-4, the standard transmission code is

Introducin



Their 3rd generation high speed remote terminal, $44,000.

EBCDIC. But optional multi-code capability means you can also use ASCII or ASCII-8. Or with the option of code selection, all three.

By the simple change of a format card, the CP-4 also operates in many formats.

And with up to 30 input/output devices on-line (versus 3 or 4) a single CP-4 can manage everything from card readers and magnetic tape to CRT display and teletype.

Options: Scrambling, Automatic answering. And more.

For a small extra investment you can also add data scrambling. And automatic answering.

The former, to make sure nobody understands your communications but you.

The latter, to make sure somebody's there to receive data, even when you're not around.

In fact, the list of optional CP-4 capabilities is virtually unlimited. You may require a horizontal tab on your line printer. Or only a half-duplex interface. Or a 132 column printer. Or additional memory.

Whatever your requirements, the CP-4 is compatible with every important kind of central computer, peripheral equipment and software.

The terminal is remote. The service isn't.

With everything else going for us, you'd think we might relax on service.

Not a chance.

Because right now, everywhere we install a CP-4 remote terminal, we're installing a CP-4 local service office, too.

Your alternatives, then, seem to come down to this:

Do you buy a 3rd generation terminal that costs more?

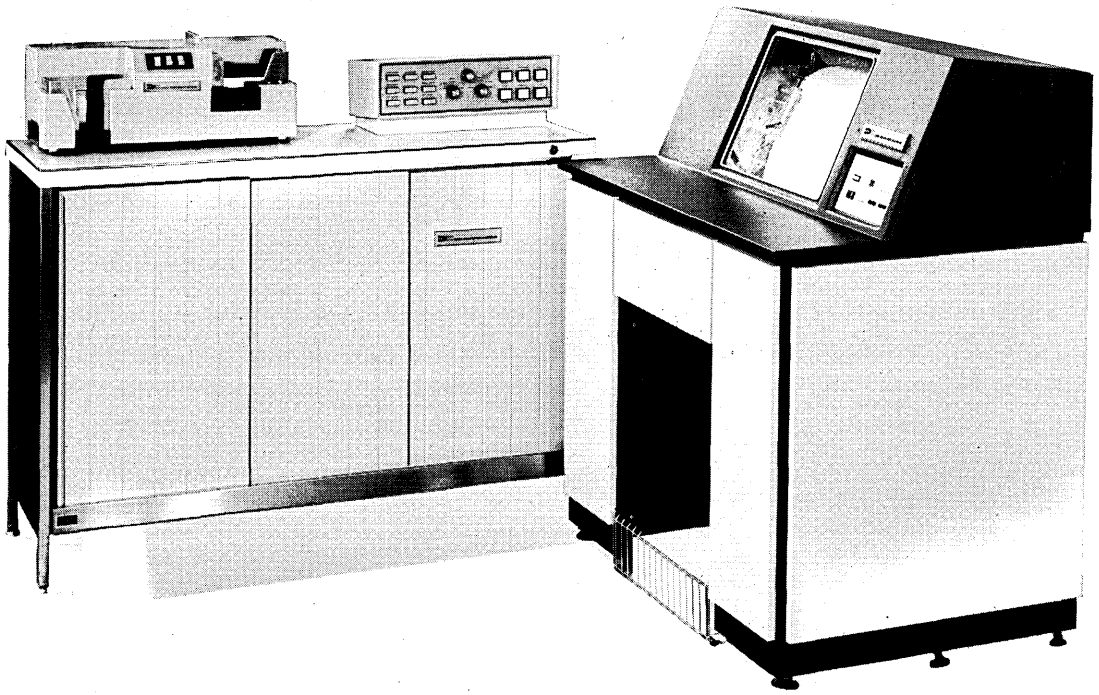
Or get the 4th generation terminal that does more?

Some choice.

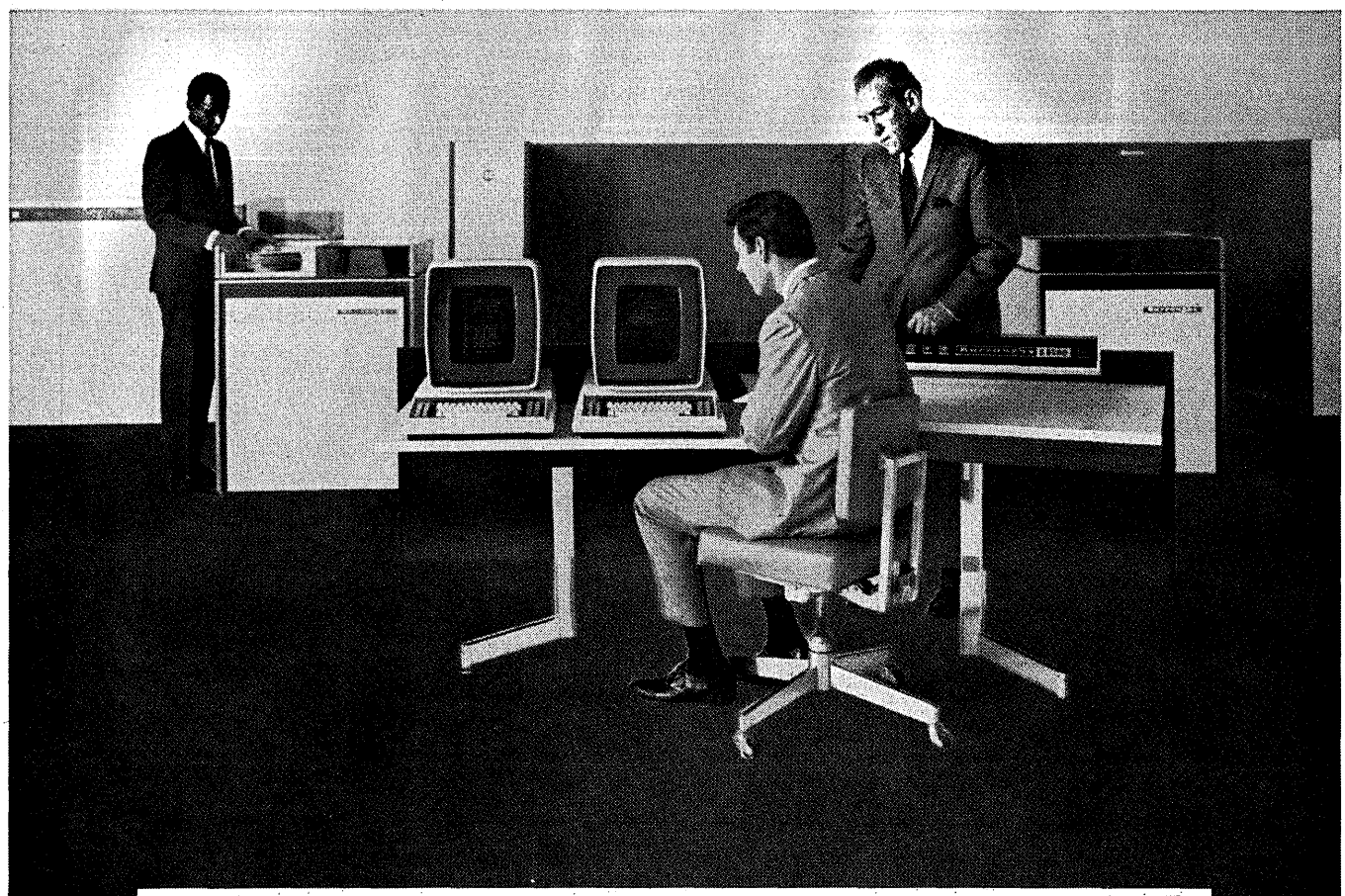
DATA COMPUTER SYSTEMS

For complete facts, write or call
Dick Musson. (714) 542-4789.
Data Computer Systems, Inc., Dept.C-2, 1612 So. Lyon St., Santa Ana, California 92705.

g a choice.



Our 4th generation high speed remote terminal, $34,000.



What's the real price of a new computer?

To find out, you may have to look beyond the contract. Because the price of reprograming for a new system plus the costs of overhead and future expansion can exceed what you'll pay for the machine itself.

Unless you're moving up to a B 6500.

Take programing, for example. The B 6500 is a high level language system. Your COBOL, FORTRAN or ALGOL programs will run on the B 6500 at full efficiency, usually with no reworking. If you're a B 5500 user, simple recompilation may be all it takes to transfer your whole library.

Consider overhead. The B 6500's Master Control Program handles many complex and expensive tasks for itself. Like job scheduling, memory allocation, resource selection. It takes less manpower. Helps your programmers and operators do a better job.

How about expansion? You can add memory, data communications or peripheral equipment to the B 6500 without reprograming. Its MCP puts new capabilities to work automatically. Your programs run faster and more efficiently.

The price of a B 6500 is the real price. And it's one reason why many price-conscious companies are moving up to this outstanding system.

Burroughs 

look ahead

IBM DROPS ITS UNBUNDLING BUNDLE

IBM's June 23 separate pricing announcement essentially creates prices for previously "free" systems engineering services, education, and a new class of software called program products which includes "application programs, conversion aids, sort programs and language processors" (compilers). Prices of 18 software packages were announced, all of them representing types included in the price of hardware before. IBM will license (not lease or sell) programs. Minimum contract, cancellable by the customer on three-month notice, is three months.

In the process, IBM announced hardware (purchase and lease) price reductions of "approximately three percent." Purchase price reductions are effective for systems installed after June 15; new lease prices start Oct. 1, '69. Separate service and software prices start Jan. 1, '70. And they're going into "custom contract services," which means doing all or part of everything from designing to installing a system...but not operating it.

WHAT'S IT ALL MEAN?

SDS President Max Palevsky snorted at the price cut, thinks it's really a price increase, believes the announcement shows IBM feels its anti-trust position is "pretty strong." He'll consider raising and/or separating his prices. Other major competitors are pulling similar wait-n-see acts, but Burroughs is preparing a separate pricing policy for hardware, software and services for "larger EDP systems."

Software companies producing file management systems feel that IBM's GIS is overpriced at $1500/month. But for program packages generally, IBM will have the decided advantage of advanced notice of system software and hardware interface information.

One observer feels the main significance is that the separate pricing will allow GSA to get into IBM's books; discovery that hardware manufacturing costs are only 12-15% of sales price will encourage the feds to seek lower prices. They'll get them, leading to lower prices for private customers.

A preview on the effect of separate prices on costs to the user comes from one source who says the prices for three classes of SE services will be $154, $196, $245/day. For a typical $13K/month mod 30, the 3% cut would mean $3900. If the SE in the middle range is on-site for 20 days, that's $3920...for only one of the new services.

Maybe not so incidentally, IBM stock closed up 3¼ on the day of the announcement—another day of deep declines for most stocks.

(Continued on page 35)

look ahead

BANK BORROWING MEANS LESS LOOT FOR LESSORS

The pained expression on the faces of some leasing company moguls is caused by the prime interest rate hike from 7½% to 8½%. For those who have big lines of bank credit without a fixed rate, the increase means about two additional months to recoup investment on leased systems, or five months total if you count back to '66 when the rate was 6%. One firm said that with its $80-million-plus bank loan, the one-point raise will chop $175K out of net-after-tax earnings. Others, like DPF&G, say they're saved by fixed-rate bank loans, long-term debt (bonds, insurance loans), and/or heavy use of "good old" IBM's installment credit plan, which has a fixed interest rate.

For the user, it is not now the lessee's market it was a year ago, when contracts were being written with as much as 20-35% off IBM rental price. The high cost of money, plus the shortening life of IBM 360's and diminishing competition, has drastically cut the number of new systems bought by lessors and increased the lease price. Mod 30's are through in that game. One lessor said that when IBM starts delivering its "4th generation," though, his 360 investments will have been recouped and discounts could dip to 50% off IBM rental.

SDS PLAYS NUMBERS GAME

Rumors are that Scientific Data Systems is agonizing about extensions to its Sigma series, with the 3 — the upper end of the low end of the line — likely to be announced within a couple of months. Also being considered: the 6, a business system; and the 9, large-scale scientific, mebbe time-sharing. Although the 6 might make sense as a Xerox-SDS business edp entry, we doubt Max Palevsky is ready to wander into the cruel world of IBM domination. The 9, a more likely candidate for survival, is probably a year away.

EXEC 8 IN FULL OPERATION—AT LAST

Univac's 1108 installations at both JPL and Marshall Space Flight Center have now passed their GSA acceptance tests—which require 90% uptime for 30 days. So rent money starts, retroactive to the start of testing.

The Huntsville MSFC case is the more significant, since it involves three processors and thus exercises the full Exec 8 operating system for multiprocessing. And it's been about two years since the hardware was delivered—a long time to wait for the money. Success of the single-cpu JPL installation will mean upgrading to a dual-1108 providing NASA approves the request now in process.

BYPASSING THE SCHOOL BUDGETEERS

A new Los Angeles company, Cognitive Systems Inc., may have found a way to make use of computers in teaching without getting bogged down in budget hassles, campus computer center politics, or teacher fears that the dreaded machine is about to throw them out in the snow.

CSI's offering is called Mentorex. It's a computer-based teaching/testing system that gives the student a printed analysis of his test results, with study questions designed to fill in the gaps shown by the test. The system was conceived by Dr. Jack Kirschenbaum, a psychologist and professor, and the company is headed by another psychologist, Dr. Frieda Libaw. The first course offered, not surprisingly, is introductory psychology; several local colleges and junior colleges are using it on an experimental basis.

(Continued on page 203)

If you have to service time-sharers while running batch.

Get one Sigma.

Most machines can't handle both. A few fake it by treating batch like a time-sharing terminal, so it gets worked on a few milliseconds at a time.

Sigma 5 and 7 handle both, concurrently. Our new BTM software allocates core memory and time for effective batch time-sharing. But if all your 38 time-sharers aren't time-sharing, BTM automatically takes up the slack to speed batch processing.

As a result, batch runs smoothly at central site, or from remote batch terminals. BTM even lets time-sharers have access to the batch job stream for greater computing power and flexibility.

If batch isn't running fast enough for you, terminal users can be gracefully dismissed from the system so all available time and memory can be given to batch. Without stopping the system or dumping files just to change modes.

But just because Sigma uses half its mind for batch and half for time-sharing, don't expect half-witted programs. There's a long list of conversational languages and services such as SDS Basic, Fortran IV H, and Symbol, which are compatible for batch operations. Plus powerful batch processors like SDS Fortran IV, SDS Cobol 65, FMPS, SL-1, Manage and others.

This sounds like a promise of things to come. It isn't. We'll come to your office and demonstrate it. Now.

SDS

Scientific Data Systems,
El Segundo, California

editor's readout

WHAT'S IT ALL ABOUT, ALFIE?

A small army of systems analysts, programmers and designers have for some years now been crawling through every crooked nook of almost every facet of what we call the American system, looking for better ways of doing all the things we do.

The results have been, sometimes, impressive. We've designed massive defense systems which give us almost enough warning to retaliate, in case. . . . We've automated reservations and check handling systems, made it possible to collect money and catch deadbeats faster. But you know the list. There *are* some unachieved goals, of course: air traffic control, machine translation, artificial intelligence . . . reliable, useable hardware/software systems. You know *that* list too.

In the main, it seems to us, our industry has served systems pretty well. But how well has it served people . . . you know, individuals?

To answer that question, think of yourself for a minute—if you can—as an individual (rather than as a computer specialist), and try to figure out just how you (or your mate, children, friends, relatives and acquaintances) spend your time.

How much time do you spend getting from one place to another? Waiting at poorly timed traffic lights, sitting sizzling in a mid-town hell of cars and horns, or moving 5 mph in the fast lane of the freeway? And how useful is that time? Does your car contain a tape player, offering French lessons? Does it have a phone? A dictating machine? How much time do you spend at a ticket counter while the agent laboriously looks up air fares for a guy whose flight leaves three hours from now?

How much time do you spend looking up phone numbers? And how much time waiting for the three or four people between you and the guy you're calling to get through to him?

How much time do you spend writing checks, looking up information for and calculating your income tax, filling out expense accounts?

How much time do you spend seeking out a decent hotel, restaurant or social companion in a strange city?

How much time do you spend trying to find or sell a house or car? Find a job? How much time do you spend seeking the best bargains in furnishings, food, clothing? In checking the unit price differential on two different brands of groceries a few cents and a few ounces apart? In going carless while repairs which might have been anticipated and prevented are being made?

How much time do teachers spend teaching, doctors doctoring, administrators administrating?

There are plenty of reasons our systems haven't tackled or solved such questions and problems: tardy technology, price barriers, bureaucracy, resistance to change. And there's another one: lack of perspective.

Try thinking about what you'd like a computer to do for you, as an individual. You may come up with a system which will save millions of people time and tedium . . . and get rich doing it.

— R.B.F.

WHITHER OCR?

and whence

by Jacob C. Rabinow

Why did it take so long? Before we can discuss the future of optical character recognition we should take a look at the past. The roots of OCR technology go back a long way. Around 1870, Mr. Carey of Boston patented an image transmission system using a mosaic of photocells—in the OCR art it is now called a retina scanner; and in about 1890, Nipkow of Poland invented sequential scanning—here the image is analyzed line by line as is done in modern television and in many reading machines. The first reference we can find to a true reader, that is, a machine that converts printed characters into code, is in the telegraph art of 1912 where Mr. Goldberg of Chicago patented a machine to read characters and convert them into the telegraph code. He could thus send the messages over wire without human intervention. Devices for converting coded messages back into characters were already in existence.

OCR for data processing didn't come into being, of course, until the data processing devices themselves were developed and that brings us to the middle 1940's. With the birth and development of the electronic digital computer it became quite obvious that the problems of data entry would be very important, particularly for the business world. The great pioneer in this art was David Shepard, who founded the Intelligent Machine Research Corp. to develop and build OCR equipment. Others followed soon after, and most of the basic thinking in the technology of OCR was done in the 1950's. Large scale commercial development followed in the 60's and we might cautiously say that it is in full bloom at the present time.

why ocr?

The original development of computers was for military and scientific purposes where relatively little data had to be entered but a considerable amount of computation had to be done. In the data processing world, in general, and in the business world, particularly, the amount of data that has to be entered and retrieved from a large electronic system is large and the complexities of computation are, generally speaking, quite low. And so the problem arose: how should we interchange data between a human and a computer or, as we like to say, how should a human talk to a computer and how should a computer talk to a human?

When a computer talks to a computer, the problems are relatively simple—we can either connect them together by wires or radio links, or record the information on tape or discs and transfer the tape and discs from one machine to another.

When a human being is involved, however, either as the

Mr. Rabinow is a vice president at Control Data Corp., responsible for the operation of the Rabinow Laboratory Div. He is widely known for his pioneering work in optical character and pattern recognition and has advised the U.S. Post Office on design and installation of mail scanning and sorting systems. Before forming his company, acquired by CDC, he was with the National Bureau of Standards.

one who generates the data or the one who has to see the data during its life cycle, the problem becomes more interesting. There are several options.

It has often been suggested that the human being should speak to the computer. There are several problems here. The first is that speech is inaccurate, particularly when it deals with material that has no contextual information found in ordinary speech; secondly, speech is slow; and third, we don't know how to do it. This doesn't say that machines haven't been built that can recognize a few sounds spoken carefully by some particular speaker, or that a special language couldn't be designed which would be particularly suitable for computer input. This would be useful in some special applications such as sorting packages in the post office or controlling some special functions of an automatic machine. But the recognition of speech is a problem very similar to the reading of script and the translation of languages. The present type of computers are probably not suitable for these functions. I say "probably" because one never knows what breakthroughs may be now occurring in some remote corner of some remote laboratory.

Another option is to use direct keyboard entry—generally operated by some charming girl. Almost always in such cases the data is first prepared as some form of paper document which is handed to this operator and she acts as a transducer to feed the data into the keyboard. Sometimes she also does some editing or rearranging of the data, but this is generally minor. This technology is quite popular at the present time and will always find some uses. It has, in my opinion, some great disadvantages. The equipment is not inexpensive, the fact that a human operator is involved means human errors are produced, and finally, the basic objection is that this human is adding very little human value to the data.

Another option is, of course, to convert the data we want to enter into a computer into some special machine-readable code—the most common being holes in cards or, sometimes, holes in paper tape. Far be it from me to belittle the tremendous contribution to world technology that was and is being made by the Hollerith card. The equipment that reads and sorts punched cards is simple, inexpensive, and universally available. The basic problem of using punched cards in the modern age, however, is that a human "transducer" is still required to generate the majority of the cards. Also, the format is very rigid, the equipment to punch the card is approximately ten times more expensive than a typewriter, the error rate is greater than that which occurs in typing, the speed of operation is lower, and the training required is higher.

control for simplicity

It is interesting to note that the card is an extreme illustration of the general rule that the more control one puts on a document, the simpler its reading machine can be. There is no doubt in my mind that the card, as a general purpose input mechanism to a computer, is on the way out but I hope that I shall be forgiven for repeating my often quoted remark that the punch card business is the only fading industry that has a rising sales curve. The cards will, of course, be with us for a long, long time. They work, and they work well.

Another option which has gained some popularity in recent years is the use of mark sensing. The marks are either made by hand, as in filling out forms or in answering examinations, or by machines that print special bar codes. These are presumably easier for the machine to read than ordinary characters. In my opinion these are temporary expedients, justified only because reading machines of the past have not been able to do the job, or were very expensive. There is little doubt today that the recognition of marks on paper is not appreciably easier than reading machine printed characters or even hand-printed characters and the great advantage of reading ordinary characters far outweighs the small advantages of mark sensing.

In discussing options for machine input some mention should be made of magnetic printing, such as that used

today by the banking industry. Here the characters are more or less conventional, except that they are printed with a special magnetic ink and the pick-up device, instead of being optical, is magnetic. These pick-ups are very similar to the heads used to pick up information from a magnetic tape. The reason for the use of magnetic characters on checks is that overprinting or overwriting does not affect the accuracy of reading. I have no doubt that if the problem were being solved today, optical character recognition would be used. There are tricks by which overprinting can be disregarded optically, and certainly the checks could be so designed that the useful information to be read would be kept away from the signature area and from other forms of extraneous "noise." It should be noted that the magnetic printing on checks is required to be of superb quality and can be easily read by optical means as well.

There are also several hybrid systems where the characters are so designed that they can be read magnetically or optically as codes while to the eye they appear as more or less conventional characters. Such a style of printing is the CMC-7 magnetic font developed in Europe. Other forms of "sliced" characters were also developed here. The bar code is relatively easy to recognize by machine while the over-all shape of the character is read by a human. Again, it is my opinion that these are temporary expedients and because of the difficulty and expense of printing such characters they will be eventually replaced by conventional forms.

From all of the above snide remarks about other options the reader will, undoubtedly, infer, and quite correctly, that I am an advocate of conventional printing techniques as the most effective way of feeding data to a computer where the generation or reading of such data involves human beings. Let us, then, examine the arguments in some detail.

advantages of ocr

The present state of OCR is roughly this: Machines are now built or can be built which can read almost any type of printed material. I would have liked to say "all printed material" but there are styles of printing so ornate and special that it simply does not make sense to devote the millions of dollars necessary to recognize them. Nor are we yet sure how well we can read languages other than those based on Roman characters. We believe all languages can be read, but to the best of my knowledge no one has yet built machines to read Chinese, Arabic, and some of the Indian languages.

Since most of our business data involves the reading of characters printed by typewriter, high speed printers, etc. we are quite safe because reading machines have been built to handle this output.

The world would like to have machines that could read fonts without preselection. That means we would really like to have omnifont machines and a few attempts have been made to build such machines. Actually, the few elaborate machines built today should be called multifont readers, that is, they can read many fonts for which they were programmed. The trouble with definitions is that "multi" flows into "omni" and it is hard to say whether machines with feature analysis like the ones in the Post Office and Social Security operations are omnifont machines or multifont machines. It is probably correct to say that they are something in between.

True multifont machines, however, have been built and are very successful in many applications. In these machines the fonts are known in advance and the machines are either programmed to read one font at a time or to read them intermixed. Such machines are very useful in the business world, which is generally not concerned with a tremendous variety of printing.

Before one lists the general classes of machines, it might be appropriate at this point to discuss some of the relative costs of OCR machines. If one wants to read pages with several fonts at fairly high speeds, one should expect to spend from one-half to two million dollars and the speed will be something between 500 and 14,000 characters per second. At the top of this scale stands the Bank of America machine developed by Control Data Corp. that reads seven different styles of printing at the interesting rate of 14,000 characters per second; then there is the IBM 1975 built for the Society Security Administration which reads a wide variety of fonts and for which the price is not known. There are also multifont machines built by Recognition Equipment, Philco-Ford, Scan Data and others.

Moving down the price scale one comes to more limited machines which may be either of the page reading or document reading variety. Such machines are built by many manufacturers and the prices vary from perhaps $50,000 to $500,000, depending on the flexibility of control, the number of fonts, the number of output sorts, etc.

Finally, there are just beginning to appear low priced machines for limited applications. One approach is to locate only a remote-scanner mechanism on the premises of the user. This scanning device converts the visual image of the paper into an electrical signal and transmits video signals over telephone wires to the recognition machine proper, operated at some central location. Cognitronics Co., under the direction of the same Dave Shepard, has built and demonstrated such equipment. A remote scanner system has also been announced by Recognition Equipment.

Other workers in the field, including my group at Control Data, have played with this approach and it does seem to have particular promise in applications where the permissible speed can be low, the amount of data small, and the character shapes difficult to analyze by simple equipment.

Another approach to low-cost readers is that taken by us at Control Data where we have built and demonstrated several machines designed to read one line on a document, at low speed and using a controlled font such as the USASI-A (of which more will be said later). Such machines can be sold for something like $5,000 and up.

problems of paper handling

One of the surprising things to the workers in the OCR field—at least it was to this worker in the OCR field—is that the problem of handling paper is every bit as difficult as the problem of recognizing characters. The reason for this is that the paper that OCR machines are expected to read has in some cases been handled or mishandled by human beings. This means that the paper has been spindled, mutilated, stepped on, coffee'd on, stapled and crumpled. Because OCR machines are fast, the problem of handling such paper at very high speeds is extremely difficult. While the paper moving problem is gradually being solved, there are, at the present writing, no machines which can handle such documents without occasional, or perhaps, more truthfully speaking, frequent jams and the quality of paper handlers can be catagorized not by whether they have jams or not, but by how easy it is to unjam the machine when the jam occurs. This is a case where training and cooperation of the users will pay great dividends.

Handling large sheets of paper, in page readers, is somewhat easier because the speed of paper handling is much lower. Even at 14,000 characters per second we do not have to handle more than two pages per second. Compare this with a document handler that may go at 30 documents per second and remember that mechanical difficulties rise at least as the square of the speed.

Probably the simplest classification of OCR equipment is

by application and it would look something like this:

Omnifont—Books, magazines, catalogs, mail, general correspondence, Internal Revenue forms, Social Security records, etc.

Multifont—Documents generated in a large enterprise that has more than one type of printing equipment, documents with several fonts selected from a large multitude of fonts, situations where the reading machine can have its fonts changed to fit the documents.

Fixed-font—"Turn-around" documents printed by or for the OCR user himself, such as bank checks, subscription blanks, bills, credit-sales slips, notices, documents generated by card imprinters, typewriters, high speed printers and other such printing equipment. In addition to turn-around documents, fixed-font applications include the reading of journal tapes, message forms, and "internally" generated records of business and government.

Handprint Readers—Unconstrained printing such as found on mail envelopes (for example, the Toshiba machine in Japan which reads a form of zip code) and semiconstrained readers such as built by IBM, CDC, Recognition Equipment, Farrington, and eventually many others. In the semiconstrained hand printing, the characters have to be printed in "boxes" and be well formed. Such machines generally read only numerals and perhaps three or four alphabetic characters. There has been at least one machine announced that can read semiconstrained alphanumerics, and, undoubtedly, there will be others in the near future.

At the present time there are no machines that can read unconstrained script. Theory indicates that for special cases, where the dictionary of words is quite small, such machines are possible. For example, in the case of the Post Office, if a machine could read the names of 100 cities it could handle perhaps 80% of American letter mail. If such a machine could read 1,000 city names it could read perhaps 98% of American mail. In the case of banks, a machine that could read 100 words could read the dollar amount in ordinary script. Such a machine would have the advantage that it could compare the reading of the script to the reading of the hand-printed numerals.

The present type of OCR equipment does not look very promising for the reading of general purpose script. The human being can read script because he knows a great deal about the language involved. Generally speaking, we guess the identity of written words from very minute clues. The knowledge of English enables us to decipher the message. Until machines are developed which can store much language, and concepts described by language, true script readers will not be possible.

It should be remembered, of course, that if we could teach our children to print carefully, we could have a different ball game. In the United States the percentage of information typed is rising so rapidly that it is entirely possible that within a few generations the problem of reading script will become academic. In any case, because it appears that our children no longer write well, because most children who go to college have to learn to type, and because we hope that nearly all of our children will go to college, it may well be that the problem will take care of itself. Perhaps the gods, too, favor OCR.

This then is the present picture of OCR: If you are willing to pay the price, we can read almost anything you wish, except your handwriting and mine.

Where do we go from here?

future of ocr

It is always dangerous to predict the future of a fast-moving art. It is relatively easy to do this in an old art, but, of course, predicting its future has little value. The conclusion is obvious: One should not predict the future. But we often do what we shouldn't and I will do so now.

If paper and printing were not developed to their present state, OCR, perhaps, would make no sense as the general input technique for data processing equipment. But the facts of history are facts. Paper and printing are at such a magnificent level of development that nothing today compares with them. Paper can be obtained, at least in this country, at essentially negligible cost and of tremendous variety of sizes, kinds, finishes, etc. The machinery for printing varies from simple rubber stamps to giant newspaper and magazine presses that work at unbelievable speeds and with fantastic precision. We have color printing that can only be described as superb.

The printing industry was the first and is today one of or the most highly automated industries in the world. It is, indeed, fortunate that OCR can make use of all this vast technology. Where in data processing can one buy a piece of equipment that compares to a typewriter? An electric typewriter can be bought for about $100, and the very best costs about $400. Not only are the machines durable and fast but have been "human engineered" by the sweat of the pretty brows of hundreds of thousands of operators.

Or where can one find a pool of operators like typists?

And, finally, what is there that the bulk of the human race can do as well as read typewritten or printed copy?

It is because of these facts that if one has to interface the human with a machine there is nothing that can compare with a sheet of printed paper. Even in those cases where operators push keys to feed a computer directly or to punch holes in a card or tape—even there the operator usually gazes at a printed sheet. Then why use a human operator at all?

Think of the time that could be saved if messages could be transmitted by a low-cost reading machine via Teletype, TWX, etc. We do have equipment that transmits the facsimile (the actual picture) of a page, but this requires bandwidths 1,000 times greater than sending the results by an OCR machine—and bandwidth costs a great deal of money.

Think of the savings to our Post Office Department if all mail could be read by machine. Washington has about 1,000 people sorting—assuming $10,000 as the yearly salary with overhead, the total is something like $10,000,000 a year, and there are cities that have larger numbers of people sorting mail.

The advantages of OCR reading of credit-sales slips, airplane tickets, subscription forms and other such need not be repeated here.

The reader only has to look at his desk and, if his desk is anything like mine, the prospects for the future of OCR are obvious. In some very near future we will store our correspondence in digital form and we shall be able to retrieve the information when we need it almost instantaneously. We may also store the information on microfilm but even here line reading will be done by OCR and we shall have the great advantages of combining dense photographic storage with sophisticated OCR read-out.

ocr standards

As I said earlier, punched cards are easy to read because they are highly controlled documents. This is true of other OCR documents as well. The more control one puts into a document, the simpler and less costly is the reading machine. The relationship is far from linear.

If one were to plot the cost of a reading machine versus the control of a document (define that as you will), one would get an exponential curve that would have the following characteristics: For completely uncontrolled documents the cost of the machine would be infinite; for documents with a small amount of control, like mail or a great variety of business forms with no control of typing, the cost of the machine would be, perhaps, one to two million dollars. Then the price drops to controlled form machines in the one-half million dollar class; for turn-around documents in the

$100,000 range; and finally simple one-line controlled-font machines in the $10,000 class.

Now, how can we get this control? The answer is "Standardize!" Standardize the type of paper, standardize the size of paper, standardize the quality of printing, standardize the format, and standardize the font.

When the U.S. banking industry chose the magnetic characters with very tight control of the print quality, there were many eyebrows raised as to the "peculiar" appearance of the characters. The characters, of course, were designed for easy machine readability with the knowledge that the human being would have no trouble after the initial rise of his or her eyebrows—and this is exactly what happened. Checks are read with inexpensive equipment, the error and reject errors are extremely low, and the eyebrows have come down.

When I was an employee of the National Bureau of Standards, working on reading machines in the early 1950's, I proposed that characters be standardized for the reading machine business which looked like it was just around the corner. The report went out to all the people we thought were working on reading machines and to quite a few possible users. I proposed a character formed as a 5 x 7 grid because the 5 x 7 grid was used by many high speed printers and because it is relatively easy to read such characters by machine. The answers to our proposals were surprising at the time, but would not surprise me now. I could summarize them by: "This is a very interesting idea, but who needs it?" Eventually the industry realized that we all needed standards and so the American Standards Association, which later became the United States of America Standards Institute, set up a committee which worked very hard and standardized ten numerals, an upper case alphabet, and some symbols. It is now working on a lower case font. This is the USASI-A font.

Our European friends did not agree with us about many things about font design. They designed a font called the ISO-B. It is being read by a few machines which either read numerals only or both numerals and the alphabet where the two are read separately. There is also a lower case font in the ISO-B.

There is one unfortunate thing about the B font. While it is a nice looking set of conventional characters it is not suitable for general OCR machine use. The character shapes are not sufficiently different from each other for reading machines as we know them today. This is not the place to go into the technical arguments as to how the B font was designed. The American OCR engineers could write a book about measuring character differences by areas versus differences in centerlines. We could argue endlessly whether OCR characters will be printed only by good printers or very often by poor equipment with sloppy maintenance. The fact of the matter is that the A font is easy for machines to read and the B font cannot be read when the characters are not perfectly printed and when it is to be read it can only be read by expensive machinery. Nor can the B font be printed by certain types of nonimpact printers that are becoming increasingly popular today.

I would most diffidently propose, with all due respect to the esthetic tastes of our European co-workers, that they reexamine the B font and either modify it or design another font that is designed for OCR use, or make use of the A font which, at least in lower case, is almost conventional.

Our experience with thousands of users is that the stylizing of the A font doesn't create any human problem. There are, for example, some 3,000 A-font typewriters in the field offices of the Department of Agriculture typing out forms which are then read by our OCR equipment. I know of no case where anyone had to go to a doctor for eye treatment or to a psychiatrist because of the font. I don't even know of anyone who raised even mild objections. We use the font in our correspondence and much of our office work. People do not seem to notice it.

The esthetics of characters vary with time and place in history. The serifs which we know today are based on something that happened in Roman times due, some believe, to the problems of chiseling in stone. In any case, the Roman serifs were copied in our printing.

While we are on the subject of esthetics, it might be interesting to point out how some shapes become folklore. When automobiles were new and exciting, after the turn of the century, photographs of racing cars were almost always taken by cameras of the Graflex type. This basic photographic instrument has a focal plane shutter which has a narrow slit that moves downward over the image. Because the image is upside down in the camera, the bottom of the wheels is thus photographed first and the rest of the car is photographed progressively later. This produces a distortion which makes the car appear to tilt forward and the wheels look elliptical. This distortion has become so ingrained in our conscience that all cartoonists draw cars leaning forward when they want to indicate speed and the windows in our buses have the vertical lines tilted forward, and for the same reason. It is interesting to think what would have happened if the Graflex camera shutters moved up instead of down.

While we are on the subject of esthetics, what about the length of women's skirts? Or the shape of the heels of their shoes?

Airplanes are shaped to fly through the air with the greatest of ease, but many other things that do not fly through the air are also streamlined. Suppose the aerodynamic drag were lower for blunt, square objects—what would have happened to the streamlining of our toasters and washers?

Perhaps there are some absolutes in esthetics, but it is hard to see why Roman characters are inherently more beautiful than Chinese, Arabic, or Hebrew. Finally, why can't a simple mechanic like myself have the right to question and alter the shape of characters as did a Roman stonecutter?

conclusion

The world population of OCR today is something of the order of 600 machines. But as I write this, new machines are being developed, and if one assumes that every computer will have an OCR input just as it now has a print-out, it appears that even if no more computers are built, the potential for OCR is something like 50,000 machines.

Since we do not expect to stop the building of computers, the potential for OCR is, in the words of the promoter, "staggering."

There is simply no question that OCR equipment will be as popular as printing equipment is today and, in fact, some wag has said that an OCR machine is nothing but a reverse printer.

I am in agreement that for a long time to come reading for entertainment will not be done by anything but a human, except in the case of the blind, but the vast amount of printing which is not intended for entertainment, and this includes most of the stuff we read during our working day, will be read by machine. Hopefully, the stuff will be processed completely by machine with a human doing only that which a human should do, namely, making decisions.

I think the world will agree with me that the use of young women to act as transducers of data is an inexcusable waste. Human beings should be used for human functions, and machines should be used for machine functions, and the entry of data into computers is a machine function which should be reserved for OCR. ■

more to choose from

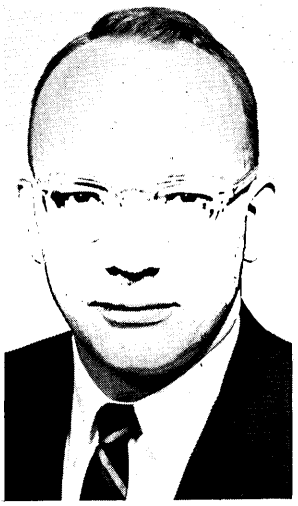
OPTICAL CHARACTER RECOGNITION— A SURVEY

by P. L. Andersson

Commercial optical character recognition was 13 years old this January, and, as the age indicates, OCR is still in its adolescence. At a time when commercial computer installations are rapidly approaching the 100,000 mark and input data preparation is generally conceded to be hampering the growing computer industry, the best estimates of OCR installations are only of the order of 1,000 or so. While this number is small, it is still large enough to conclusively prove the value of OCR; but despite these working installations, the field is still viewed with suspicion and distrust by many data processing managers.

To balance this opinion, there is only a small, if well meaning and dedicated, group of supporters who view OCR as the answer to all data entry problems. As usual, at the present level of technology, the truth lies somewhere between these extremes. Admittedly, some of the adverse opinions of OCR may be the result of early experience, when gasoline charge slips were returned with more patches than correctly punched holes. Today's OCR systems not only work better than their historical counterparts, but an increasing trend towards eliminating the actual punching of tab card forms makes errors more difficult to spot. This is a psychological advantage of the first order, particularly in credit card systems, one of the first volume uses which is still the best known of OCR applications. In fact, most large credit card organizations, such as American Express, Diners Club, Carte Blanche, etc., would hardly be feasible without OCR.

In addition to credit cards, OCR systems are used in department stores and other retail establishments for reading cash register and adding machine tapes. They are used by industry in general as information input devices, replacing punched paper tape, punched cards, and magnetic tape data inscribers, and by financial institutions for reading such documents as mortgage coupons, premium coupons and other return documents. Stock brokers are seriously considering the use of OCR for reading and controlling stock certificates. Airlines are using OCR to control tickets, and railroads are experimenting with the reading of num-



Mr. Andersson heads the consulting firm of Andersson Associates, which he founded in 1964 to specialize in advanced computer technology. He was with Univac for seven years, and before that with RCA and GE. He has a BS in mechanical engineering from the Univ. of Pennsylvania and has done graduate work in electrical engineering, marketing, and business administration.

bers on box cars for freight car inventory and control systems.

A particularly interesting example of the advanced state of the art is the multiple font readers installed in U.S. post offices. These machines read machine printed zip codes directly and can also recognize the alphabetic names of states and large cities. Four units have been in use for some time in Los Angeles, Houston, Detroit, and Boston, and machines have recently been installed in Philadelphia, San Francisco, New York and Chicago. Fourteen more of the machines are on order, although they have not yet been allocated to specific post offices. These machines, which are capable of recognizing multiple fonts, can also feed a variety of envelopes of widely divergent sizes, weights and shapes and locate the zip code on the face of the envelope before reading it. All this without mutilating any of the mail, no mean task for even a complex machine!

the choices

With the over-all diversity of applications it is not surprising that there are quite a few different machines available.

The chart which accompanies this article is an attempt to tabulate all the currently available machines, with the knowledge that any such listing can provide only a reasonable guide to machine selection, since many of the factors which have been recorded are subject to change. The manufacturers should be contacted for more information about closely competing machines. (The full names and addresses of present, and some potential, manufacturers will be found at the end of this article.)

OCR readers can be classified in two ways: first, by the type of document transport used, and second by the complexity of the font selection which the machine will handle. There are roughly three types of OCR document transports available:

1. The document reader—a machine capable of reading one, two, or three lines of information on a paper coupon, stub card, or like document. Note that the capability to handle a relatively few lines, rather than the size of the form used, is the prime characteristic.
2. The journal tape reader. This is a machine intended for reading tapes generated by cash registers and adding or accounting machines. In general, its applications resemble those of similar punched paper tape systems.
3. The page reader. A machine which will read multiple lines of typed or printed material in normal page format. Machines of this type will usually accept 8½ x 11 or 8½ x 14 forms.

Combinations of these types are possible, since several machines can read documents or pages as well as journal tapes.

When classed by font selection, OCR readers tend to fall into three categories: (1) the "psuedo" mark-sense readers, (2) the stylized font reader, and (3) the multifont reader. Only two manufacturers are building machines in the first category which are really difficult to class as true OCR readers, since they actually sense marks or bar codes arranged in the shape of numeric characters. These are GE and NCR. The GE machines read the GE COC-5 OCR font, a font made up of vertical bars, so the numerals are rather difficult for people to read; but this font makes it possible to operate in a mark-sense mode, with extremely simple recognition logic. Fig. 1 shows several of the COC-5 characters and the manner in which they are read. The missing bars in the characters generate a simple binary code in the recognition circuitry. The Bull CMC-7, now a proposed European standard, is a magnetic code which operates in much the same manner.

Going a step beyond, the NCR NOF font is easier to read manually and is mechanically read by two separate photo cells, one scanning a track through the upper half of the character while the other scans a track through the lower half. This code is shown in Fig. 2. The binary numbers above and below the characters indicate the bit pattern seen by each of the reading tracks. Except for the rather strange looking symbols, NOF appears as a reasonably normal numeric font.

The second type of reader will generally accept one or more stylized fonts. This represents a second stage of complexity beyond the pseudo mark-sense units described previously. The commonest font which almost all machines will read today is the USASC OCR font (see Fig. 3). Probably the

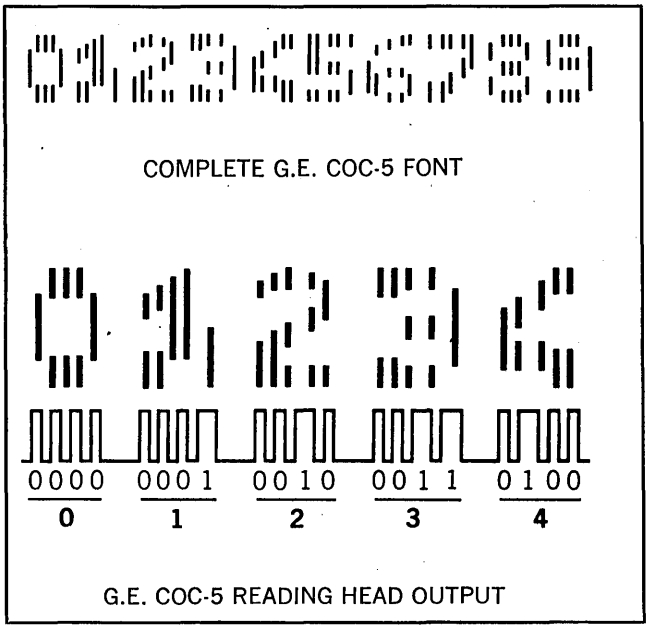


Fig. 1

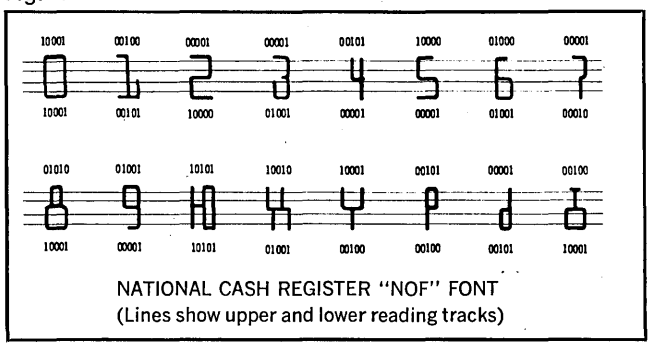


Fig. 2

next most common font is the Farrington "Self Chek." Beyond this point some machines will accept almost any Gothic numerics: The Opscan 288 and the IBM 1287/88 will read handprinted numerals. Within this class we also find several machines such as the Control Data 915, the Farrington 2030 and 3030, and the IBM 1288 which will accept a full alphanumeric font.

The third stage of complexity, then, is the multifont reader. These machines accept, as a minimum, a small group of standard typewriter or printed fonts and will usually read both upper and lower case. Several will read handprinted alphabetics.

A rough guide for relative pricing of each of these categories would place the semi-mark-sense machines in the $100,000 purchase price class. The stylized font readers fall into the order of $100,000 to $350,000 purchase price class, and the normal or typographic font readers are above $350,000. Probably in the last analysis a figure of $400,000 would be closer to correct. Of course, to some extent, these figures depend on the type of document handling devices supplied. Page readers are generally the most expensive units and journal tape readers the least.

I have included MICR equipment with the OCR machines because many of the MICR installations are performing tasks similar to those accomplished by OCR. The document handlers are frequently similar and MICR must be regarded as a superior method of handling financial control applications. Note that the Burroughs B9134-1 can be equipped with both OCR and MICR reading heads. There are far more MICR than OCR installations throughout the U.S. Of the 14,000 banks in the U.S., about 1,000 are using 1500 computers, virtually all of which include MICR check handling equipment.

Looking at the comparison chart, it can be seen that many machines will read several stylized fonts, and quite a few of the machines will also handle mark-sense information, a convenient expedient for correction or alteration of a preprinted initial entry. For instance, an invoice coupon or stub can be designed with a mark-sense area so if the amount paid by the customer does not correspond to the amount preprinted on the stub, the actual amount can be entered by any clerk with no equipment other than an ordinary lead pencil.

The most recently announced handprinted character reader, the Opscan 288, is at the opposite extreme and imposes a great deal of constraint in writing numerals so that detection circuitry need only determine whether or not a stroke or portion of the number passes through a given area. Because of the simplified recognition technique the 288 is relatively inexpensive. Even though characters are detected in what is predominantly a mark-sense mode, it is very much easier to check or proofread entries which have been handprinted in a horizontal line than it is to check the traditional mark-sense arrangement, essentially a Hollerith numeric code.

Although Recognition Equipment, Scan Data and Farrington have announced or demonstrated the capability of reading handprinted alphanumerics, I know of no actual installations to date. Philco has recently constructed a handprinted alphanumeric character reading machine for the National Educational Testing Service to read names and addresses on test scoring forms, but this machine is not commercially available. Philco has also been working on a handwritten zip code reader for the U.S. Post Office.

From the list of tabulated machine characteristics, it is possible to derive some interesting information on the future trends of OCR. For instance, Farrington, NCR and IBM are now all manufacturing journal tape readers. The Farrington journal tape reader is the newest and fastest machine in the Farrington line. As the largest application area for journal tape readers is in retail merchandising, this leads one to believe that retail establishments have finally arrived at a point where it is possible for them to effectively and economically use OCR. A check of nearby department

Fig. 3

For the same reason, there has also been a trend toward handprinted character readers in the past few years, some of which are only improved and specialized mark-sense readers. While many of the high priced alphanumeric multifont readers will read handprinted characters, the most popular handprinted character reader by far today is the IBM 1287 document reader. This is a curve tracing reader which follows the outline of the handprinted numeral with a small circular scan. If the trace formed by the character fits into the normal tolerance pattern for a particular character, then the machine will identify it correctly. This technique permits a rather wide variation in handprinted numerals.

stores shows this to be true. (See also "The Demise of the Keypunch," DATAMATION, March, 1968).

Note that only one company still manufactures what, for want of a better name, can be termed a "self punch," a machine which reads OCR information from punched cards and then actually punches that information into the card. Since the characters must be read optically anyway, most OCR tab card forms today are read and sorted optically without card punching. This is far simpler and considerably faster.

Trends in future equipment also show an increasing tendency toward the use of software recognition logic. With

(Text continued on p. 48; Equipment Charts pp. 47, 48)

OPTICAL AND MAGNETIC CHARACTER RECOGNITION EQUIPMENT

PAGE 1

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (Inches)	Documents per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
Burroughs	B102 & B103 Sorter-Reader	Friction	Conveyor Belt	Length:5.94-9.06 Width: 2.69-4.06	1,000 to 1,565	Magnetic	Analog Wave-form Matching	E-13B CMC-7	Numerals, Four Special Characters	Max. 3,200	1960	$91,000
	B9134-1 Reader-Sorter	Friction	Conveyer Belt & Roller	Length: 5.94-9.06 Width: 2.69-4.06	1,625 Max,	Magnetic or Optical	Matrix Matching	E-13B CMC-7 USASC OCR-B	Numerals, Four Symbols (Five Symbols OCR-B)	2,400 (MICR) 3,000 (OCR)	Late 1969 (MICR) 1970 (OCR)	$96,000 $80,400
Farrington Electronics, Inc.	3010 Document Reader	Vacuum	Drive Rollers	Card Stock: From: 2.2 x 2.75 To: 8.5 x 6.0 Documents: From: 2.625 x 2.75 To: 8.5 x 6.0	Max. 440	Optical Mechanical Disc	Stroke Analysis	Selfchek 7B, 12F and/or Selfchek 12L IBM 407 IBM 1428 USASC	Alphanumerics, Punctuation Marks, Special Symbols	Max. 400	1967	$2,920 R
	3020 Self-Punch	Vacuum	Drive Rollers	Standard Tab Cards: 51 or 80 column	Max. 500	Optical Mechanical Disc	Stroke Analysis	Selfchek 7B, 7BR, 12F and 12L IBM 1428 USASC	Numerals Special Symbols Punctuation	Max. 600	1969	$2,635 R
	3030 Page Reader	Vacuum	Drive Roliers	From: 4.5 x 5.5 To: 8.5 x 14	(1)	Optical Mechanical Disc	Stroke Analysis	Selfchek 12F and/or Selfchek 12L, USASC	Alphanumerics, Punctuation Marks Special Symbols	Max. 400	1967	$3,625 R
	3050 Page Reader	Vacuum	Drive Rollers	From: 4.5 x 5.5 To: 8.5 x 13.5	(1)	Optical Mechanical Disc	Stroke Analysis	Selfchek 12L or OCR-A Only (either, not both)	Alphanumerics Special Symbols Punctuation Marks	Max. 400	1969	$2,345 R
	4040 Journal Tape Reader	Tape Spool	Vacuum Conveyer	Length: to 350 ft. Width: 1 5/16 to 4 1/2 in.	6,000 lpm	Flying Spot Scanner	Stroke Analysis	Selfchek 7B or 12F IBM 1428, NOF, USASC	Numerals Special Symbols Limited Punct.	Max. 2,000	1969	$3,150 R
General Electric	MRS-200/205	Friction + Vacuum	Conveyer Belt	Length: 5.25 to 9.0 Width: 2.5 to 4.15	Max. 1,200	Magnetic or Optical	Analog Wave-form Analysis (MICR) Inbuilt Code (OCR)	E13B, CMC-7, COC-5	Numerals, Limited Symbols	Max. 2,400		$2,080R
	DRD-200	Friction + Vacuum	Conveyer Belt	Length: 3.5 to 8.5 Width: 2.5 to 4.19	1,200	Optical	Inbuilt Code	COC-5	Numerals, one Symbol	2,400		$1,200R
GE/Bull	MDR-100	Friction	Belt	Length; 2.35 to 8.75 Width: 2.75 to 4.5	300-650	Magnetic	Inbuilt Code	CMC-7	Alphanumerics Limited Symbols	Max. 700		
IBM	IBM 1412	Friction	Conveyer Belt	Length: 6 to 8-3/4 Width:2=3/4 to 3-2/3	Max. 950	Magnetic	Matrix Matching	E-13B	Numerals, Four Special Symbols	Max. 1,600	1960	$91,400
	IBM 1418 I and II	Friction	Vacuum Drum and Conveyer Belt	Length: 5.875-8.75 Width: 2.75-3.67	Max. 420	Optical Mechanical Disc	Matrix Matching	IBM 407-1 Font or 407-E-1	Numerals, Special Symbols	Max. 500	1962	$120,300
	IBM 1419 Model 1	Friction	Conveyer Belt	Length: 6 to 8.75 Width: 2.75 to 3.67	Max. 1,600	Magnetic	Matrix Matching	E-13B	Numerals. Four Special Symbols	Max. 2,112	1962	$110,500
	IBM 1428 1 II & III	Friction	Vacuum Drum and Conveyer Belt	From: 3-1/2 to 2-1/4 To: 8.75 x 4-1/4	Max. 400	Optical Mechanical Disc	Matrix Matching	IBM 1428	Alphanumerics, Symbols	Max. 480	1963	$138,600
	IBM 1282	Friction	Card	51 or 80 Column Cards	Max. 200	Optical	Matrix Matching	1428E, Farrington Selfchek	Numerals Three Symbols	N/O	1964	$72,000
	IBM 1285	Tape Spool	Tape	Journal Rolls Width: 1-5/16 to 3-1/2 Length: 36" to 200'	Max. 2,000 lines per	CRT Scanner	Matrix Matching	1428 - NOF	Numerals, Seven Symbols	Max. 365	1966	$84,000

(1) Dependent upon number of lines and fields within lines to be read.

OPTICAL AND MAGNETIC CHARACTER RECOGNITION EQUIPMENT

PAGE 2

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (inches)	Documents per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
IBM	IBM 1287	Friction + Tape Spool	Belt & Roller	Max. 5.91 x 9.00 Min. 2.25 x 3.00 Journal Rolls 1-5/16 to 4-1/2 x 36" to 200'	(1) Max. 750 (Doc.) Max 3,400 lpm (J. T.)	Optical CRT Scanner	Curve Tracing Matrix Matching	Handprinted Numerals + 5 Alpha, 1428, Selfchek 7B, USASC NOF, 3/16" Selected Gothics	Numerals, Special Symbols, Mark Sense, Upper Case Alphabetics	Max. 2,000	1968	$126,000
	IBM 1288	Friction	Belt & Roller	Max. 9 x 14 Min. 3 x 6.5	(1) Max. 444	Optical CRT	Curve Tracing Matrix Matching	Handprinted Numerals + 5 Alpha, USASC, NOF 1428, Selfchek 7B 3/16" Selected Gothics	Upper Case Alphabetics Special Symbols Mark Sense Numerals	Max. 1,000	1970	$230,000
National Cash Register Co.	420-2	Automatic Tape Spooling Device	Tape	Journal Rolls Width: 1.31 x 3.25 Length: 10 to 1560"	52 lines per sec.	Optical Mechanical Disc	Inbuilt Code	NOF	Numerals, Special Symbols	Max. 1,664		$80,000
	670-101 Sorter/Reader	Friction	Conveyer Belt	Length: 5.8 to 8.75 Width: 2.5 to 3.85	Max. 600	Magnetic	Analog Wave-form matching	E13B,	Numerals, four special symbols	Max. 1,200		$45,000
	671-101 Sorter/Reader	Friction	Conveyer Belt	Length: 4 to 8.75 Width: 2.75 to 4.5	1,200	Magnetic	Matrix Matching	E13B, CMC-7	Numerals, special Symbols	Max. 3,200		$117,500
Optical Scanning Corporation	Opscan 288	Vacuum	Conveyer Belt	Length: 3.5 to 8.5 Width: 2.5 to 4.5	1,200	Optical, Parallel Photocells	Matrix & Feature Matching	Handprinted Characters USASC, Mark Sense, 1428, Selfchek 7B	Numerals + 6 Alpha, two Symbols	Max. 800	1969	$100,000
Philco Corp.	General Purpose Print Reader	Vacuum	Conveyer Belt	From 5 x 7 to 8-1/2 x 11	180	Optical, Flying Spot Scanner	Matrix Matching	Multiple Type Fonts	Alphanumerics, Punctuation Special Symbols	Max. 1,000	1965	$300,000
	P6600	Customer Supplied	Customer Supplied	------	600	Multiple Remote Vidicon (Max. 30)	Matrix Matching	Futura, 1403	Alphanumerics Punctuation Special Symbols	Max. 1,000	1969	$70,000
	P6700	Microfilm	Film Reel	35 mm. x 100'	N. A.	Flying Spot Scanner	Matrix Matching	Customer Selected	Numerals	1,000	1969	
Rabinow Div. of Control Data Corporation	915 Page Reader	Vacuum	Conveyer Belt	Length: 2.5 to 14 Width: 4 to 12	Max. 180 for 8.5 x 11"	Optical Parallel Photocells	Matrix Matching	USASC	Alphanumerics Punctuation	Max. 370	1965	$110,000
	935-1/935-2 Document	Vacuum	Belt & Roller	Length: 2.25 to 8.5 Width: 3.00 to 5.50	200 Max.	Optical Parallel Photocells	Matrix Matching	USASC (935-1) USASC, 1428, 407-1, 1428E, Selfchek 12F, 7B, Mark Sense (935-2)	Numerals, three Symbols (935-2 reads USASC Alphanumerics)	Max. 750	1969	
Recognition Equipment, Incorporated	Electronic Retina Document Reader	Vacuum	Conveyer Belt	Length: 3.25 to 8.75 Width: 3.25 to 4.75	1,200	Optical Photocell Matrix	Matrix Matching	Handprint, Multiple Type Fonts, Mark Sense	Alphanumerics, Punctuation, Special Symbols	Max. 2,400	1964	$730,000
	Electronic Retina Rapid Index Page Reader	Vacuum	Belt & Roller	Length: 3.25 to 14 Width: 4.88 to 14	Max. 30	Optical Photocell Matrix	Matrix Matching	Handprint, Multiple Type Fonts, Mark Sense	Alphanumerics, Punctuation, Special Symbols	Max. 2,400	1964	$740,000
Scan Data	100/300 Page Reader	Vacuum	Conveyer Belt	8.5 x 11	(1)	Optical Flying Spot Scanner	Feature Analysis	Handprint, Multiple Type Fonts	Alphanumerics, Punctuation, Special Symbols	Max. 600	1968	$400,000
	200 Page Reader	Vacuum	Conveyer Belt	8.5 x 11	(1)	Optical Flying Spot Scanner	Feature Analysis	USASC, OCR-B, 1403 Selected Typewriter Handprint	Alphanumerics Punctuation, Special Symbols	Max 600	1969	$175,000

(1) Dependent upon number of lines and fields within lines to be read

the decreasing cost of small computers, it has become more and more advantageous to use a properly programmed general purpose computer to replace the wired recognition logic found in the early machines. The ultimate equipment configuration in this progression would be a simple scanner on-line to a reasonably sized computer, serving a function virtually no different from that of any other computer peripheral, with the computer performing all aspects of character recognition. Two currently available multifont readers, the Scan-Data and Recognition Equipment machines, exemplify this trend, as they are connected on-line to Digital Equipment and SCC computers respectively, while the Philco unit uses a special purpose, but internally programmed, computer. The IBM Multi-font Reader, the 1975, was a special order item and is not now being actively marketed. Whether or not it will be returned to active market competition in the future is questionable. Both the Philco and IBM machines are capable of reading a staggering multiplicity of fonts. The Philco machine installed at Rome Air Force Base will read 27 separate fonts, while the 1975 has the capability of reading any nonproportional typewriter or accounting machine font. The single copy of the IBM 1975 is installed at HEW, where it is used to read, with minimum preprocessing, the social security withholding forms prepared by every U.S. employer.

With a background of complex and sophisticated machines available it would seem that the future of OCR is more in improving user acceptance and in cost reduction of readers, but improved technology does have some possibilities. Perhaps the brightest hope for the future of OCR lies in the use of direct optical image processing through the use of laser and holographic techniques. Several companies are known to be working in this area. With direct optical image processing, it is possible to restore degraded images, thereby improving the signal-to-noise ratio presented to the recognition circuitry, or to recognize certain types of patterns much more easily and simply than by purely electronic techniques. While the physics of the operation are such that it would be difficult to construct an optical system which would recognize a complete alphabet, direct optical image processing could be used to augment electronic techniques, forming a hybrid system of considerable power and relatively low cost.

There are also several companies which expect to announce new OCR systems within the next year or so, so the field is hardly static at this time. Univac, Mergenthaler Linotype, Scan-Optics, and Information International are among the most frequently mentioned names.

After reading OCR articles for many years which have concluded with some variant of the phrase "OCR has come of age," it seems incongruous to use it even once more. Nevertheless, I believe indications of a developing market are stronger today, both in the host of machines available, and in the greater acceptance of OCR by large segments of the data processing industry, than ever before. It is clear that the technology has finally matured to the point where OCR can be utilized for all input applications where a data processing organization has reasonable control over the preparation of the input document. ■

Names of Current Manufacturers

Rabinow Division of Control Data Corp.
1425 Research Blvd.
Rockville, Md. 20850

Optical Character Recognition
Information Systems Division
General Electric Corporation
Phoenix, Arizona 85000

OCR Products Administrator
International Business Machines Corp.
3605 Highway 52 North
Rochester, Minn. 55901

National Product Manager
Farrington Manufacturing Company
5881 Leesburg Pike
Falls Church, Virginia 22041

Scan-Data Corporation
800 East Main Street
Norristown, Penna. 19401

Public Relations Dept.
The National Cash Register Company
Dayton, Ohio 45409

Industrial Marketing Div.
Burroughs Corporation
6071 Second Avenue
Detroit, Michigan 48200

Optical Scanning Corporation
P. O. Box 40
Newtown, Penna. 18940

OCR Sales Manager
Philco-Ford Corporation
3900 Welsh Road
Willow Grove, Penna. 19090

Recognition Equipment Inc.
1500 West Mockingbird Lane
Dallas, Texas 75200

Names of Potential Manufacturers

Information International Inc.
545 Technology Square
Cambridge, Mass. 02139

Scan-Optics, Inc.
100 Prestige Park Road
East Hartford, Conn. 06108

Mergenthaler Linotype Co.
One Mergenthaler Drive
Plainview, L.I., N.Y. 11803

Honeywell Electronic Data Processing Div.
60 Walnut Street
Wellesley Hills, Mass. 02181

Data Recognition Corp.
644 Emerson
Palo Alto, California 94301

Peripheral Sub-Systems
Univac Div. Sperry Rand Corp.
Jolly Road
Whitpain, Penna. 19422

OCR FOR CREDIT CARD PROCESSING

rei moves in

by J. L. Poitevent

Almost since optical character recognition (OCR) first came on the data processing scene in the mid- to late-1950's, the credit card industry (particularly oil companies) has used some sort of scanning device—usually optical card punch equipment—and an array of keypunch machines, verifiers, proof encoders, sorters, and collators.

In 1957, oil companies such as Mobil, Standard of California, Standard of Indiana, and others had installed early generation OCR systems to process credit card charge tickets for statement preparation. And even from the very first, it was apparent the largest single OCR application would be credit card billing. Almost immediately, manufacturers turned to the task of developing volume information processing needs.

One such system is the Electronic Retina* Computing Reader manufactured by Recognition Equipment Inc. Along with its Ink-Jet Printer and Bar Code Reader/Sorter, the optical reader is today widely used by the credit card industry—processing more than 100 million documents weekly.

Recognition Equipment systems, with a total purchase value of about $19 million, already are installed and in operation at Texaco, Humble Oil and Refining, Atlantic-Richfield, Texaco/Canada, Imperial Oil of Canada, and at American Express (not an oil company, but one of the largest credit card organizations). Another $13 million worth of equipment has been ordered for installation in 1969 at American Oil, Gulf, Mobil, Sinclair, Standard Oil of California, and Standard Oil of Ohio. Users of any of these companies' credit cards have seen the evolution of these large-scale optical reading and sorting systems during the past two years when they receive their monthly statements. The bar codes appear on the back of both charge tickets and statements.

*Electronic Retina is a trademark of Recognition Equipment Inc.

Reviewing the industry's use of the Electronic Retina Computing Reader, we must first consider the challenges faced by credit card companies during the past five years in processing large volumes of charge tickets for customer billing, why they chose optical reading, and how they have been able to solve many of their data input problems.

information processing problems

Most major oil companies extend credit to their millions of customers. In order to collect on these charge accounts, a typical company must process hundreds of thousands of individual credit purchases that pour in daily from its service station dealers and bulk plant operators and send out

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monthly statements on intricately designed billing cycles. And to properly bill customers, the companies must balance ticket batches against daily dealer summaries, capture account numbers and amounts of purchases, encode the tickets for sorting, segregate the tickets for proper placement in their vaults, sort according to billing cycle, and prepare statements. The credit card centers also must fine-sort the charge tickets and statements for mailing to customers.

Prior to 1967, when large petroleum marketers began installing large-scale optical reading and sorting systems, most used optical scanner punch systems, plus keypunching and related equipment that, when used in a credit card operation, required up to 18 steps before statements and charges could be mailed to the customer. The process went something like this for most companies:

Upon receipt of ticket batches and dealer summaries, these were posted for dealer control and proper sequence numbers were scanned. The account numbers and purchase amounts were punched on cards, using optical card punch equipment. Batches with rejects (and for some companies the reject rates were as high as 70%) were sent to keypunch for correction or for filling in missing numbers, then to the optical card punch. All cards were tabbed for balance control. Out-of-balance batches were sent to a clerical-comptometer section, and in-balance batches were sorted by cycle. Cards then were retabbed for balance to generate billing cycle controls, and the tickets were placed in a billing file—a vault.

Charges for the next cycle to be billed were pulled from the vault in trays for fine-sorting. All necessary information then appearing on the cards was put on magnetic tape, and statements were produced on the computer. The account number, total purchase amount, and mail code were punched into the statements on the optical card punch, and the statements then sorted by mail code. Statements and charges were finally collected and prepared for mailing to the customer.

The industry's problems with credit charge processing operations were related, for the most part, to costs and time.

The number of steps involved sometimes took as many as six days (depending on volumes and billing cycle requirements) from receipt of charge ticket to sending of statements. And some companies experienced billing cycle delays of two or three days during peak volume months.

Costs were involved in equipment and personnel required to handle the credit card billing process. An installation with a monthly invoice volume of six million tickets, for instance, would have had 18 to 20 keypunch machines, six or more scanners, four proofing machines, six or seven sorters, up to five collators, and a few accounting machines—representing a total monthly rental figure of over $20,000. As for personnel, there probably were as many as 20 keypunch operators, six scanner operators, 20 or more unit record operators, three pre-balance clerks, and 15 batch checkers—costing more than $45,000 in 1968 monthly salaries. The handling of rejected documents alone would have tied up about a fifth of the total equipment and personnel.

These data processing headaches of the early 1960's were accompanied by additional problems that had to be faced. For example, most petroleum products marketing organizations had an ever-increasing volume of charge tickets to process due to more credit card users; some had consolidated several marketing organizations into one credit card system; there was an expanded acceptance of oil company cards by hotel and motel chains and an ever-growing trend of using cards for automotive accessories and mechanical repairs. Several large companies could foresee an annual ticket volume increase of about 15% from 1968 to 1972.

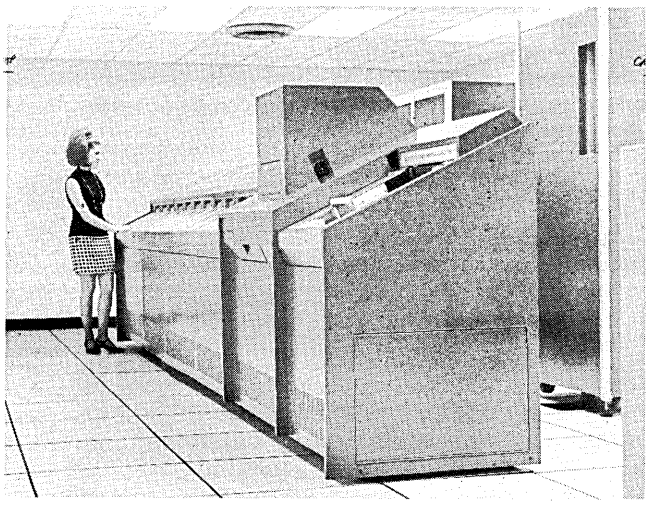
There was another problem, too, in most oil industry credit card operations. More people in the mid-1960's were taking auto vacations than ever before. Millions upon millions of charge tickets were flooding credit card centers during the summer peaks. A delayed billing cycle during summer months meant a continuing game of catch-up on into autumn.

enter optical reading

In 1967, it was realized that the method of data input in use at that time was not ideal for meeting some companies' ever-growing processing requirements. Furthermore, soaring processing costs had to be curtailed if data processing operations were to fit into corporate profitability pictures. After examining the alternatives available—improved key-to-tape equipment devices using cathode ray tubes, and the like—one company turned to large-scale optical reading as an answer. The equipment chosen was, as stated earlier, the Electronic Retina Computing Reader.

The Electronic Retina Computing Reader is a large-scale, program-controlled OCR system. It includes paper handlers, a general-purpose digital computer, the Electronic Retina and Recognition Unit, magnetic tape units, and line printers. The system is available with two types of paper handlers—a Page Carrier for page-sized documents and a Document Carrier for unit-sized documents—both of which can share the Electronic Retina and Recognition Unit.

Credit card companies use the Document Carrier for their processing needs. It handles documents from 3¼" by



An REI system with Document Carrier, used by major oil companies.

3¼" to 4¾" by 8¾" in size and weights from 12 pounds to heavy card stock intermixed. The system reads one or two lines from these documents and includes 12 output pockets. Reading speeds are 1200 documents per minute for invoices and 900 documents per minute for statements.

The Electronic Retina Computing Reader has no fixed vocabulary—it can read up to 360 characters. The typical credit card installation has a vocabulary of about 60 characters, including 7B (front or back read using a mirror image), E13B (MICR font read optically) for re-entry purposes, and 1403 (line printer font) used for statement preparation and internal accounting procedures.

The system's Ink-Jet Printer is an optional feature, but used by credit card organizations, that prints 30-bit-per-inch BCD codes on invoices and statements as they are being read at speeds up to 1200 documents per minute. Pressurized fluorescent ink flows steadily through a preci-

sion ground, glass nozzle. As the jet stream of ink leaves the nozzle, it breaks up into 48,000 drops every second. A piezoelectric vibrator insures that the drops are of uniform size and mass, only a few thousandths of an inch in diameter. In an 8-hour day, the printer consumes less than a pint of ink.

When the printer receives a command from the Programmed Controller to print a bar, a precisely controlled, variable electric charge is applied to each drop of fluorescent ink (used to give contrast) flowing from the tiny glass nozzle. As the drops move through a constant electrical field, they are deflected upward in proportion to the charge they carry and form a straight line. And, because the Ink-Jet Printer operates under computer control, it performs a read-after-write check each time a bar is printed.

The Bar Code Reader/Sorter is an independent system that reads and sorts the documents that have been encoded by the Ink-Jet Printer. Each reader/sorter includes a general-purpose computer and one or two document transports, the same basic transport as that on the Electronic Retina Computing Reader. As the documents move through the reader/sorter at speeds up to 1200 documents per minute, they pass a reading station with an ultraviolet light source. The unit reads and interprets fluorescent bar codes and, under program control, selects the proper output pocket for each document. A typical large oil company credit card center would have one Electronic Retina Computing Reader with Ink-Jet Printer and two or more Bar Code Reader/Sorters. Some oil companies, of course, have several credit card centers and such equipment installations at each.

credit card processing

Credit card companies use the system (along with other peripheral equipment) in performing the monthly billing processing function. Here is the step-by-step procedure:

As batches of charge tickets and dealer summaries arrive from the service stations and bulk plants, they are entered into the optical reader (usually in trays holding 2500-3000 tickets each) where each account number is verified using the self-check digit. Most companies' tickets come to the processing centers with the amounts imprinted by variable amount imprinters at the service stations; however, some still must manually encode these amounts on the tickets at the center using inexpensive proof encoders. A magnetic tape for properly read invoices is produced that contains account numbers and amounts. The total of the detail transactions for each summary is accumulated and zero-balanced with the amount shown on the dealer's summary. An audit trail for each transaction is produced on a line printer for balancing. Any out-of-balance or exception conditions are noted on the audit trail. The system then sorts all tickets according to the billing cycle sequence numbers.

Each reader/sorter has 12 pockets—with oil companies usually using 10 pockets for digital sorting, one pocket for rejects, and one pocket for miscellaneous documents requiring special handling. A thirteenth or "emergency" pocket catches any cards that have no rightful place to land and obviously must go somewhere. The chance of any document falling into the emergency pocket is rare, but when this occurs the sorter automatically stops, thereby signaling a sorting malfunction.

The account number and amount for the properly read documents are encoded by the Ink-Jet Printer while the invoice is on its initial pass through the system. The documents are then sorted by the reader/sorter according to base prefix numbers (usually a geographical designation) on the account ticket. Regular charges with other prefix numbers are placed in a second pocket (two passes are required on the second and third digits to place these items in sequence) for handling by center personnel. Interchange (tickets of the company's card holders from other companies' stations), government, and TBA (tires, batteries, and accessories) items are placed in the second pocket also. This is to allow special accounting procedures, particularly in the case of tax-free government agencies. Dealer summary and rejected items are sorted into the first pocket.

A batch listing balances the dealer's assignment. This listing shows the account number, amount, pocket number, the sequence within the pocket selected, and the tape sequence for each item read. Out-of-balance batches usually can be reconciled by addition of the rejected items, which are corrected with a proof encoder. A magnetic tape and audit trail then are prepared, exactly as in the original run.

The edited tape is fed into the computer for accounts receivable processing. At the end of a cycle, the statements produced from the billing process are entered into the optical reader, where the account number, amount, and mail code are printed on each statement using the Ink-Jet Printer. These statements are then placed with the charges for that cycle and fine-sorted by account number and mail code on the reader/sorter. On billing day, statements and charge tickets are mailed to the customer. The total processing time, from receipt of charge ticket to statement preparation, often is only one day, never more than two.

Customer complaints have been reduced, except for that occasional customer who claims his vacation gas purchases are on a statement reaching his home even before he returns from the annual summer jaunt!

At this point, it might be worthwhile to examine the reasons why the printer and reader/sorter are used for sorting instead of the sorting mechanism on the Electronic Retina Computing Reader. The optical reader could be used (and, in fact, some companies did before the printer and high-speed sorters were available for delivery) but not ideally.

Most companies use a seven-digit code for sorting, and the cost of tying up the more expensive reading system for multipass sorting is one major factor. Another is the need for maximum reliability. The documents are sorted in seven passes, using a single digit in each pass—beginning with the least significant digit. In any such sorting operation, rejected documents cannot be machine-sorted after the first pass. This is true regardless of the technology used; it could be MICR, OCR, punched cards, or bar codes.

To illustrate this, let's look at what happens on the second sorting pass. The documents are in correct sequence according to the least significant digit at the beginning of the pass. At the end of this second pass, they should be in correct sequence in accordance with the *two* least significant digits. If the rejected documents are rerun at the end, there is no way to merge a reject having 21 as its two least significant digits into the "2" pocket ahead of a correctly read document with 29 as its least significant digits.

The Electronic Retina Computing Reader is very reliable, but it would be reading actual characters for sorting that are field prepared. These characters might have been smudged or printed by a faulty imprinter at the service station. Even though read correctly once, there are seven more chances for error in the sorting process. The bar codes used by the reader/sorter are easier to interpret and are printed in the clean environment of the data processing center.

better controls available

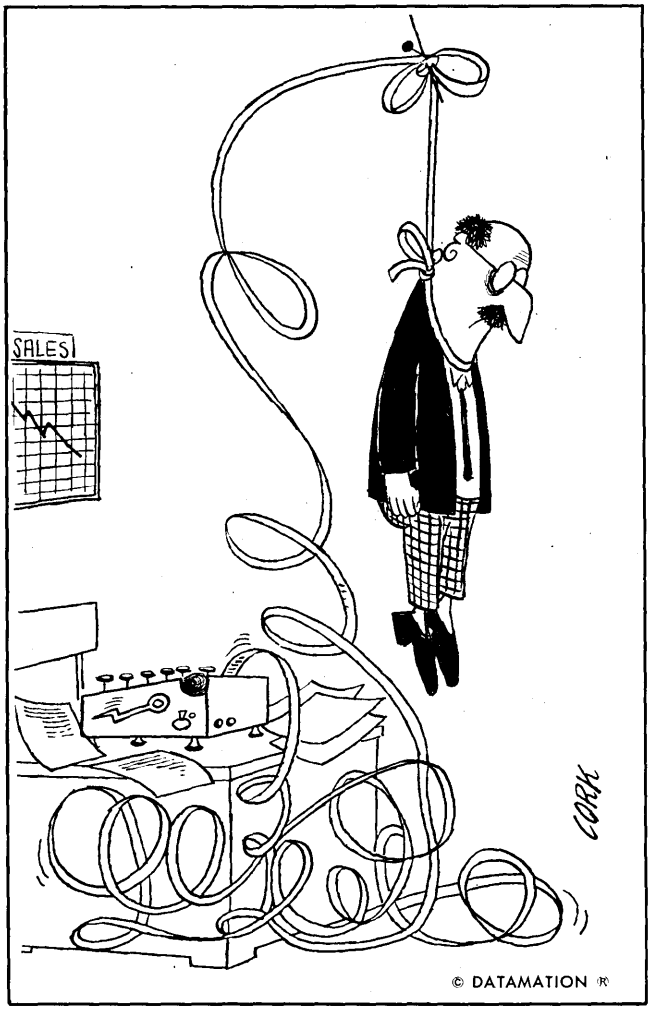
From the above detailed description, it is evident that companies have better accounting control from ticket receipt to customer billing. The many steps required now can be consolidated into an initial entry step. And most of the control balances required throughout the conventional processing path can now be eliminated.

The use of audit trails further tightens accounting control for the oil industry. For example: rejected documents had been handled through several steps and accounting control was extremely difficult. Now, rejected tickets from the ini-

tial entry run, along with their summaries and the audit trails, can be encoded by the proof encoder. After totaling, the rejects can be assigned a separate batch identification with the appropriate control and can be processed by the optical reader. It produces a magnetic tape and cycle distribution for the accepted items, a new audit trail, and a summary of items, if any, that still are unreadable. The rejected items and the new audit trail are then returned to the balancing phase of processing for recycling. As one can see, the audit trail's usefulness in the handling of rejects is significant.

Regarding rejects, the Electronic Retina Computing Reader can handle rejected documents in two ways, thereby eventually producing an almost perfect document. Obvious rejects are caught on the initial entry run, marked for attention of the proof encoding clerk, and returned once in correct form to the reader for data capture bar code spraying. The Ink-Jet Printer, having a read-after-write capability due to its being under computer control, can catch other errors that may still be present. As to the optical reading system's ability in lowering reject rates formerly experienced by credit card companies, it can be said that several oil companies have been able to cut their reject rates in half since replacing the optical card punch equipment formerly used.

Mutilated documents, or "mutes" as they are called by credit card processors, are considered rejects since most are unreadable by conventional scanning systems. They usually are caused by service station personnel or malfunctioning



station imprinters. Mutes have been almost eliminated by the Electronic Retina Computing Reader, according to several petroleum marketers, mainly due to its ability to read badly imprinted characters.

As with any corporate operating function, cost reduction is a primary factor in oil company credit card processing. As discussed previously, tighter accounting controls and lower reject rates made possible through optical reading save the companies money. One of the cost savings procedures used by oil companies with the optical reading and sorting equipment is what the industry calls a "range sort" for readying charge tickets in credit card center vaults. The vault holds all processed invoices until the billing cycle calls for them to be sent to the customer.

With conventional equipment, the companies were required to make four, sometimes five, sorting passes to get the tickets ready for vault storage. This now has been reduced to an average of 1.7 passes in most cases and never more than two—resulting in substantial dollar savings each year in personnel requirements and machine usage.

Looking again at a company with a six million monthly ticket volume, using the optical reading system has reduced equipment and personnel costs about $5000 per month. This is based on the use of one Electronic Retina Computing Reader with Ink-Jet Printer and two Bar Code Reader/Sorters—having a total rental cost of about $33,000 per month, including maintenance.

In addition, there is a substantial improvement in cash flow because of a reduced processing cycle. For the company with a daily volume of about 250,000 tickets (at an average value of $5 per ticket), a net daily cash flow of $1,250,000 would be available for every processing day saved.

An area of future savings being considered by oil companies with the optical reading system is in reduction of mailing costs, since these companies can switch from 45-pound card stock to 24-pound paper stock used for the invoices sent in and returned with statements. The company with six million monthly ticket volume mails about 90% of the tickets at six cents per packet and the remainder at ten cents per packet. Since the Electronic Retina Computing Reader can process paper invoices, over 99% of the tickets could be mailed at six cents per packet, resulting in a savings of about $7000 per month.

conversion to optical reading

One more point should be made regarding oil company utilization of optical reading. Conversions from punched-card systems to the new system have proved much easier than most companies anticipated.

Depending on particular operations, there usually are two choices available in conversion: spraying bar codes on every charge ticket in the vault in one operation (amounting to several million tickets at a large company) or spraying only the arriving invoices, handling existing documents in the old manner. The latter method more often is chosen, partly because it frees center personnel for other conversion duties and partly as a means of establishing a tighter control situation at the outset of the changeover.

The first conversion step, therefore, is in balancing all incoming invoices and in processing the dealer summaries so the dealers can be paid on schedule. Next, the system is used for encoding rejects and substitutions.

The third conversion step is in sorting documents for control and flow breakdown (sorting the tickets into pre-vault groups and for interchange handling) on the reader/sorter. The reading system then begins its final conversion operation—reading all invoices in the vault, except those scheduled on the billing cycle for that day, and recording account numbers only. In this manner, the vault can be "cleaned up," new invoices are phased in easily, and the system is made fully operable in a matter of days. ■

with handprinted input

OCR AT FOREMOST FOODS

by Robert C. McMindes

From the viewpoint of optical scanning, the accounting involved in monitoring the performance of dairy routes doesn't seem to be an ideal application. Although the volume of inputs in a national organization the size of Foremost Foods Co. is well above the threshold needed to justify optical scanning economically, there is no way to tightly control the quality of these inputs. The use of imprinters or any other type of business machine is out of the question; handprinted input is the only kind that is practical. What's more, the majority of the input comes from route drivers and plant personnel, neither of whom work in an environment that encourages good penmanship.

Despite this problem, the Foremost Dairy Div. of the Foremost Foods Co. decided in November of 1967 to use optical scanning to process the inputs to its route-accounting system. The decision was made on the basis of hard economics.

At the time, we had just begun automating and centralizing route accounting for our six regions within the continental United States. Since this involves the processing of some 70-75,000 documents a day, we had decided to automate the input processing as much as possible by using a mark-sense reader. Just about the time we had the first three branches of our first region, Northern California, on the system, the IBM 1287 optical reader became available.

The decision to switch to optical scanning was not a hard one to make. We weren't too far into the implementation program to make the switch impractical; the mark-sense reader automated only a portion of our input load; and cost studies showed that input processing with a mark-sense reader would cost approximately $200,000 a year more than with optical-scanning equipment.

The decision was a good one, both operationally and economically. Operationally, our handprinted character-reject rate is ½ to ¾ of 1%. Our document reject rate on some 30,000 documents a day now on the system is running at a very comfortable 15 to 18%, and 85% of these

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contain arithmetic errors that are easily corrected by the 2260 display terminal operators.

Economically, our first year of operation has produced a tangible savings of $350,000 when compared with the cost of keypunching the source documents. Since this savings is based on only two of our six regions, we expect it to grow as the others are added.

implementation

The application of optical scanning is not without challenge. The major one cropped up in April of 1968, when we went operational. At this point we learned the hard way that check digits, hash totals, and selective redundancy are essential to the most effective application of optical scanning equipment. Without them the system had no basis for recognizing printing or reading errors.

The solution was to redesign all our forms to include the necessary check digits, hash totals, and redundancy, and to modify our programs accordingly. The check digits eliminated the problem on all identification numbers, such as branch, route, customer, and product codes. The hash totals did the same for quantities and dollar values. And the requirement that some totals be entered twice provided a little extra insurance where we needed it. This job cost us two months, but when it was finished we went operational without any further delay.

Our relatively smooth implementation experience was due to taking some special care in two very important areas. One was the design and printing of forms. Meeting the high standards needed for optical scanning requires meticulous care in both the preparation of the paste-up mechanical for the printer and the printing process itself. To assure the quality of the mechanicals, we prepare all of them ourselves. To maintain printing standards, we have clearly documented our standards, have been careful to select only printers who are willing to work to the exceptional precision needed, and have maintained a very close liaison with the ones selected.

The other area was training. Since we are working with handprinted input, the training effort had to be much more comprehensive than that normally required to make a new system operational. We had to be concerned with training 4500 people to print numbers properly.

This took some three months of presentations that reached every location that would be affected. The presentation consisted, first, of slides demonstrating the type of automated accounting system being developed—why and how it would work. Special attention was paid to the types of automatic equipment that would be used and the types of forms that would be adopted. Every new form was shown along with the form it would replace.

This was followed by a discussion of how the forms should be filled out, with special emphasis on how the numbers should be printed. For this, we used an illustrated IBM manual on hand-printing for optical-scanning applications. Samples of properly printed numbers were displayed, without any explanation, on the walls of each location several days in advance of the presentation. Therefore, the audience was already subconsciously familiar with the numbers they would be required to print. After going through the rules for handprinting, we had everyone try to apply them by filling out a sample form. These samples were later run through the optical scanner and returned with an analysis of problem characters.

Actually, the training program was more in the nature of orientation. We made no attempt to teach people how to write a different way. All we were concerned with was familiarizing them with a few simple rules that would help them to write more legibly. The initial presentation did this quite successfully.

Naturally, our reject rate at the beginning was much higher than it is now. The major problems were zeros that were too small; sloppy twos, sixes, and eights; and the habit of linking numbers as letters are linked in script. These problems have been reduced to minimal proportions through a continuing program of returning documents with unreadable characters to the people who printed them, with an analysis of the problem.

One particularly interesting fact about the quality of handprinted input is that the drivers and plant personnel, the ones we thought would be the biggest problem, have done the best job. Our office personnel, by ratio of documents prepared, are responsible for the highest percentage of our rejects.

programming

Another important implementation consideration, of course, was programming. We chose a time-independent method of programming in which all the fields of the document are completely read before the data is processed (validated against check digits and hash totals), and all the processing is completed before the document is dispatched to the appropriate stacker. Carrying out these three functions in serial fashion precludes, of course, the opportunity to increase throughput by overlapping. Nevertheless, we had several good reasons for choosing this approach.

For one thing, speed is no problem on the 1287. Using the slowest programming method available, we are reading some 60 to 120 documents a minute, a rate that includes the manual reading and on-line keyboard correction of rejected characters.

Another reason was that the time-independent approach simplifies the programming job and makes it easier to add new documents and formats to the system.

systems operation

How the 1287 fits into our route accounting system is shown in generalized form in Fig. 1. The full equipment configuration consists of an IBM System/360 Model 40 with 128K core, five 2311 disc drives, four 2402 and one 2404 tape drives, the 1287 optical scanner, four 2260 keyboard-display terminals, two 1403 high-speed printers, one 2540 card read/punch, and a 2501 card reader.

The cpu operates in a multiprogramming mode under DOS/360. The 128K memory contains a 12K supervisor and three processing partitions: two foreground and one background. Foreground I, which is 22K, is where the 1287 operates. Foreground II, which is 48K, is where the 2260 display terminal operates. In addition, it also is used for spooling and various utilities. The background partition is 46K and is used for job processing in a batch mode.

The input processing subsystem consists of the 1287 scanner, the four 2260's, and two of the disc drives. The scanner and display terminals share a multiplexor channel with the printers and card devices.

Documents entered into the 1287 are sorted into three different categories: those which are error free, those which contain characters that can't be read, and those which have been read, processed and found to contain an error. The data from error-free documents are written to disc. Unreadable characters are displayed by the 1287 to the operator, who makes a judgment and enters the illegible characters through the scanner keyboard. The data from documents that have been read, processed and found to contain an error are written, along with a description of the error, to the second disc for 2260 display

terminal manual editing.

The 2260 display terminals have reduced the cost of this manual editing operation by approximately 50%. Working from the original source documents and a display of the data and error, a girl is able to handle some 120 documents an hour. Since 85% of these error documents contain hash totals for which the computer has already generated a new total, most of the editing time is spent retotaling on an adding machine to make sure that the scanner didn't misread a character. The clerk keys in her total from the terminal and requests the data to be saved for reprocessing, which is done in batches. The data records for documents that pass the second processing cycle are deleted from the error disc and written to the error-free disc. Any documents that still contain an error are recycled

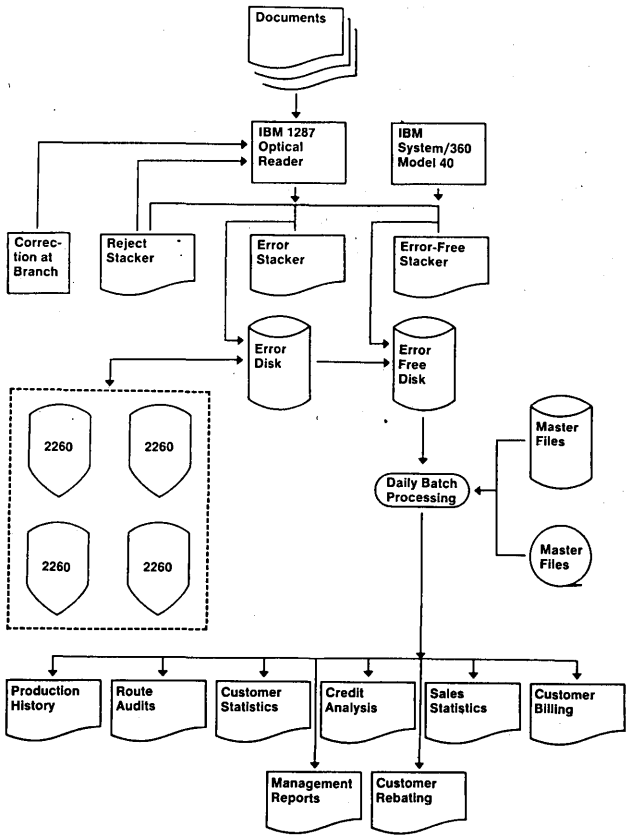


Fig. 1. Foremost route accounting system with optical scanning input.

through the edit/processing procedure for the second time. This happens infrequently, and when it does the error is always corrected on the second cycle.

Documents with units stated, but no description or product code number, cannot be handled by the clerks since they have no way of knowing what code number the originator intended to enter. Consequently, these documents are mailed back to the branches for correction. When the document is returned to us, the corrected data is entered through the 1287, and the data record goes through the same correction procedure explained above.

route accounting

The documents being handled in this manner consist of everything needed to monitor the performance, in detail, of over 1500 retail, wholesale, subdistributor and transfer routes in two regions. Within the next few months, we will be adding a third region with an additional 150 routes.

Two basic types of documents are involved: those generated by drivers and those generated by the office or plant.

The drivers generate:

Load sheets on which they order the stock needed for the next day.

Inventory sheets on which they specify what is being returned at the end of the day.

Sales tags on which wholesale drivers and subdistributors specify what was sold to each customer.

Deposit slips on which all drivers, plant and office, show their daily cash sales, collections and any payouts.

Accounts-receivables slips on which subdistributors specify sales to accounts whose receivables they have assigned to us.

Those generated by the office or plant are:

Charge/credit slips for nonproduct items, such as cabinet rentals, miscellaneous supplies, and accounts-receivables service.

Miscellaneous cash-receipts and disbursement slips for transactions unrelated to a specific route, such as cash received on house accounts.

Bad check charge-back slips.

Office-collection vouchers that show payments sent directly to the company by customers on wholesale and subdistributor routes.

Miscellaneous-transfer sheets to show stock transfers between branches.

A few additional documents are used in more than one operational area. One is a load-adjustment sheet that the drivers use to add to and delete from their orders, and to specify off-quality merchandise that had to be returned to the plant; another the plant uses to show items they couldn't supply in an order and substitutions they made; and another the office uses to enter corrections to error transactions from previous days. Since our primary concern is to provide a full accounting for all route activity every day, charge and cash errors are not held out but carried on the route account until they are corrected. The drivers responsible for the errors receive computer-generated correction memos that provide a copy of all the data on the error document with an explanation of the error. These memos have a turnaround section that is returned to the office and entered back into the system.

Another document used in more than one area is a miscellaneous-entry form for retail routes. It is used by the drivers for such things as customer transfers and deposit adjustments to correct an error from a previous day. It is used by the office for such things as payments made by retail-route customers to the office, payroll credits, and adjustments to customer bills.

The main product created from all this data is a daily audit for each route. While the audit for retail, wholesale, and subdistributor routes differ slightly in their details, they all show three different pictures of route performance. The first picture shows the driver's accountability for the day in terms of physical stock. This is shown in detail: an itemized account of his initial load, all additions and deletions, sales, returns, and any overs and shorts. Transfers between branches are handled as routes.

The second picture concentrates on the driver's financial accountability. On retail routes, for which we have no customer detail, this is shown only in gross form: the total amount of money that should have been posted, to the route books by customer, the total amount deposited for cash, sales and collections. On the wholesale and subdistributor routes, where we do have customer detail, we show it by customer and type of transaction (charge or cash). We also show any adjustments made to the driver's account.

The third picture shows month-to-date sales on a daily basis by route. Sales are shown in both total quantities, total dollars, modified units, route over/short and total stops for milk or ice cream. Outstanding discrepancies in either category are also shown.

Besides the route audits, the optically scanned docu-

OCR AT FOREMOST . . .

ments are also used for customer billing and to generate various types of sales, customer, and management statistical reports.

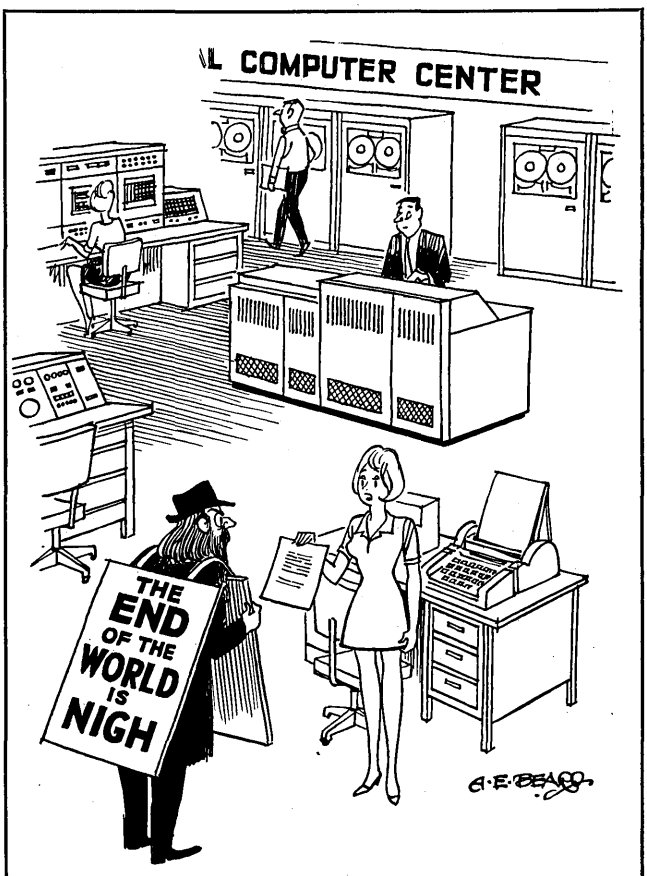
In the near future, the application scope of the optical-scanner subsystem will be expanded to include payroll inputs. In addition, the subsystem will be refined in a number of ways.

For one thing, we plan to use the multitasking release of DOS/360 to move the 2260 operation from the Foreground II partition to Foreground I, where it will run concurrently with the 1287. This will speed up the reprocessing of edited error data.

We also plan to refine the processing programs used in the input operation to see what types of unreadable or missing characters can be reconstructed automatically by the computer. This will probably increase our over-all throughput by reducing on-line interruptions. It may also reduce the number of documents with check-digit errors or omissions that have to be returned to the originator.

A 2314 direct access storage facility, that will soon be installed, will permit us to process data on a direct access basis. This will be a significant improvement over the current sequential method that imposes limitations in the way we batch and process data.

I mentioned earlier that our particular application does not appear to be ideal for optical scanning. I believe we have proven, even in this relatively uncontrolled environment, that handprinting is not only viable—but the most economical—means of computer input. ■



"Bad news, I'm afraid, Mr. Henshaw—we make it 1120 hours, February 13th, 2006."

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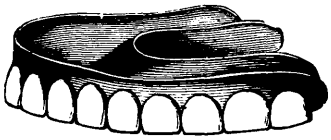

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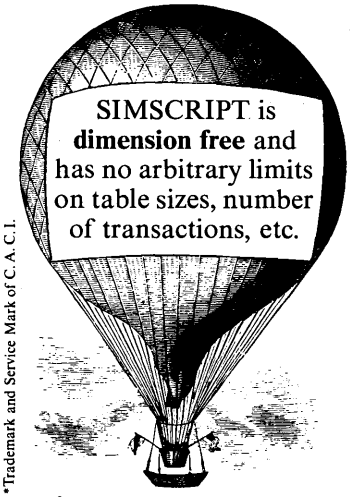
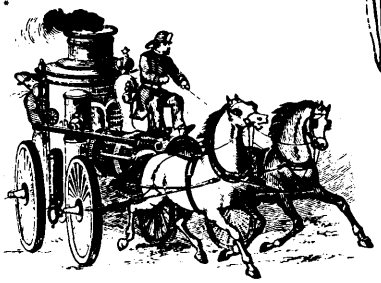


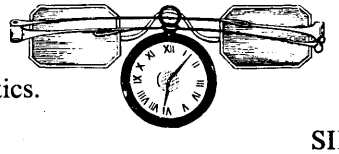
SIMSCRIPT is **dimension free** and has no arbitrary limits on table sizes, number of transactions, etc.

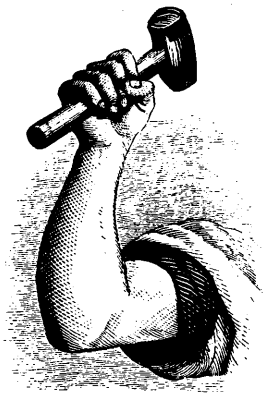
*Trademark and Service Mark of C.A.C.I.

SIMSCRIPT operates in a compile-execute mode with previously compiled routines being loaded as object decks.



SIMSCRIPT produces clear compiler and execution time diagnostics.





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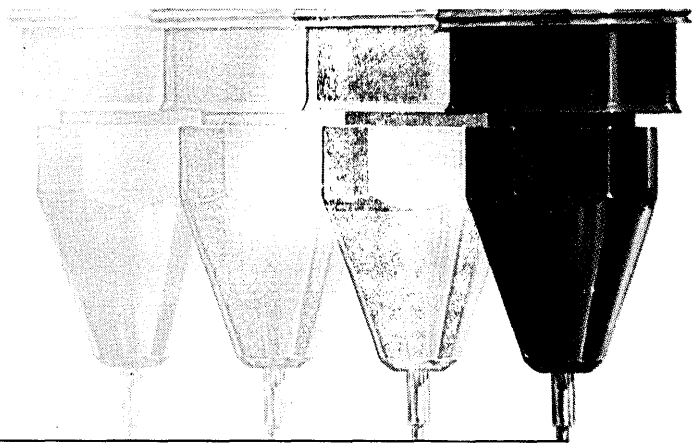

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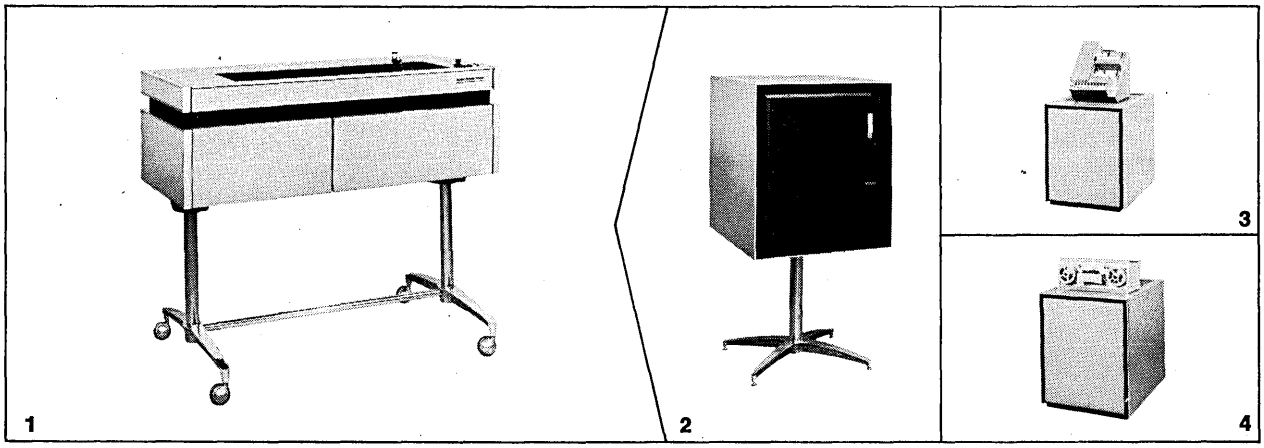

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THE SJCC

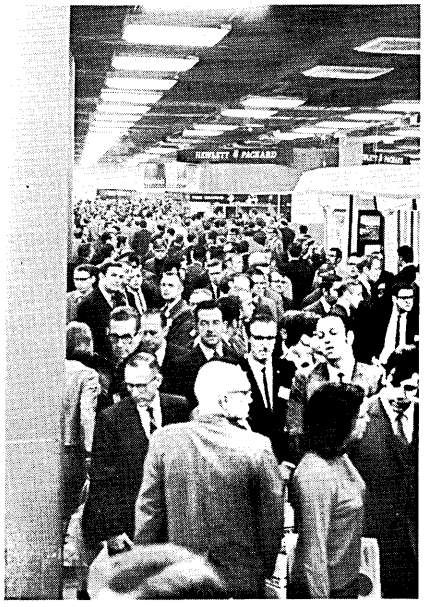
boston will rise again

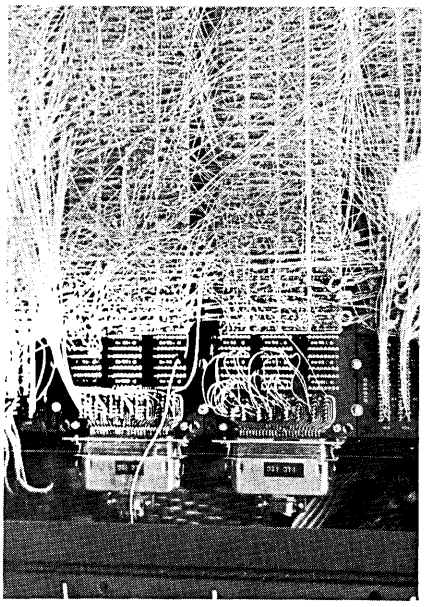
For perhaps the first time at a JCC, the computer industry made *loud* noises—some wailing, some obscene, but most important, some constructive—about its concern for the World Outside the Technology and Business of Electronic Data Processing. There were, of course, many speeches with little more than eloquent generalities. But there were also descriptions of constructive programs or experiments for the underprivileged. There were the protests against the involvement of the industry and the universities in war and other military efforts. And there was the plan to re-establish a social implications committee of the Association for Computing Machinery, perhaps portending more real-world projects—yet undefined—by that association.

Tea-Party Town was the appropriate location for the "awakening from a dream" (hopefully not temporary), even if Boston didn't have adequate facilities to handle the gigantic show. It was the biggest conference of any kind ever held in Boston, and naturally one of the biggest JCC's. About 8600 members and nonmembers and 1200 students registered; 4,800 exhibitor personnel manned the 174 exhibits covering 427 booths; 16,500 exhibit "guests" and 3,400 more with $5 tickets walked through the exhibits. That makes nearly 35,000 people. We chuckle to think that an industry which might be personified as a 6'5", 270-pound giant should continue to blame its "infancy" for its various weaknesses and failings.

The keynote speech of General James M. Gavin set the stage for the social implications emphasis of the conference. The general, former R&D chief of the Army and ambassador to France, is now board chairman of Arthur D. Little, Inc.

After noting the role of computers and communications in the increasingly rapid dissemination of information, he said that "when people are as well informed on as many matters as they are today, they want action at a rate comparable to that at which they acquire new information." They will not stand for the time it takes to bring about change through normal chan-





nels, such as legislation, and further "they need to feel they can participate in bringing about the changes" that affect their daily lives.

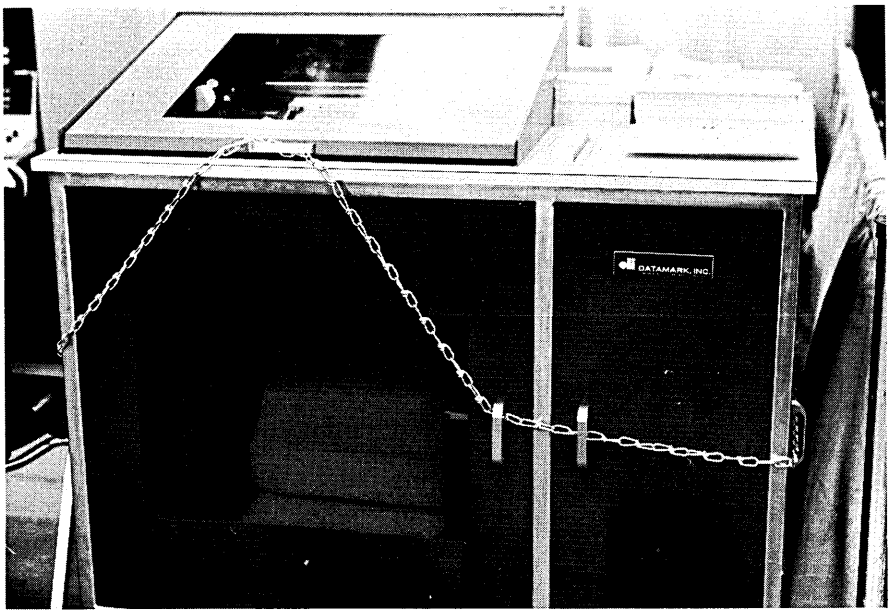
Computerization has also affected the power of managers, who can control "greater amounts of capital, raw materials, people, production, and marketing systems than ever before . . . Hence, we have the growing movement of multinational corporations, and these, in turn, have tremendous social and political significance."

If there is a potential danger in these unleashed powers, the computer also offers hope of coping with them. It is clear that the "human action" which is needed to attack the problems of ethnic groups, poverty, medical care, education, and man's environment, "must be preceded by information—detailed information which defines and delineates the problem in a quantitative way."

Computerized information systems can supply the required quantity of data, Gen. Gavin argued. They can also improve the policymaking job qualitatively. "I doubt that, under the present conditions in this country, there is any legislation being considered . . . to deal with the problems of the next five to 10 years. Yet now is the time when we should be acquiring information and passing the legislation that will permit us to act when the problems do arise."

Too, the computer, as a "single tool in the package we are going to need," must be developed, used, and managed "on an interdisciplinary basis," encompassing "the combined professional resources of social scientists, architects, and planners with those skilled in understanding and programming computers."

Each specialist will have to understand the "context of social problems," Gen. Gavin added, which computerniks might find difficult. The industry to date "has concentrated on hardware and relatively straightforward mathematical languages . . ." growing up "in isolation."



Focusing on one of the problems Gen. Gavin mentioned, the panel on "Computers and the Underprivileged" suggested that converting ghetto youth into self-supporting computer programmers and operators apparently depends less on student aptitude than on prevailing employer attitudes.

Prof. John Donovan, who set up a training course for the disadvantaged at MIT's Lowell School, criticized employers for paying too much attention to the statistical success of such programs—the number of students who graduate and then get jobs. He implied that by playing this numbers game the employer is masking a reluctance to train the socially handicapped worker on the job. Such training is more expensive and takes longer than for better-educated, more affluent job applicants, he admitted, but the potential rewards in competence and contribution from the ghetto-bred employee are as great.

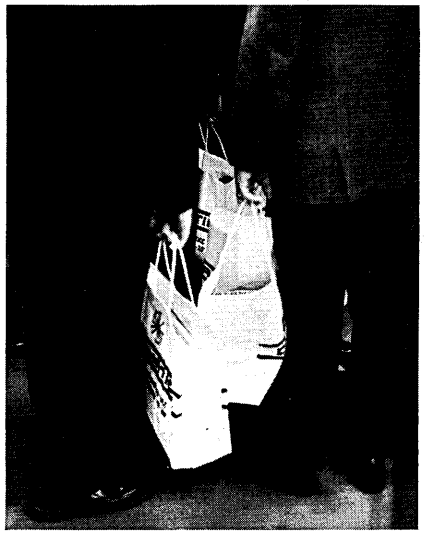
Milton Bauman (Price Waterhouse & Co.), who heads a training project sponsored by the Delaware Valley ACM in Philadelphia, said he had found jobs for the project's graduates by soliciting company presidents and board chairmen, instead of their personnel managers.

Large companies put up bigger barriers than smaller firms to hiring computer technicians who lack formal academic credentials and experience, according to panelist Allen L. Morton, of Computer Personnel Development Associates, a non-profit, ghetto-oriented training organization in New York City. He implied that aptitude tests widely used to select entry level dp technicians do more harm than good. For example, in the first dp course given by Morton's firm, none of the 32 students had a high school diploma, all were embroiled in personal problems, and none could pass a programmer aptitude test. Yet when the course was finished, only four were "not ready" for employment, and more than half of the class was hired as programmers or operators. The remainder entered the service, continued going to school, or were promoted in their existing jobs.

Constructive youth was heard from on this panel. Barry Klein, president of the RESISTORS, a teenage group of budding scientists with a working interest in computers, felt that there should be less emphasis on training out-of-school underprivileged youth, and more on motivation of those still

in school. He suggested installing a small computer or a terminal in a ghetto school, along with an instructor, and making both available to any student who indicated an interest. His own club tried a similar experiment with Trenton students who had all the symptoms of being potential dropouts. The results are enumerated in a separate story on the club in this issue.

The most emotional of the sessions was "URGENT—An Increased Dialogue with Society." As a session whose charter it was to discuss the means to dialogue, it might be called a failure. Besides the oft-heard generalities of the panelists, one of the major reasons was that the Computer Professionals for Peace, primarily an anti-war and anti-poverty group, wanted to discuss the war. Their



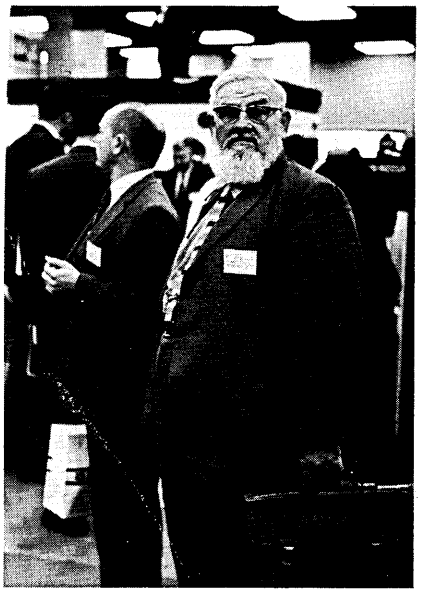
shock tactics, in the form of repeated interruptions and some obscenities, did indeed unnerve the philosophical panel and stir the audience to its feet. But little constructive action resulted —except, of course, to bring the aims of the CPP to the attention of the audience, and to the doves this was enough success. A paper not given by panelist William Konigsford did contain some proposals for achieving dialogue on local and national levels in this industry. Thus the session and this paper are covered in the news pages here.

The CPP group engaged in less emotional debate on the war later that day at a meeting held by those interested in re-establishing the ACM Special Interest Committee on Social Implications (SICSIC). About 100 attended this gathering, which was available for airing opinions on any topic. The group polled 35-5 against the war (for the record). ACM was also called upon to set up another SICSIC group, and the council later that week called on Jean Sammett, as chairman of the special interest committees and groups of ACM, to bring a working plan for another SICSIC to its August meeting.

Other discussions and meetings were held outside the formal sessions to discuss and condemn the Cambridge Project (CAM), which MIT has proposed to the Advanced Research Projects Agency in a bid for $7.6 million in funds. The project would tie time-sharing and simulation techniques with a social sciences data bank. It is the contents of the base which has aroused the ire of many students and faculty members, since it would include information on youth movements, characteristics of local conflicts and limited war crises, psychological warfare, and other subjects which objectors claim could be used by the U.S. in manipulating not only opponents abroad but also protest movements here.

Naturally, while social consciousness was the main thrust of the show, most of the 33 sessions presented revolved around technical and general topics indigenous to the industry.

One of the most important computer topics for this decade and this generation was "Software Transferability." But at the SJCC panel session it only received the genial lip-service of generalizations from oracles speaking to infants who cannot understand the great inner workings of The System. John Gosden (Mitre) and Robert Bemer (GE) gave pertinent, controversial and articulate comments, but



on a fairly philosophical level. And their comments are not likely to be translated into action.

Bemer noted that, of the current $36 billion software inventory, only $2-3 billion is transferable, usable. "To get out of this mess, we must demand that the user conform to certain practices." There was stress by the panel on the need for standardization of data descriptions, for a data description language. "The primary goal is usefulness, not elegance," said Grace Hopper, U.S. Navy, noting that "we don't have in mind the computer we will have 25 years from now. We must standardize." Gosden feared that of the two alternative approaches—formal standardization (which might take 10 years) and commonality (do it my way), the latter might be the only way to achieve standard data descriptions.

Another panel session was on the harried topic of computers and communications. There was the usual discussion of the current differences between the computer user and the common carrier. AT&T panelist Edward Goldstein set the audience straight when asked about the happy rumor that AT&T was planning to relax its blanket ban on the use of

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.

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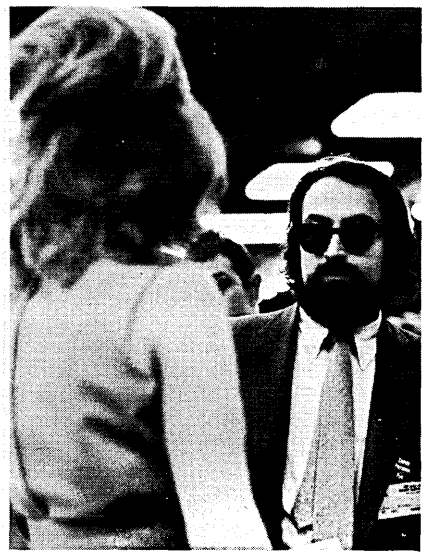
Computergraphics have come a long way

independently manufactured network control signalling devices: "I think your happiness may be somewhat premature. At the present time, I would not predict any policy changes (concerning control signalling)."

Stanford Research Institute's Andrew Lipinski related that a five-year study showing how the average American family can exploit data communications will be launched by SRI "in a year or so." It will encompass three unnamed communities, several hundred families and "over 100 data communications services." Snow forecasts for skiers, retail price information for shoppers, and possibly use of telephones in conjunction with credit cards to pay bills on-line, are among applications to be tested. The study will utilize CATV as well as telephone terminals, said Lipinski.

In the panel discussion, "Microprogramming—An Opportunity for LSI," it was put forth that the decision of whether to use microprogrammed instructions in read-only memory (ROM) or to use conventional logic circuitry is one that must be made anew in every application. Re MOS microprogramming, the following are among conditions necessary to make it desirable: a large number of units (high hundreds) must be involved; the problem must be expressible as a



truth table and its outputs must closely approximate those from a conventional table look-up; and the relative slowness of MOS design must be less critical to the designer than the higher costs, in time and money, of other techniques.

ROM is chosen for smaller machines on the basis of cost, including that of building the software (which can be the major item), and of adaptability. In larger machines, the panel said, it is chosen for emulation, simpler design and diagnostic capability. In some cases, as the 360 series' 7090 emulator, optimum results can be achieved through a marriage of technologies (hardwired conventional circuitry for speed in multi-branching operations and ROM for buffer management, packing, shifting, etc.).

All panelists agreed on one point—that the distinctions between circuit engineers, logic designers, and programmers are rapidly disappearing.

Many sessions were devoted to graphics and attendees particularly praised three presentations. Ted Lee's "Fast Drawing of Curves for Computer Displays" done with Dan Cohen

and Lee's "A Class of Surfaces for Computer Display" both represent significant work in this field. Lee shows a reasonable way to use difference equation techniques and tensor manipulations based on common arithmetic operations to make for a neat, clean, straightforward, and even elegant method of representing curves. The difference between his methods and those in common use is mainly ease of applicability.

W. R. Sutherland's "Graphics in Time-Sharing: A Summary of the TX-2 Experience" was about what one attendee called the "finest graphic system in the world—it's too bad it takes the world so long to find out about these things." Finally, the graphics theatre containing a series of films on current work was a fine idea.

Among other papers receiving kudos was "TRANQUIL: A Language for an Array Processing Computer," by a large "author pool" at the Univ. of Illinois, working on the ILLIAC IV. TRANQUIL is one of the first languages for such a computer, and hence the paper deserves mention for newness as

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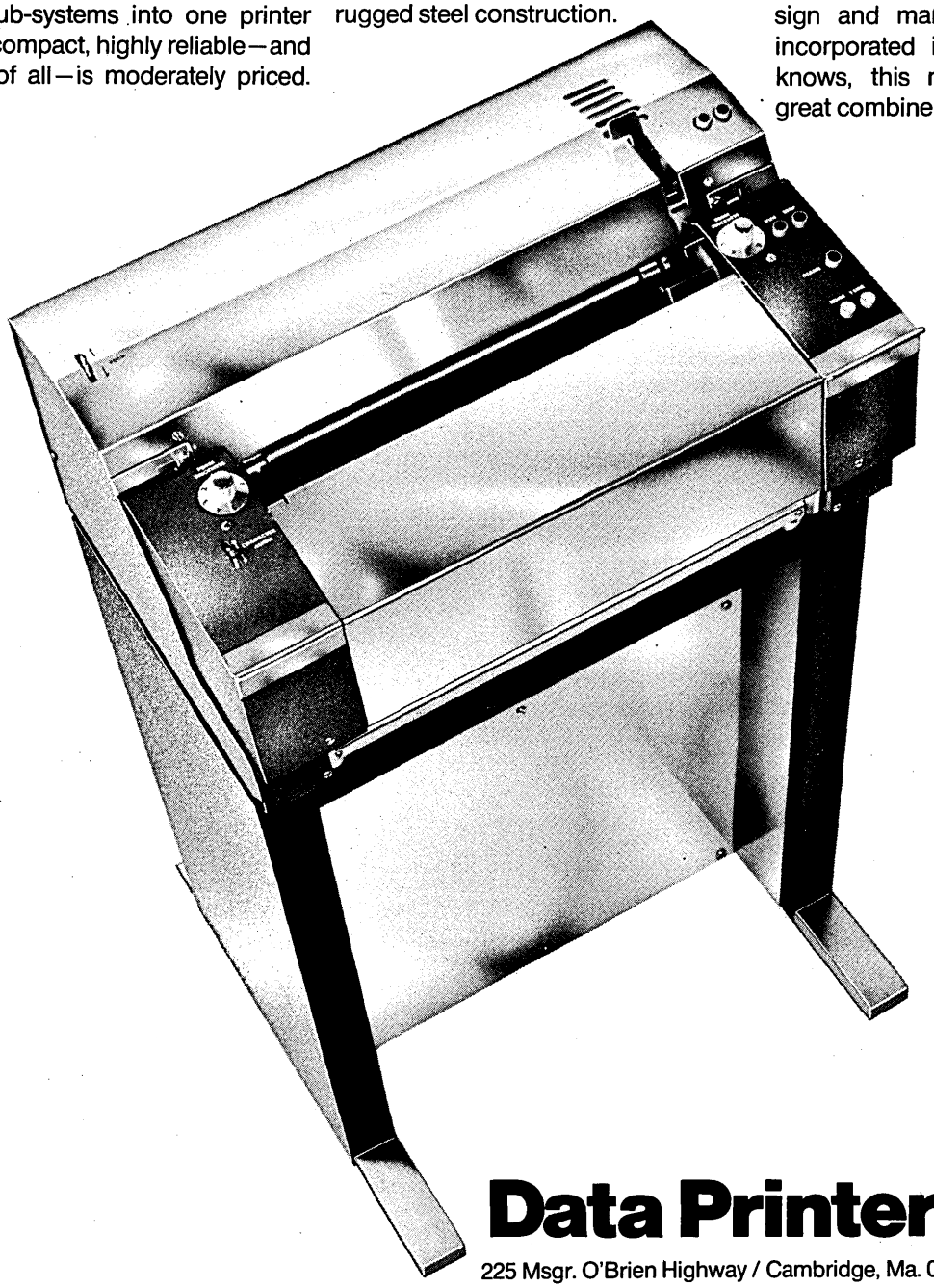

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well as excellence. The session on "Time-Sharing Systems" was also singled out as one with good papers, enthusiastically given.

And speaking of enthusiasm, we still wonder why speakers can't summarize their papers or at least read them well? Is AFIPS wasting money by sending professional tutors around the country to give the JCC "thespians" tips on how to present papers?

struggling through the exhibits

Carnival barkers are not a dying breed, only a changing one. Instead of the straw hat and rolled-up shirtsleeves you'll find him in a burgundy dress jacket with a monogram over

Photo by Wolf von dem Bussche

the left breast pocket. He no longer shouts and claps his hands to attract a crowd; he uses a throat mike. And instead of selling Professor Barkingham's Elixir, he's pushing full-blown computer systems at computer conferences. His line of patter is still the same in many cases, and he still uses scantily clad girls to hold—or distract—your attention. And this show had the prettiest, on and off the street.

At the AT&T booth he played a Huntley-Brinkley act with a pal. Part of the chatter we caught was something like this, Huntley: ". . . and transmits that data across those lines at a fantastic 500,000 bits per second rate." Brinkley: "That's faster than my mother-in-law talks!"

Viatron's gimmick was color tv and a pitch in French. RCA had a sweet young thing hard-selling its product line and referring always to "our" competitors and "our" product as if she worked nights stringing cores. Systems Engineering Labs and Electronic Associates, Inc., displays each had lunar landing games with a target and a spacecraft shown on a crt screen.

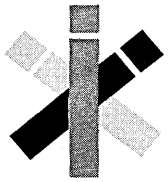
CalComp started off with a stereoptic display using colored glasses (one red lens and one blue lens, just like those used in those "3D" movies of the early fifties) but gave it up when everyone wanted to look at the pretty pictures and no one bothered to look at the machines or at the software ads posted in the area.

And who will forget the strains of old IBM songs sung by the Association of British Secretaries of America (a record dispersed by Advanced Computer Techniques)? Or their cherished photo with a World War I vintage plane (compliments of Commonwealth Computing).

and in conclusion

The SJCC was a success for AFIPS. It brought in about $500K. The technical sessions were "no worse than usual," said one attendee, and they netted a "few good ideas" which makes them a success. The exhibits in War Memorial Auditorium were jammed. In fact, there were so many additional exhibits in suites in different hotels (about 50) that one newcomer to the field spent the first day wandering the suites of the Sheraton Plaza. He finally remarked to someone that the "show wasn't so big" and was told that the main exhibits were at the auditorium.

The hotels were jammed too. So jammed, in fact, that we've heard various reports that a trial being held had to go either miles out of town to put up its jurors or declare a mistrial because no rooms could be found for them. In other words, Boston isn't big enough to handle the spring conference and won't have another one for years to come. (Maybe that's why the slow elevators, slow service, and if-the-room's-empty-rent-it-to-someone-else philosophy of the Sheraton Boston, the conference hotel.) AFIPS says that Atlantic City and Miami Beach will be the site of SJCC's, probably till 1980. It'll be Las Vegas and Houston for the Fall Joint shows until Los Angeles can get its convention facilities up (probably '72) and San Francisco does likewise (probably after '74). Hope those playlands won't kill that "new consciousness." ■



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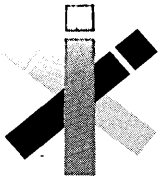

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expanding abbreviations

COAX: A PREPROCESSOR FOR COBOL

by Robert G. Teague and Allen H. Brady

Since the COBOL language specifications[1] were first published in April 1960 the language has suffered from three major drawbacks: (1) the inefficient code generated, (2) the long compilation time, and (3) the amount of writing necessary. With the advent of the present generation of computers the first two of these problem areas have been nearly eliminated. The inefficient code generated by early compilers is a thing of the past, and the time required for compilation has been dramatically reduced. Yet one element, the programmer, is still woefully neglected, he being required to expend a disproportionate amount of time to write even very trivial programs.

With an English-based sentence and paragraph structure and words of up to 30 characters in length, COBOL does indeed have an inherent form of "writer's cramp," and a lag between the programmer's mental and physical output bordering on the unbearable. But it is this very feature which provides COBOL with one of its greatest assets: the ability to self-document. This feature allows a person unfamiliar with the language to review a well-written program and derive from it a clear, though general, understanding of the procedures used therein. All too often, however, the programmer follows the natural inclination to avoid this "writer's cramp" by using short, cryptic data-names, thereby rendering his program unintelligible to even the "initiated."

a solution

English-speaking peoples when faced with this problem developed a workable solution in everyday speech and writing: a system of contractions and abbreviations. It is here, in a scheme which would allow the programmer to write cryptic statements and sentences, that an answer for COBOL may also be found. Moreover, if the contractions and abbreviations were to be automatically replaced by equivalent words, the self-documentation feature of the language would be retained unscathed.

The authors' inspiration for such a scheme to be used in programming came from a primitive abbreviation convention which has been incorporated in the MAD compiler.[2] In that language *predefined fixed* abbreviations for a certain few awkward reserved words such as W'R for WHENEVER and D'N for DIMENSION are accepted by the compiler and replaced in the listing by the words which they represent. For COBOL a general approach applicable to nearly all words has been used as the basis for a preprocessor called COAX (for COBOL abbreviation expander). COAX accepts an abbreviated source language as input and produces as output a standard source language for input to a compiler (see Fig. 1, p. 73). The sections which follow give a brief description of this processor.

forming abbreviations

In COBOL, words are divided into two classes: reserved words, which are a static inherent part of the language, and the user-supplied words (data-names and procedure-names). Both classes are formed according to the same set

[1] CODASYL Short Range Committee, *COBOL—A Report to the Conference on Data Systems Languages, including Initial Specifications for a Common Business Oriented Language (COBOL) for Programming Electronic Digital Computers* (Government Printing Office, Washinton, D.C., 1960).

[2] Arden, B., Galler, B., and Graham, R., *Michigan Algorithm Decoder* (University of Michigan Press, Ann Arbor, Michigan, 1964).

Mr. Teague is now an instructor at San Fernando Valley State College in computer sciences. His previous experience includes positions with General Motors and the Univ. of Notre Dame. He is a member of the ACM and has a BBA from Notre Dame.

of rules: a word must be 30 characters or less in length taken from the inclusive set zero through nine, A through Z, and the hyphen. The hyphen is used to join two or more separate words such as GROSS and PAY to form a single word: GROSS-PAY. The apostrophe is added to this set by COAX and is used as a control character in two ways: to distinguish an abbreviation from other types of character strings, and to indicate character deletion. The segments of a word which are bounded either by two hyphens or a hyphen and a space are used as a natural basis for the COAX abbreviation system.

Given a COBOL word of nine or fewer hyphenated segments, a proper abbreviation for that word is defined to be a string comprised of the first *six* or fewer consecutive characters of each of its segments, each segment taken in order from the left with the terminal hyphens for the segments replaced by apostrophes. The nine-segment limitation is not standard to COBOL, but at the same time is not impractical since to have a nine-segment word each segment would have to average fewer than three characters in length. The final segment is also followed by an apostrophe to indicate deleted characters if any. The data-name QUANTITY-TO-BE-ORDERED, for example, can be properly abbreviated in any of the following ways:

QUAN'T'B'ORDER'
QUAN'T'B'ORD'
QUAN'T'B'O'
Q'T'B'O'
Q'T"O'

This list is certainly not exhaustive. There are, in fact, 384 proper abbreviations for QUANTITY-TO-BE-ORDERED, which demonstrates how COAX affords the programmer a wide latitude in choosing abbreviations which are the most meaningful to him. Note that in the last example one segment of the word, namely BE, was completely replaced by an apostrophe. At least an apostrophe for each segment must be written in order for an abbreviation to correspond to a word since one must contain the same number of segments as the other. The first (or leftmost) segment must always consist of at least the initial character of the word; otherwise, any segment of a word may be entirely deleted and still produce a proper abbreviation. Thus an abbreviation which commences with an apostrophe such as

'T'B'O'

would be invalid. This provides, among other things, a means of distinguishing between an abbreviation and an alphanumeric literal.

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Any character string containing an apostrophe, except an alphanumeric literal, is construed by COAX to be an abbreviation. Thus several additional forms which will be converted by the processor to proper form are allowed. The following examples illustrate the rules which apply in these instances and show, first, the abbreviation as encountered and, second, how it is changed.

ABBR.	DATA DIVISION	PROCEDURE DIVISION
A'		ADD
B'	BLANK	BEFORE
C'	COPY	CLOSE
D'	DIVISION	DIVIDE
E'		EQUAL
F'	FILLER	FROM
G'		GREATER
H'	HIGH-VALUE	HIGH-VALUE
I'		INTO
J'	JUSTIFIED	
K'	KEY	
L'	LABEL	LESS
M'		MULTIPLY
N'		NOT
O'	OCCURS	OPEN
P'	PICTURE	PERFORM
Q'	QUOTE	QUOTE
R'	REDEFINES	READ
S'	SYNCHRONIZED	SUBTRACT
T'		THAN
U'	USAGE	UNTIL
V'	VALUE	VARYING
W'		WRITE
X'	(ILLEGAL)	
Y'	(ILLEGAL)	
Z'	ZERO	ZERO

Table 1 Special single character abbreviations.

1. A segment of more than six characters will be reduced to the first six characters. This allows an abbreviation to contain a segment in its entirety:
   QUANTITY'T'B'O'
   QUANTI'T'B'O'
2. All occurrences of an apostrophe immediately preceding a hyphen will be reduced to just the apostrophe:
   QUAN'-T'B'ORD'
   QUAN'T'B'ORD'
3. All occurrences of a hyphen within an abbreviation will be replaced by an apostrophe:
   QUANTI'TO-BE-O'
   QUANTI'TO'BE'O'
4. An apostrophe will be added to the final segment if one is not already present:
   QUAN'T'B'ORDER
   QUAN'T'B'ORDER'

In order to find a word which corresponds to a given abbreviation, a table of words capable of being abbreviated must be formed. The reserved words, being static in nature, could properly be abbreviated immediately and are therefore already in the table at the start of processing. The data-names and procedure-names, simply by being used in a given program, are automatically added to the table during processing. For the sake of efficiency, COAX is a single-pass processor which provides no way of handling a forward reference. This requires that a word be abbreviated only if it has *previously* appeared in the program fully spelled out (see Fig 1, p. 73, for examples). Once a word has thus appeared and been placed in the table, it may be abbreviated as many times and in as many ways as desired without further action.

It is the responsibility of the programmer to ensure that an abbreviation will correspond to one and only one word when encountered by COAX. For instance, the abbreviation CA'RE' which was intended to stand for CARD-RECORD can also represent the reserved word CARD-READER and is therefore invalid. With the addition of one character to the sec-

ond segment the abbreviation CA'REC' now becomes unique. If an abbreviation is ambiguous, that is, if it corresponds to more than one entry in the table, a character string consisting of the *proper* abbreviation (including changes made to it by COAX) will be placed in the output with each apostrophe replaced by the letter "Y" (from "ambiguity") and an appropriate diagnostic message will be given. If, on the other hand, there is no word which corresponds, the apostrophes will be replaced by the letter "X" (from "non-existent") and the string sent to the output with a diagnostic message. This placement of the apostrophes permits the preprocessor output from a program which contains abbreviation errors to be compiled immediately without the generation of many extraneous error messages that would otherwise occur.

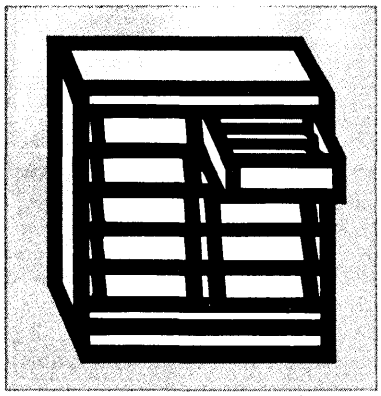
Although it would appear to be legal from the above rules to use abbreviations consisting solely of an apostrophe following the first character of a single segment word, this would in almost every case not produce the necessary uniqueness, and thus be invalid. This situation has therefore been defined as a special case, and for each letter of the alphabet there corresponds a frequently used reserved word. Furthermore, certain important reserved words beginning with the same letter are unique to particular divi-

(Fig. 1B and 1C on p. 75; text continued on p. 77)

Fig. 1A Abbreviated COBOL input to COAX.

```
100000 IDENT' D'.                                                    PAYROLL
100010 PRO'ID'.  PAYROLL.
100020 AU'.   BOB TEAGUE.
100030 INS'. UNIVERSITY OF NOTRE DAME.
200000 ENV' D'.
200010 CONF' SECT'.
200020 SO'CO'. U'1107.
200030 OBJ'CO'. U'1107.
200040 IN'OU' SECT'.
200050 FI'CON'. SELECT PAY-FILE ASS' TO CA'R'EIGHTY.
200060          SELECT PAY-REPORT ASS' TO PRINTER.
300000 DATA D'.
300010 FILE SECT'.
300020 FD  PA'F' L' RECORDS ARE OM' DATA RECORD IS PAY-CARD.
300030 01  PA'CA'.
300040     02 MAN-NUMBER P' 9(6).
300050     02 EMPLOYEE P' X(18).
300060     02 HOURS-WORKED P' 99.
300070 FD  PA'R' LAB' RECORDS ARE OMIT' DATA RECORD IS REPORT-ITEM.
300080 01  RE'I'.
300090     02 MA'NU' P' 9(6).
300100     02 F' SIZE IS 3.
300110     02 EMP' P' X(21).
300120     02 F' SIZE IS 3.
300130     02 HOURS-WEEKLY P' 99.
300140     02 F' SIZE IS 3.
300150     02 TOTAL-PAY P' 9999V99.
300160     02 F' SIZE IS 3.
300170     02 VALIDITY-ERROR P' IS X.
300180 WOR'STO' SECT'.
300190 77  REGULAR-HOURS P' 99 V' 40.
300200 77  REGULAR-PAY P' 9999V999.
300210 77  OVERTIME-HOURS P' 99.
300220 77  OVERTIME-PAY  P' 9999V9999.
300230 77  HOURLY-RATE P' 9V999  V' IS 2.604.
300240 77  MAX-HOURS P' 99 V' 80.
300250 77  OVERTIME-RATE P' 9V999 V' IS  3.906.
400000 PROCED' DIVIS'.
400010 BEGIN. O' INP' PA'F'.  O' OU' PA'R'.
400020 READ-A-CARD. R' PA'F' AT END MOVE 'SENTINEL MISSING.' TO RE'I'
400030     W' RE'I' AF' ADV' 2 LINES STOP RUN. MOVE SPACES TO RE'I'.
400040 PARAGRAPH-1. IF MA'NU' IN PA'CA' E' 999999 GO TO FINISH. MOVE
400050     MA'NU' IN PA'CA' TO MA'NU' IN RE'I'. MOVE EMP' IN PA'CA' TO
400060     EMP' IN RE'I'. MOVE HO'WO' TO HO'WE'. P' VALIDITY-CHECK.
400070     IF HO'WO' G' T' REG'HO' GO TO OVERTIME-PAY-CALCULATION. M'
400080     HO'WO' BY HO'RA' GIV' TO'P' ROU'.
400090 PARAGRAPH-2. W' RE'I'. GO TO RE''CA'.
400100 FINI'. C' PA'F'. PA'R'.  STOP RUN.
400110 V'C'. MOVE SPACE TO V'E'. IF HO'WO' IN PA'CA' IS NUME' NEXT
400120     SENTE' ELSE MOVE Z' TO HO'WO' IN PA'CA' MOVE '*' TO V'E'. IF
400130     HO'WO' IN PA'CA' G' T' MA'HO' MOVE '*' TO V'E'.
400140 OV'P'C'. S' REG'HO' F' HO'WO' GIV' OV'HO'. M' REG'HO' BY
400150     HO'RA' GIV' REG'P'. M' OV'HO' BY OV'RA' GIV' OV'PA'. A'
400160     OV'PA', REG'P' GIV' TO'PA' ROU'. GO TO PAR'2.
```

TAME WILD CARDS



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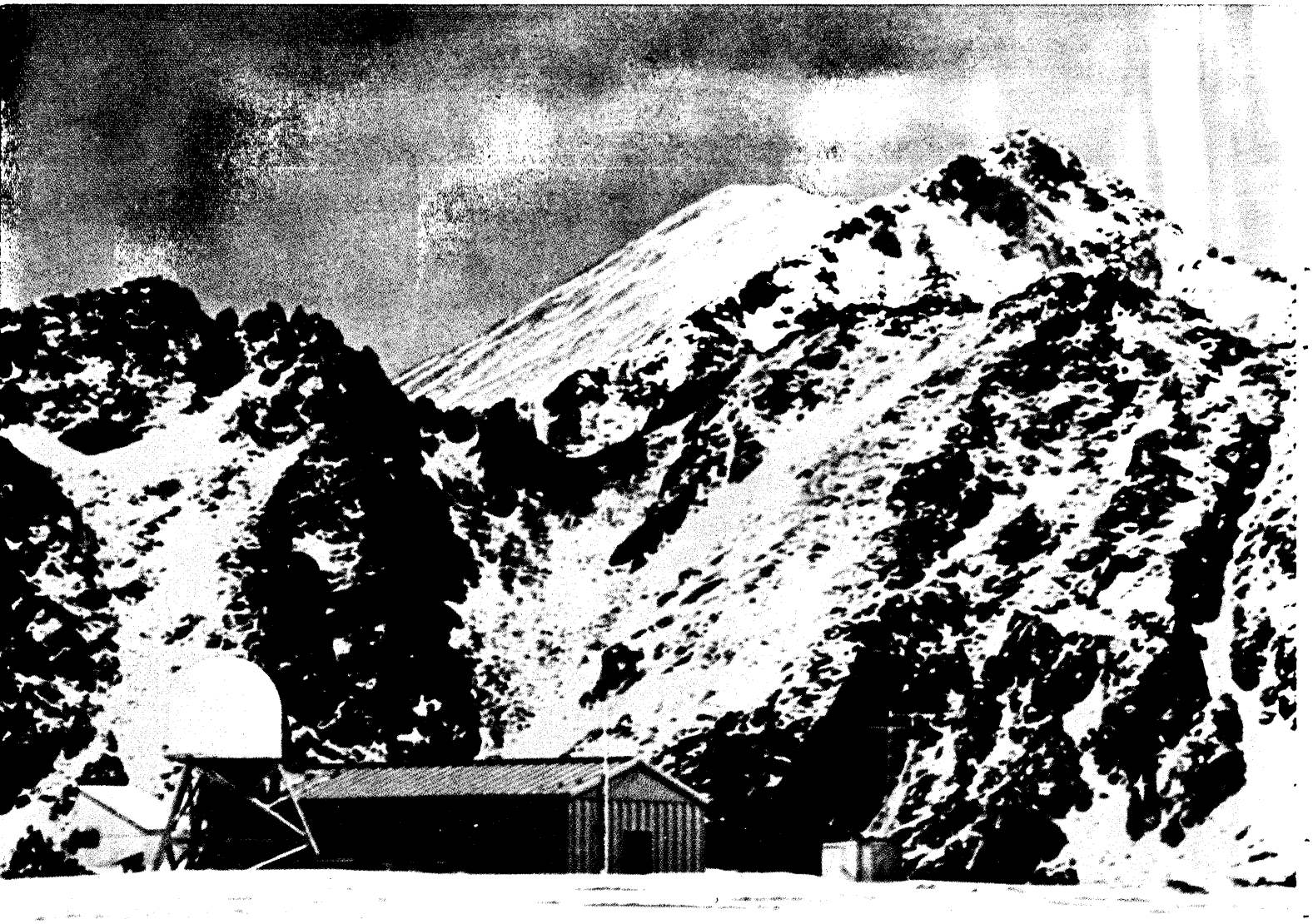
```
100000 IDENTIFICATION DIVISION.                                        PAYROLL
100010 PROGRAM-ID. PAYROLL.                                            PAYROLL
100020 AUTHOR. BOB TEAGUE.                                             PAYROLL
100030 INSTALLATION. UNIVERSITY OF NOTRE DAME.                         PAYROLL
100040 ENVIRONMENT DIVISION.                                           PAYROLL
100050 CONFIGURATION SECTION.                                          PAYROLL
100060 SOURCE-COMPUTER. UNIVAC-1107.                                   PAYROLL
100070 OBJECT-COMPUTER. UNIVAC-1107.                                   PAYROLL
100080 INPUT-OUTPUT SECTION.                                           PAYROLL
100090 FILE-CONTROL. SELECT PAY-FILE ASSIGN TO CARD-READER-EIGHTY.     PAYROLL
100100     SELECT PAY-REPORT ASSIGN TO PRINTER.                        PAYROLL
100110 DATA DIVISION.                                                  PAYROLL
100120 FILE SECTION.                                                   PAYROLL
100130 FD PAY-FILE LABEL RECORDS ARE OMITTED DATA RECORD IS PAY-CARD.  PAYROLL
100140 01 PAY-CARD.                                                    PAYROLL
100150     02 MAN-NUMBER PICTURE 9(6).                                 PAYROLL
100160     02 EMPLOYEE PICTURE X(18).                                  PAYROLL
100170     02 HOURS-WORKED PICTURE 99.                                 PAYROLL
100180 FD PAY-REPORT LABEL RECORDS ARE OMITTED DATA RECORD IS           PAYROLL
100190     REPORT-ITEM.                                                PAYROLL
100200 01 REPORT-ITEM.                                                 PAYROLL
100210     02 MAN-NUMBER PICTURE 9(6).                                 PAYROLL
100220     02 FILLER SIZE IS 3.                                        PAYROLL
100230     02 EMPLOYEE PICTURE X(21).                                  PAYROLL
100240     02 FILLER SIZE IS 3.                                        PAYROLL
100250     02 HOURS-WEEKLY PICTURE 99.                                 PAYROLL
100260     02 FILLER SIZE IS 3.                                        PAYROLL
100270     02 TOTAL-PAY PICTURE 9999V99.                               PAYROLL
100280     02 FILLER SIZE IS 3.                                        PAYROLL
100290     02 VALIDITY-ERROR PICTURE IS X.                             PAYROLL
100300 WORKING-STORAGE SECTION.                                         PAYROLL
100310 77 REGULAR-HOURS PICTURE 99 VALUE 40.                          PAYROLL
100320 77 REGULAR-PAY PICTURE 9999V999.                               PAYROLL
100330 77 OVERTIME-HOURS PICTURE 99.                                  PAYROLL
100340 77 OVERTIME-PAY PICTURE 9999V9999.                            PAYROLL
100350 77 HOURLY-RATE PICTURE 9V999 VALUE IS 2.604.                   PAYROLL
100360 77 MAX-HOURS PICTURE 99 VALUE 80.                              PAYROLL
100370 77 OVERTIME-RATE PICTURE 9V999 VALUE IS 3.906.                 PAYROLL
```

Fig. 1B COAX output through DATA DIVISION

Fig. 1C COAX output of PROCEDURE DIVISION

```
100380 PROCEDURE DIVISION.                                             PAYROLL
100390 BEGIN. OPEN INPUT PAY-FILE. OPEN OUTPUT PAY-REPORT.             PAYROLL
100400 READ-A-CARD. READ PAY-FILE AT END MOVE 'SENTINEL MISSING.' TO   PAYROLL
100410     REPORT-ITEM WRITE REPORT-ITEM AFTER ADVANCING 2 LINES STOP  PAYROLL
100420     RUN. MOVE SPACES TO REPORT-ITEM.                            PAYROLL
100430 PARAGRAPH-1. IF MAN-NUMBER IN PAY-CARD EQUAL 999999 GO TO FINISH. PAYROLL
100440     MOVE MAN-NUMBER IN PAY-CARD TO MAN-NUMBER IN REPORT-ITEM.   PAYROLL
100450     MOVE EMPLOYEE IN PAY-CARD TO EMPLOYEE IN REPORT-ITEM. MOVE  PAYROLL
100460     HOURS-WORKED TO HOURS-WEEKLY. PERFORM VALIDITY-CHECK. IF    PAYROLL
100470     HOURS-WORKED GREATER THAN REGULAR-HOURS GO TO               PAYROLL
100480     OVERTIME-PAY-CALCULATION. MULTIPLY HOURS-WORKED BY          PAYROLL
100490     HOURLY-RATE GIVING TOTAL-PAY ROUNDED.                       PAYROLL
100500 PARAGRAPH-2. WRITE REPORT-ITEM. GO TO READ-A-CARD.              PAYROLL
100510 FINISH. CLOSE PAY-FILE, PAY-REPORT. STOP RUN.                   PAYROLL
100520 VALIDITY-CHECK. MOVE SPACE TO VALIDITY-ERROR. IF HOURS-WORKED IN PAYROLL
100530     PAY-CARD IS NUMERIC NEXT SENTENCE ELSE MOVE ZERO TO         PAYROLL
100540     HOURS-WORKED IN PAY-CARD MOVE '*' TO VALIDITY-ERROR. IF     PAYROLL
100550     HOURS-WORKED IN PAY-CARD GREATER THAN MAX-HOURS MOVE '*' TO PAYROLL
100560     VALIDITY-ERROR.                                             PAYROLL
100570 OVERTIME-PAY-CALCULATION. SUBTRACT REGULAR-HOURS FROM            PAYROLL
100580     HOURS-WORKED GIVING OVERTIME-HOURS. MULTIPLY REGULAR-HOURS  PAYROLL
100590     BY HOURLY-RATE GIVING REGULAR-PAY. MULTIPLY OVERTIME-HOURS  PAYROLL
100600     BY OVERTIME-RATE GIVING OVERTIME-PAY. ADD OVERTIME-PAY,     PAYROLL
100610     REGULAR-PAY GIVING TOTAL-PAY ROUNDED. GO TO PARAGRAPH-2.    PAYROLL
```



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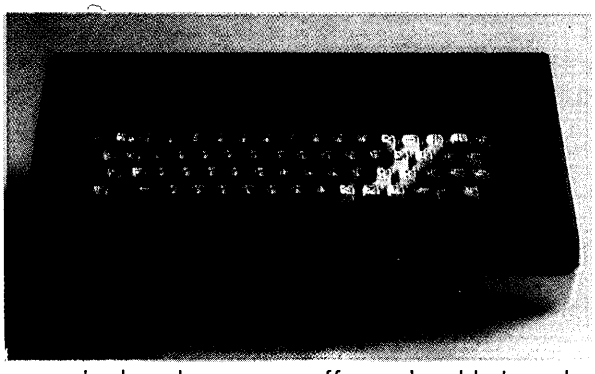

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CIRCLE 65 ON READER CARD

sions. Thus P' can represent PICTURE in the DATA DIVISION and PERFORM in the PROCEDURE DIVISION, and V' can represent VALUE or VARYING. Table 1 (p. 70) shows the special abbreviations used in COAX.

Superficially it would appear that the COAX processor must perform a great deal of syntax analysis, and it therefore comes as a surprise how truly little analysis is necessary. The major effort expended in this area is in classifying a character string as a word, literal, or abbreviation The COBOL specifications require a word to contain at least one alphabetic character; the numeric literal to contain only the digits, plus or minus signs, and the decimal point; and the alphanumeric literal to be bounded in quotation marks. The COAX abbreviation must have at least one embedded or terminal apostrophe. It is, therefore, clear that the determination of the class of a character string can easily be done directly from that string, without reference to its context. Moreover, the classification can most often be made from just the first character.

The occurrence of a level number or indicator, paragraph or section name requires special positioning in the output. All that is necessary for proper handling is that a new output card image be started at the same column as the number or name in the input image. The processing of a picture requires some contextual analysis. This is, however, limited to ascertaining whether the last word encountered (or expanded from an abbreviation) is the word PICTURE. In this instance, because of the possibility of an intervening IS, the next two character strings must be inspected to determine which is the picture and it is then sent to the output without change.

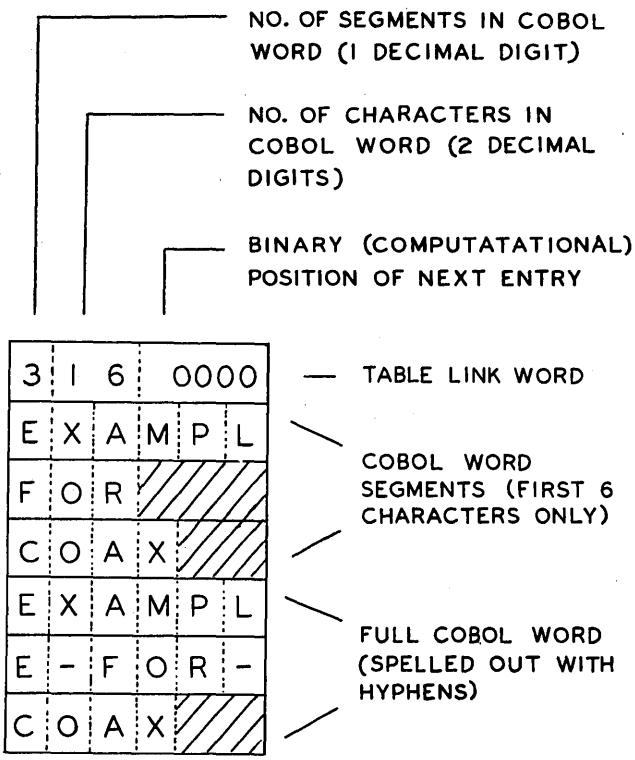

Fig. 2 Table entry format (3 to 15 computer words).

Some of the diagnostic work which would normally be done by a COBOL compiler must be done by COAX. Such things as non-ascending sequence numbers, unclear continuation of literals, words or literals which are too long can all affect the operation of the processor and thus will produce messages with accompanying corrective action.

Finally, the handling of a NOTE deserves special mention. Except for staying within the B margin and the use of a terminating period in a NOTE sentence there is no restriction on format or content of a note. Thus a NOTE must be watched for and COAX must distinguish between a paragraph and sentence NOTE as would the compiler. Since part of the information conveyed in a NOTE may be in the physical arrangement itself, no attempt is made to alter this arrangement; COAX simply passes the NOTE on intact.

structure of the word table

The structure of the word table has a bearing on the abbreviation scheme as well as on the efficiency of operation of COAX, so we have included here some mention of the details.

The table is ordered in a semi-lexicographical arrangement based upon the collating value of the leading six characters of each segment of the word, with words of fewer segments being filed before words of more segments. For example, COMPUTE is filed before COMPUTATIONAL-1. Thus, the table is not in a truly alphabetical order, but the anticipated search efficiency was realized.

Each table entry (Fig. 2) is composed of a six-character (one computer word) table linkage, all hyphenated segments to a maximum length of six characters each, and the COBOL word fully spelled out. This somewhat redundant organization was chosen to match the characteristics of a fixed-word machine and to permit efficient handling of the table using COBOL. The table when used becomes a linked list imposed upon a REDEFINED array of six-character segments. We anticipate this organization will also work well in a byte-oriented machine.

To achieve speed in searching for an appropriate word, a table look-up is performed, keying from the first character of the abbreviation into the first 26 entries of the table, to find the initial address for the search of the list. A sequential search is then performed following the ordering arrangement until a matching word is found. After a match has been found, the succeeding table area is searched as far forward as is necessary to determine whether any additional matches exist.

current implementation

The experimental version of the COAX preprocessor was written entirely in COBOL, and except for minor language limitations and some bothersome compiler errors the effort progressed smoothly and has been providing invaluable experience since August 1966. We chose COBOL as the language in which to write the processor since this would help bridge the differences between separate installations, and because any installation having use for COAX would necessarily have a COBOL compiler. In order to further facilitate compatibility, none of the special features of COBOL 61[3] or COBOL 65[4] were used in writing the program.

There currently are two versions of the preprocessor. The first has been operational since March 1967, and processes at an average of 360 input lines per minute on the Univac 1107. With a little extra care in forming abbreviations and by proper use of the single-character abbreviations, this rate can be increased to 430 lines. The second version, differing only in user options and system-dependent code, has been in service on the IBM 360 since June 1968. It processes at an average of 350 lines per minute under DOS on a model 40, which rate can be increased to 400 lines.

The processor, including tables, is kept entirely in core

[3] CODASYL COBOL Maintenance Committee, COBOL-'61 (Government Printing Office, Washington, D.C., 1961).
[4] CODASYL COBOL COMMITTEE Publications Subcommittee, COBOL, Edition 1965 (Government Printing Office, Washington, D.C. 1965).

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and requires no external storage. With a 60,000-character table, COAX requires 16K words on the 1107, and 65K bytes on the 360. Current usage also indicates that for each input line 2.6 output lines are produced, but with a large PROCEDURE DIVISION this rate increases to approximately 4 to 1.

coax and other solutions

The COAX scheme is not espoused as the "best" possible but simply as "good" and "workable." Some of the restrictions cited were a product of the computer word size and the method of implementation. Experience has already shown, for example, that the addition of trailing characters facilitates the formation of unique abbreviations, particularly for many reserved words such as PRINTER and PRINTERS, or CARD-READER and CARD-READERS. Also, for certain other computing systems an eight-character-per-segment abbreviation may be more efficient. Desirable special features such as a name replacement capability could easily be added. The authors have noted with concern the current trends in the area of reducing COBOL writing. These developments tend to fall into two categories: reduction of COBOL to a symbolic language, and inclusion of static abbreviations (i.e., shortened words) in the language. The former path, exemplified by I.C.T. Rapidwrite[5], has some merit in that such a plan can produce a standard listing, preserving COBOL's documentation abilities. But the approach has two major drawbacks which far outweigh this ability: it forces the programmer to learn in addition to COBOL an entirely new language with rules and definitions of its own, and it renders the source program totally unreadable to the novice.

The second approach is demonstrated by the inclusion of PIC for PICTURE, CORR for CORRESPONDING, and other abbreviations in the American Standard COBOL.[6] Perhaps this reduces the writing time, but so few words can be abbreviated that merely the start of a solution for COBOL's verbosity is realized. It also forces upon the programmer a standard set of abbreviations which possibly are to him not the best mnemonics. But what is really poor is that this is an undermining approach which if carried far enough will eventually destroy the ability of the language to self-document.

The COAX system considerably shortens the time a programmer must spend in writing programs, and yet does not force him to learn a new language or a fixed set of abbreviations: COAX is COBOL with the same syntax, rules, definitions, and formats. The abbreviations are user-oriented, allowing him to choose those which are most meaningful, quickest to write, or which meet some other criterion, and they pertain to both user-defined and reserved words. Yet, with expansion of these abbreviations, the COBOL self-documentation feature remains intact, yielding a quite readable compiled listing (see Fig. 1). Moreover, this feature of the language is enhanced by COAX since the very fact that data-names and procedure-names can be abbreviated encourages the use of longer, more descriptive names in a program.

Any COBOL compiler already possesses the beginnings of this abbreviation scheme since they of necessity contain a table of reserved words, and build a table of user-supplied words. With not much difficulty a compiler scan routine could be programmed to recognize an abbreviation, search the tables for a match, and retrieve the appropriate word. The resulting abbreviation system would be superior to COAX in processing speed since duplicate diagnostic work and an extra pass would be eliminated.

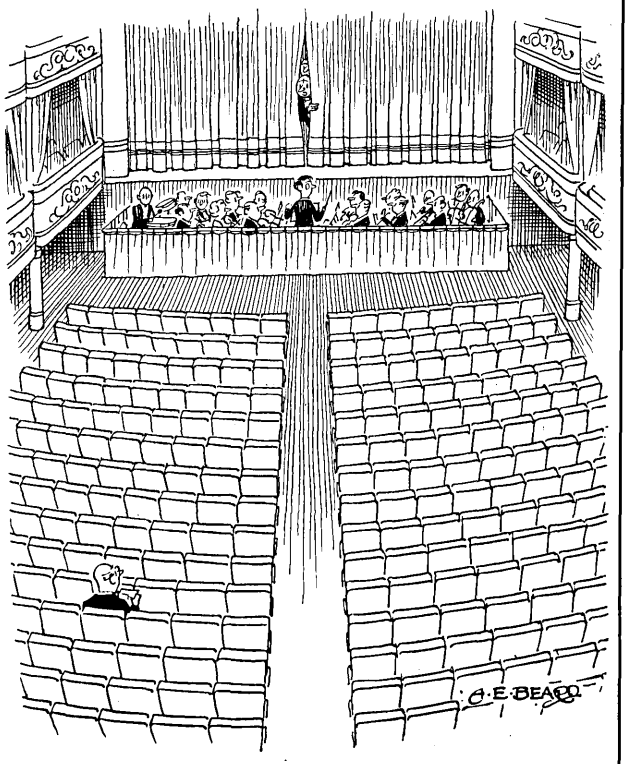
[5] Humby, E., "Rapidwrite — A New Approach to COBOL Readability," Computer J. V.4, No. 4, p. 301 (1961).
[6] United States of America Standards Institute Working Group X3.4.4, X3.4 COBOL Information Bulletin No. 9 (1967).

conclusion and recommendations

There are very few persons in the computing industry who do not now accept the importance of COBOL software in its roles of serving as a standard data processing language, in facilitating program implementation, and in supplying through its self-documentation feature a major contribution to proper management control. There has been much programmer resistance to the use of COBOL, particularly among those who have been conditioned to the use of symbolic language through years of experience with character-oriented machines lacking acceptable COBOL compilers.

The concessions to these holdouts now being made in the COBOL standard are unnecessary and are in fact detrimental to the fulfillment of the purposes of the language. We feel that COAX offers an alternative, and that the COAX scheme, which not only preserves but enhances the self-documentation feature of COBOL, should be made an integral part of the standard COBOL language. COAX is not merely a debugging aid (though, perhaps, effort should as well be made in standardizing and requiring the implementation of decent debugging aids). Inclusion of COAX in the standard would reverse the current trend toward sacrificing readability for the sake of minor gains in coding efficiency.

We have been encouraged by the enthusiastic acceptance of COAX by those who have had an opportunity to use it. The use of COBOL without COAX could almost be likened to using absolute machine code because no one has provided an assembler. Too frequently the simple needs of the programmer are overlooked. The benefits that are to be derived from a modest effort such as this are not of little consequence, and the small expense of implementing the COAX scheme in a COBOL compiler has ready economic justification. ■



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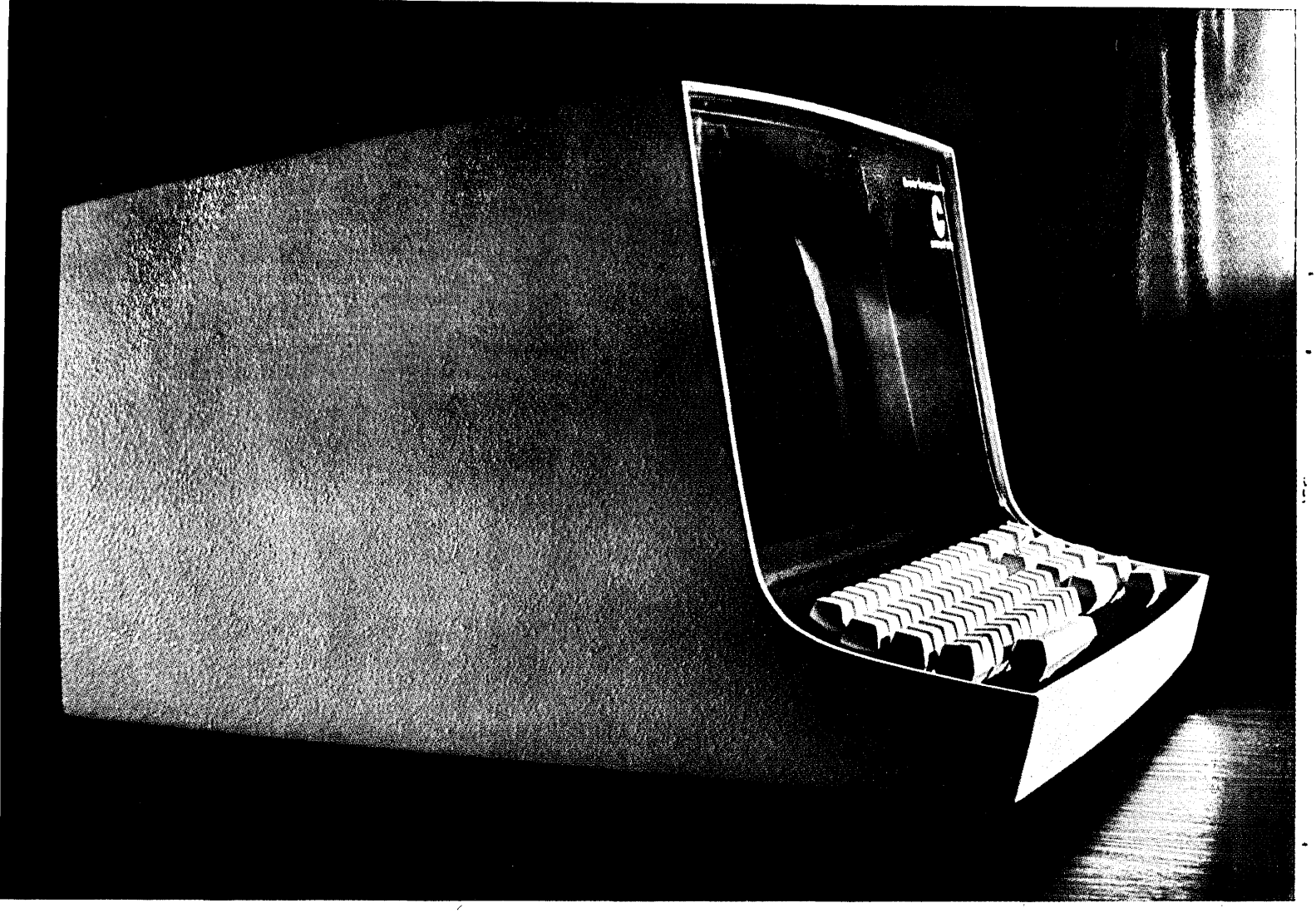

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A PLEA FOR CONTINUED CLARIFICATION AND CONSISTENCY IN THE USE OF QUANTITATIVE CONCEPTS

by Peter L. Lindley

For some little time now there has been a gratifying grass-roots trend in the English language toward the simplification of concepts relating to quantitative measurement and its expression. In an age of fast-growing technologies and fast-shrinking worlds, this is both natural and commendable. This article will attempt to indicate the state of progress, and to speed the day when such simplified concepts will be generally accepted and used.

The words footage, yardage, and mileage, for instance, have already found acceptance to represent distance measured in feet, yards, and miles, respectively. There is no reason not to include inchage and light-yearage, say, for very small and very large distances. For the concept of area acreage has become popular, while squaremileage is still rarely seen.

The quartage of milk consumed in the home, the fifthage, pintage, and shottage of liquor consumed at bars and parties are measures that should sound no stranger than the concept of poundage gained by the imbibers. One will be more specific, and more economical of wordage, by referencing calendar time in the preferable terms of decadeage, yearage, monthage, weekage, and dayage, as appropriate. Scientists and engineers in particular should espouse chronometry expressed as hourage, minuteage, secondage, microsecondage, etc. The budget for a technical project, for that matter, is immediately brought into the proper semantic ballpark when referred to as its kilobuckage or megabuckage.

Only recently was the American engineering profession given a unit of frequency; this can now be stated as hertzage, an improvement over the previously-applicable cyclepersecondage. Most of us still lack units to measure velocity and acceleration. For, while naval and aerospace personnel will note a ship's knottage or a missile's geeage, we can do no better than to conceive of mileperhourage and footpersecondpersecondage . . .

But not only the scientific community stands to benefit from a continuation of the conceptual clarifications. The wealth of a cattle baron is measurable by his cowage and steerage; the efficacy of a powder or smoking room can be gauged by its drainage (being the aggregate total hopperage, urinalage, and sinkage); a draftsman's lineage should indicate his worth to the company; the degree of failure of a social program can be clearly stated by its message; and the wife's insistence on not having a thing to wear may be countered with a reference to her garbage bulging the closet door.

In the field of electrical engineering, toward which the author happens to be partial, one already uses amperage for current, wattage for power, etc. I would add the terms ohmage for resistance, millihenriage for inductance, picofaradage for capacitance. Ohmpercircularmilfootage would replace resistivity, while voltage would replace . . . Aha! Scooped again! ■

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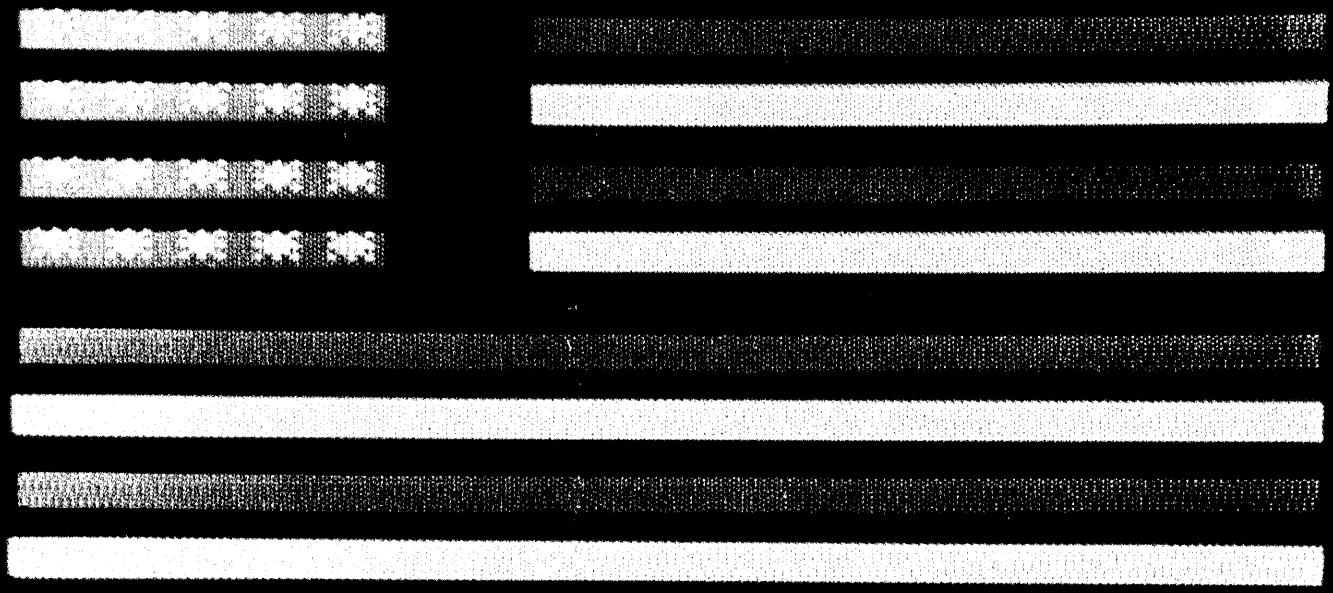

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CIRCLE 59 ON READER CARD

THE WASHINGTON STATE PENITENTIARY EDP SCHOOL

by Gordon Graham

Learn computer programming and earn an associates degree in applied sciences while serving time in a maximum security prison. It's happening in the state penitentiary at Walla Walla, Wash. This program is a joint development of the federal government, through the Department of Vocational Rehabilitation, and the state through the Department of Institutions.

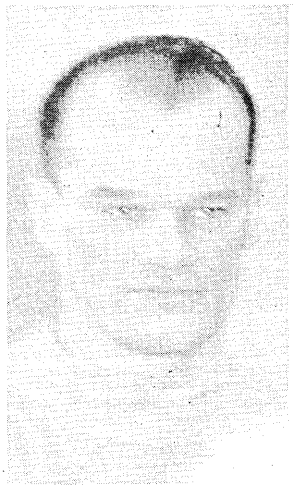
The Division of Vocational Rehabilitation provides vocational counseling, postrelease guidance, and the funds to pay tuition. The institution has built and equipped a new classroom, hired the instructor, and supplied the keypunch and auxiliary equipment.

This up-to-date data processing school opened in 1967, and paroled graduates are now employed as programmers by the Department of Institutions and the State Highway Department—and at least one man is working in private industry. Two paroled graduates are enrolled at the state university studying for their bachelor's degrees, and still others are attending community colleges. The men employed in data processing centers have proven to be knowledgeable programmers with a thorough understanding of computer systems and their languages.

The school instructor, Mr. William Painter, has been in the data processing field for more than 10 years. He was previously employed as a manager for a large California firm, and has had prior teaching experience in the data processing department of Columbia Basin Community College. At the prison he has established a rigid curriculum designed to train programmers capable of competing in private industry. "You have to be a little better than men graduating from schools in free society because you have one strike against you," Mr. Painter warns students.

A bulletin is distributed throughout the prison when a new computer class is scheduled to begin. A high school diploma is a prerequsiite for inmates who apply; still, as many as 80 men will qualify to take the IBM Programmers Aptitude Test. The men who score highest on this test are given other occupational examinations and interviewed by a psychologist to determine attitude and sincerity. A class not exceeding 15 men is eventually selected from the original 80, and those who finally graduate as programmers will be comparable to any class graduating from a community college—and better qualified than men from many private data processing schools.

The school is situated at the minimum security section of the prison which lies outside the walls of the main institution. Private cubicles for students, and a large modern lec-



Mr. Graham is serving a ten-year sentence at Washington State Penitentiary in Walla Walla. He has been doing free-lance writing for the last four years and has had several articles published in newspapers and trade journals.

ture hall, lend a free-world atmosphere to the school. The students work with modern-third generation equipment. The computer, an IBM 360/40, is located in Olympia, headquarters for the Department of Institutions. The students, however, have at their disposal a 1050 tele-processing unit which makes available remote terminal communications and the updating of programs that have been processed on the computer.

One decided advantage the WSP computer class has over other institution-based schools is the opportunity for students to complete their course at a free-world community college. This enables the inmate to obtain an associate degree in applied science, thereby increasing his employment value. This liberal training release program was implemented by the Department of Institutions. It was originally designed as "work release," which allows inmates to work for civilian employers while they serve a portion of their prison sentence. It has since been expanded to include men eligible for college and has proven a tremendous asset to the men in the computer class.

The data processing course is broken down into four three-month quarters. A student spends three hours a day in class. The balance of the day is spent in study, with Mr. Painter available for consultation. The classroom is conducted with as near to "on-the-job" conditions as possible. Students are expected to maintain a businesslike manner in class and they are graded on personal appearance and attitude. Smoking and coffee are prohibited inside the classroom and Mr. Painter stresses the importance of the proper mental approach to programming.

There have been some remarkable changes in the inmates who have attended Mr. Painter's classes. One student attempts to explain, "None of us have had much business experience, but Mr. Painter takes this into consideration and teaches us not only programming but also a new approach to life in general."

course content

The first three months of the course are spent familiarizing the student with data processing concepts. He learns the history of data processing in its many forms—manual, mechanical, and electronic. He learns the basic computer systems, how a computer receives, processes and outputs information. The flow of information through a business organization is outlined and the student is given a brief preview of the language used to communicate with the computer. The student practices programming with a language similar to SPS, or AUTOCODER. He familiarizes himself with various input/output devices and auxiliary equipment. Also, included in the first quarter are computer math and bookkeeping. Bookkeeping is an evening class and is taught by a civilian accountant.

The second quarter is devoted almost entirely to learning COBOL, its proper usage and the various formats and options available for each instruction. Students solve problems using COBOL. Both magnetic tape and disc problems are included. Mathematics, additional bookkeeping and cost accounting are also a part of the second three months.

After six months the student begins to write actual COBOL programs. These are processed on the 360. The student is required to debug his program, make deletions, insertions and feed the updated information to the computer via the 1050 tele-processing unit. Mr. Painter places emphasis on documentation. The student is asked to write a brief narrative explaining the logic of his program and to include flow charts and decision tables. He is introduced to the different approaches to machine design which affect programming. He also learns about related industries, such as software houses, form manufacturers and special purpose computers.

The fourth quarter involves actual programming, and the learning of other languages including S/360 BAL, RPG and FORTRAN. A student might be asked to convert an AUTOCODER program to COBOL for a state agency. At the completion of this quarter, a student is allowed to enroll at the Walla Walla Community College, situated approximately four miles from the prison.

outside education

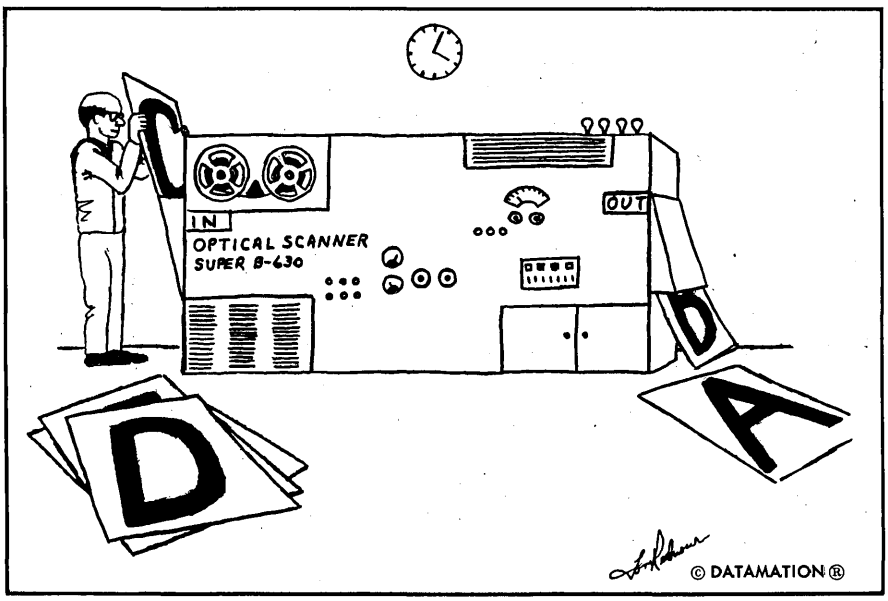
The inmate, dressed in civilian clothes and unescorted, leaves the prison at 7:30 a.m. and attends classes until noon. At the college he studies business statistics, logic, and business administration as well as elective courses. When he returns to the prison his afternoons may be spent in the prison's classroom writing programs.

A man who is released prior to receiving his associate degree may matriculate to a community college in the area where he is paroled. The Division of Vocational Rehabilitation will pay tuition and maintenance during his schooling.

For men who have completed the course and still have some time left on their prison sentence, a program has been established enabling these men to write programs for state agencies. A pay scale has been determined whereby a man receives a fee for his labors. An inmate is currently working on a program for which he will receive a $500 fee upon satisfactory completion.

A state co-ordinator, whose primary concern is placing graduates in state agencies and industry as programmers, has added greatly to an inmate's chances of employment when he is released from prison. Some men have established contacts with private industry, and a Seattle newspaper has carried brief articles explaining the purpose of the course.

By establishing contact with the sophisticated world of automation, computer programming has brought a new dimension to vocational rehabilitation at the Washington State Penitentiary. ■



WESCON '69

More than 45,000 qualified (women and children not included) visitors are expected to attend WESCON's eight-ring show August 19-22 in San Francisco's Cow Palace. The annual convention is sponsored by the Western Electronic Manufacturers Assn. and the Sixth Region of IEEE. There are reasons for WESCON: Eleven western states produce about a quarter of the national electronics activity dollar volume (about $8 billion in sales), employ a quarter of the people in electronics in the U.S., and western industry purchases nearly $3 billion worth of electronic components and equipment to use in its manufacture.

Again this year, the exhibit area will be divided into eight sections: Instruments and Instrumentation, Electronic Circuit Packaging, Production and Processing Equipment, Solid State Fabrication Equipment, Components and Microelectronics, Computers and EDP, Science Systems and Communication Equipment, and Microwave Equipment and Laser Systems. Considering that more than 625 manufacturing companies will be exhibiting their products in 1180 booths, this is certainly a sensible arrangement. Exhibits will open at 9:30 a.m. each day and close at 5:30 p.m. except on Wednesday, when show hours will be extended till 9:30 p.m.

WESCON is trying to make the show as convenient and comfortable as possible for attendees. Existing facilities for food service, ventilation, and lighting at the Cow Palace have been supplemented by WESCON just for this convention. Shuttlebus service will be offered without charge between the San Francisco International Airport, the Cow Palace, and downtown hotels; and from the Palo Alto area to the Cow Palace throughout "WESCON Week." These services are provided to guarantee that conferees are never more than 20 minutes from downtown or the airport. Also, national and regional airlines are cooperating with WESCON in special information services, block-booking of flights or the establishment of extra schedules, and other measures aimed at accommodating the heavy air travel. Hopefully, some of this will help prevent "another Boston."

WESCON Week begins Monday the 18th at the San Francisco Hilton (headquarters hotel) with the annual Distributor-Manufacturer-Representative Conference, where marketing men will preview the upcoming activity. More than 500 factory, distributor, and sales representative personnel are expected to participate in the day-long program of individual sales conferences.

The 23 technical session units each contain a group of complementary papers on a single subject. Format is for three sessions to run concurrently each

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1. IC/Systems: The Changing Interface
2. Handling Microcircuits Automatically
3. Current Solid State Microwave Devices and Circuits

Tuesday Afternoon:

4. Integrated Circuits in Active Filters
5. New Company Start-Ups: The Engineer Becomes Entrepreneur
6. Computer-Aided Design of High Frequency Circuits

Wednesday Morning:

7. Time-Sharing—What It Can Do for the Electronics Industry and Vice Versa
8. Manufacturing and Computers
9. Linear Integrated Circuits in Communications

Wednesday Afternoon:

10. University Instructional TV Networks—What They Mean to Industry
11. Signal Processing Techniques in Digital Communications
12. Data Relay Satellites

Thursday Morning:

13. High-Speed Oscilloscope Recording
14. Overseas Marketing: A Perplexing Opportunity
15. MOS IC's: A Critical Review

Thursday Afternoon:

16. Automatic Production of Semiconductors
17. High Power Microcircuits—The Real Challenge
18. Trends in Large System Data Display

Friday Morning:

19. Future Avionics System Architecture
20. New Solid-State Devices
21. Computer - Aided Testing, Management and Implementation

Friday Afternoon:

22. Instrumentation for High-Speed Phenomena
23. Computer-Aided Circuit Design and Testing

WESCON '69 . . .

morning and afternoon, 10-12:30 and 2-4:30, at the Cow Palace.

As a concurrent activity, WESCON will offer the 1969 International Electronic Circuit Packaging Symposium Wednesday and Thursday, Aug. 20 and 21, in the Grand Ballroom of the San Francisco Hilton. The eight sessions include: Important Advances in Aerospace Avionics; Modern Packaging Materials and Processes; Lubrication in High Vacuum or Space; Which Microcircuit Package – Flip-Chip Beam Lead, or Spider?; Intra/Inter-Connections–What's New?; Emphasis on Microelectronics Packages; Testing the Electronic Packages; and Laser Applications in Packaging. William L. Shockley, president of Nuclear Systems, Inc., Dallas, will be keynote speaker at the symposium luncheon Wednesday.

The schedule of special and social events includes a ladies' program, cocktail party (Tuesday evening at the Hilton), Science Film Theater, industrial design awards display and luncheon, a reception for international guests, and still more luncheons.

At the Tuesday Sponsors Luncheon, Dr. Lee DuBridge, former Caltech president and currently science advisor to President Nixon, will be the recipient of the WEMA Medal of Achievement; and John B. Gunn, recognized as the discoverer of the bulk-effect phenomenon now known as the "Gunn Effect," will receive the IEEE Morris N. Liebman prize award. On Wednesday, Eta Kappa Nu will hold an awards luncheon for outstanding college engineering students. Patrick E. Haggerty, chairman of Texas Instruments, will address the group. Robert H. Brunner of Hewlett-Packard will speak at the Thursday Future Engineers Awards luncheon held in honor of 23 western-states high school students who will stage their own exhibit, hold their own technical symposium, and compete for $3,400 in scholarship prizes. All luncheons are held at the Hilton.

The ladies will be treated to a champagne reception at the St. Francis Yacht Club Tuesday afternoon. The speaker there will be Daniel E. Noble, vice chairman of Motorola, whose paintings will be shown at the Cow Palace. On Wednesday, a luncheon and fashion show is scheduled at the Fairmont. The ladies' hospitality suite at the Hilton will be open all week.

For further information on the conference, contact WESCON at 3600 Wilshire Blvd., Los Angeles, Calif. 90005, 213/381-2871. ■

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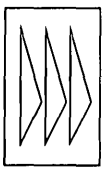

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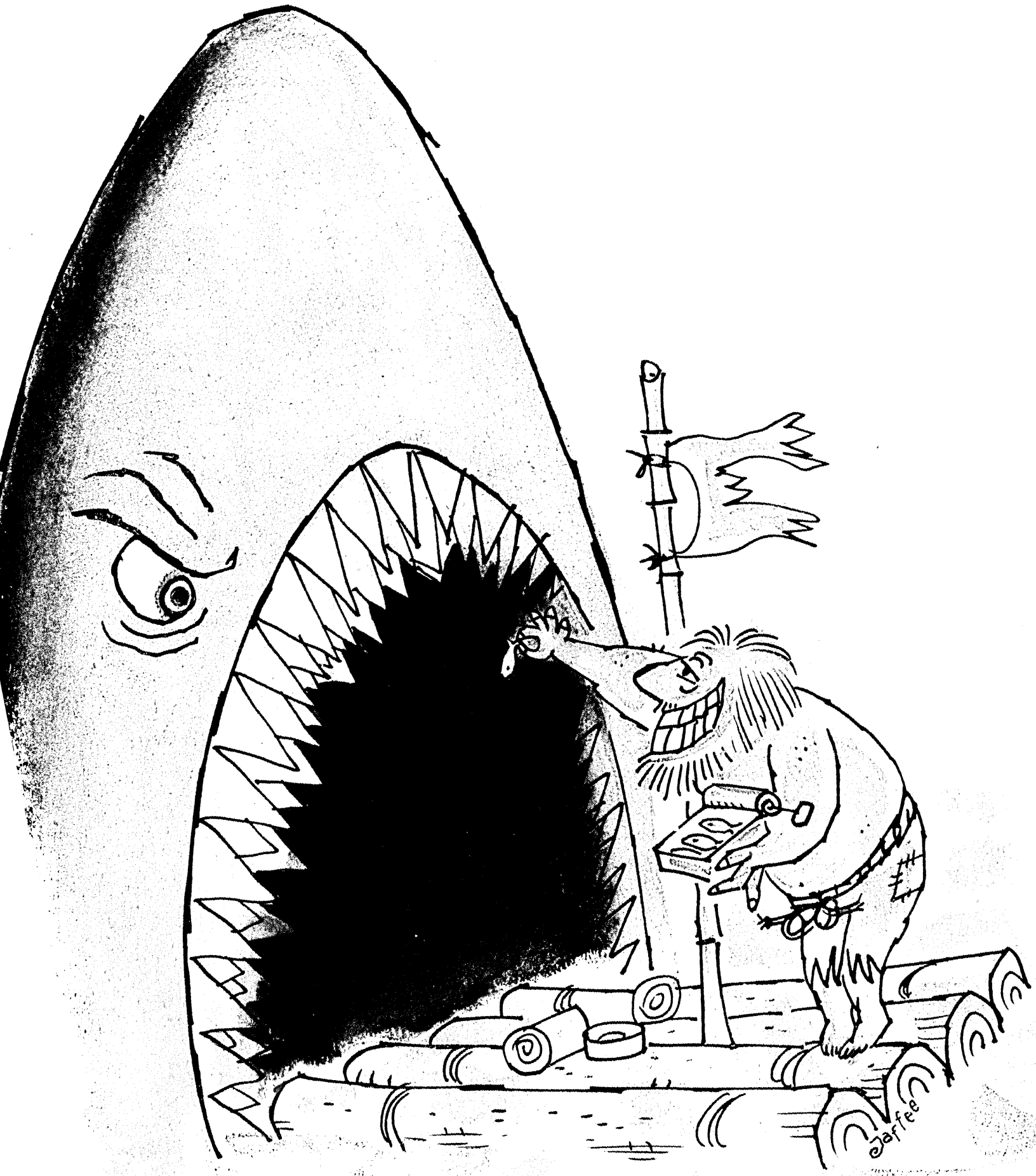
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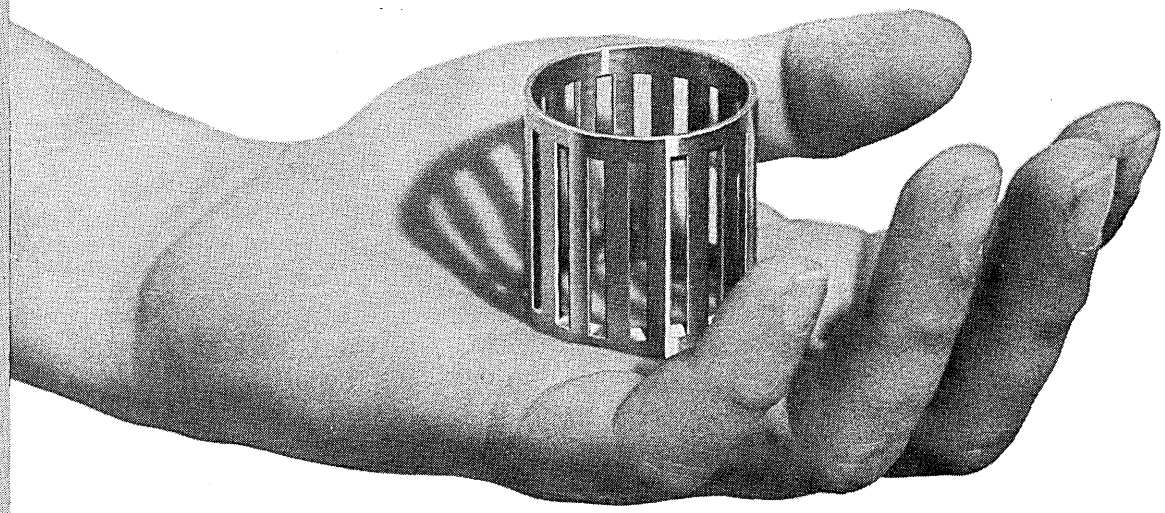

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THE INFORMATION SYSTEM MODEL

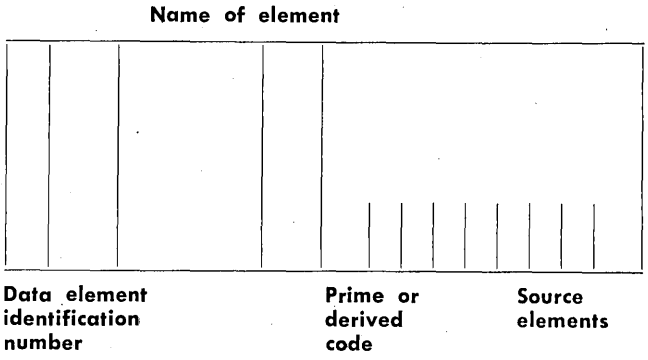
by Lee Schruben

The model, a standard tool to aid in the understanding of existing systems and in the experimentation with new designs, is here applied to an information system. This technique was developed and implemented in a study at the Emerson Electric Co. of a highly decentralized employee information system, from which the examples are drawn. However, due to the general nature of the model, it can also be effective in other information system studies. A minimum of hardware and software support is required. The project mentioned utilized a Honeywell 200, four-tape system with a standard FORTRAN compiler. The model is created during the documentation of an information system and used to aid in documentation control. It is then applied in analysis and design activities.

The term "data element" denotes an elementary item of information such as an employee's *social security number.* The objective of an information system study is to determine the most efficient, effective flow of such data elements. This flow can be achieved by using manually compiled forms, computer generated reports, or on-line data management systems.

The model contains two computer files. One file records certain characteristics of the data elements in the system, and the second contains characteristics of the forms and reports in the system. It should be noted that characteristics other than those mentioned in these examples might be desirable depending on the objective of the study. A description of each file follows.

Each data element found in the system, and any additional element which is not presently in the system but possibly should be, is recorded on the following format.



Characteristics in this record which are not self-explanatory are described as follows. The data element identification number is for record control and is a link between the files. The prime or derived code indicates if the element can be calculated directly from other elements in the system. An example of a "prime" element would be a worker's *birthdate* from which, along with the *current date,* his *age* can be derived. Finally, the source elements field contains the identification numbers of data elements from which the element in the record could be derived and is left blank for prime elements.

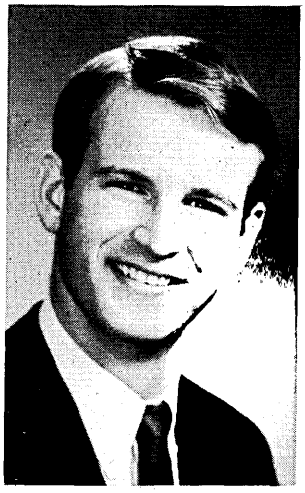
Whenever a new element is discovered, it is defined and assigned to the next consecutive unused I.D. number. Other characteristics that could be included in a data element file are security ranking, coding possibilities, and computer COBOL pictures.

forms and reports file

The record kept for each form or report in the system has the following formats. Format 2 (p. 97) is a continuation record used when reports or forms are too large to be described by one record.

The record counter and report identification number are for control purposes. The frequency of generation such as weekly, monthly, etc. are coded in the frequency code field.

The function code is structured similar to an accountant's chart of accounts and indicates the primary function which the form or report serves. Examples of such functions are "accounting," "payroll," "tax reporting," and "pensions ad-



Mr. Schruben graduated from Cornell Univ. in June, 1968, and has been employed by Emerson Electric Co., first as a student and then as a member of the operations research department. He is now in the Navy and received a commission in May, 1969.

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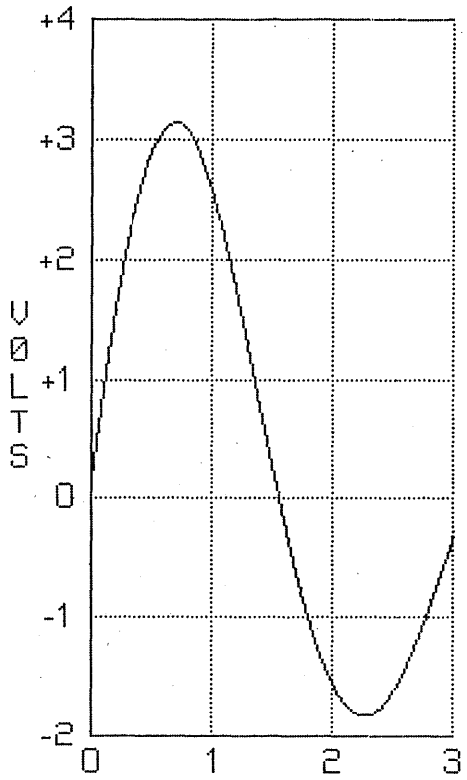

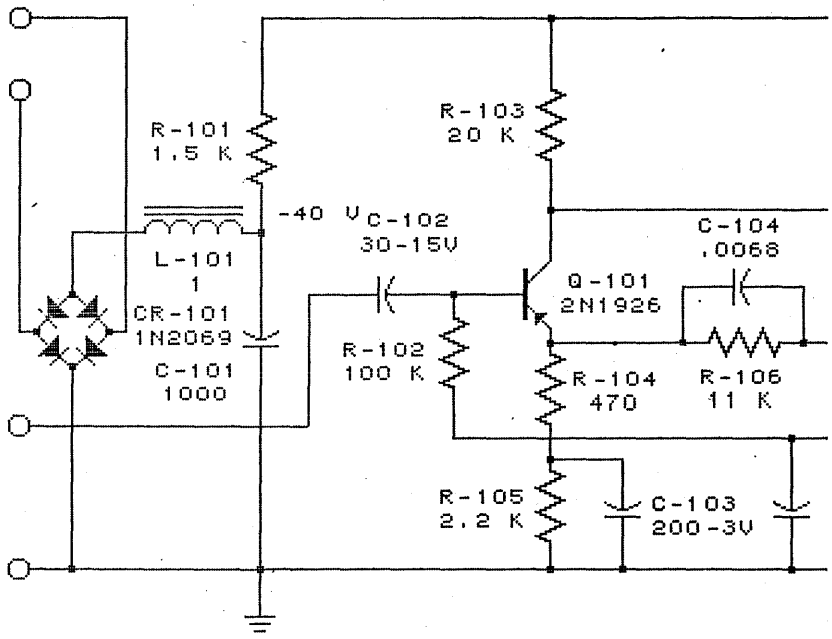

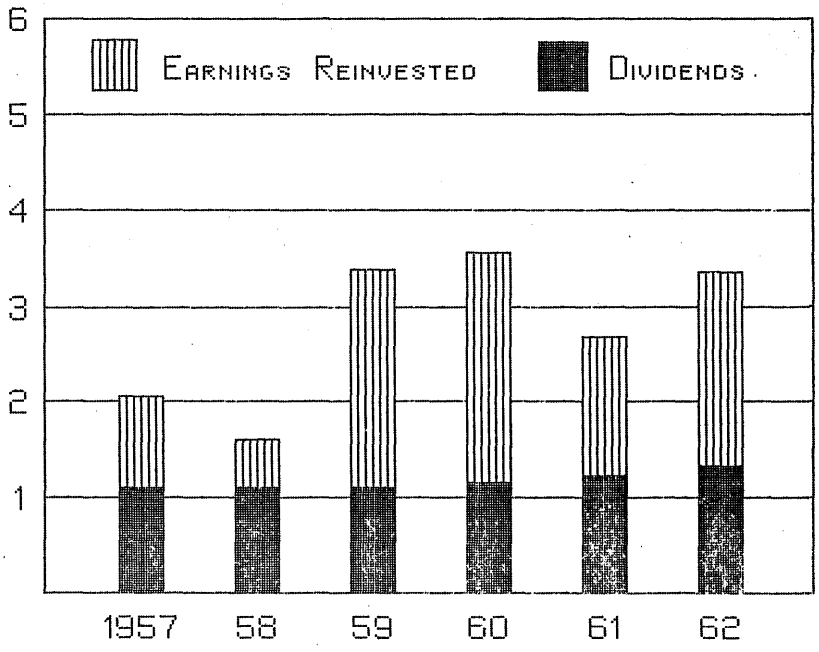

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ABCDEFGHIJ
KLMNØPQRST
UVWXYZ
1234567890

ABCDEFGHIJKLMNØPQRS
TUVWXYZ 1234567890
.,;:%()[]+-*/?='><$≠""×

THESE CHARACTERS ARE NØMINALLY 10 UNITS HIGH BY 7 UNITS WIDE. SØME CHARACTERS ARE 1 UNIT WIDE AND ØTHERS ARE 9 UNITS WIDE.

abcdefghijklmnopqrstuvwxyz
1234567890
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THESE CHARACTERS ARE NØMINALLY 10 UNITS HIGH BY 6 UNITS WIDE. THE HEIGHTS VARY FRØM 6 TØ 14 UNITS. THE WIDTHS VARY FRØM 1 TØ 9 UNITS.

ABCDEFGHIJKLMNØPQRSTUVWXY
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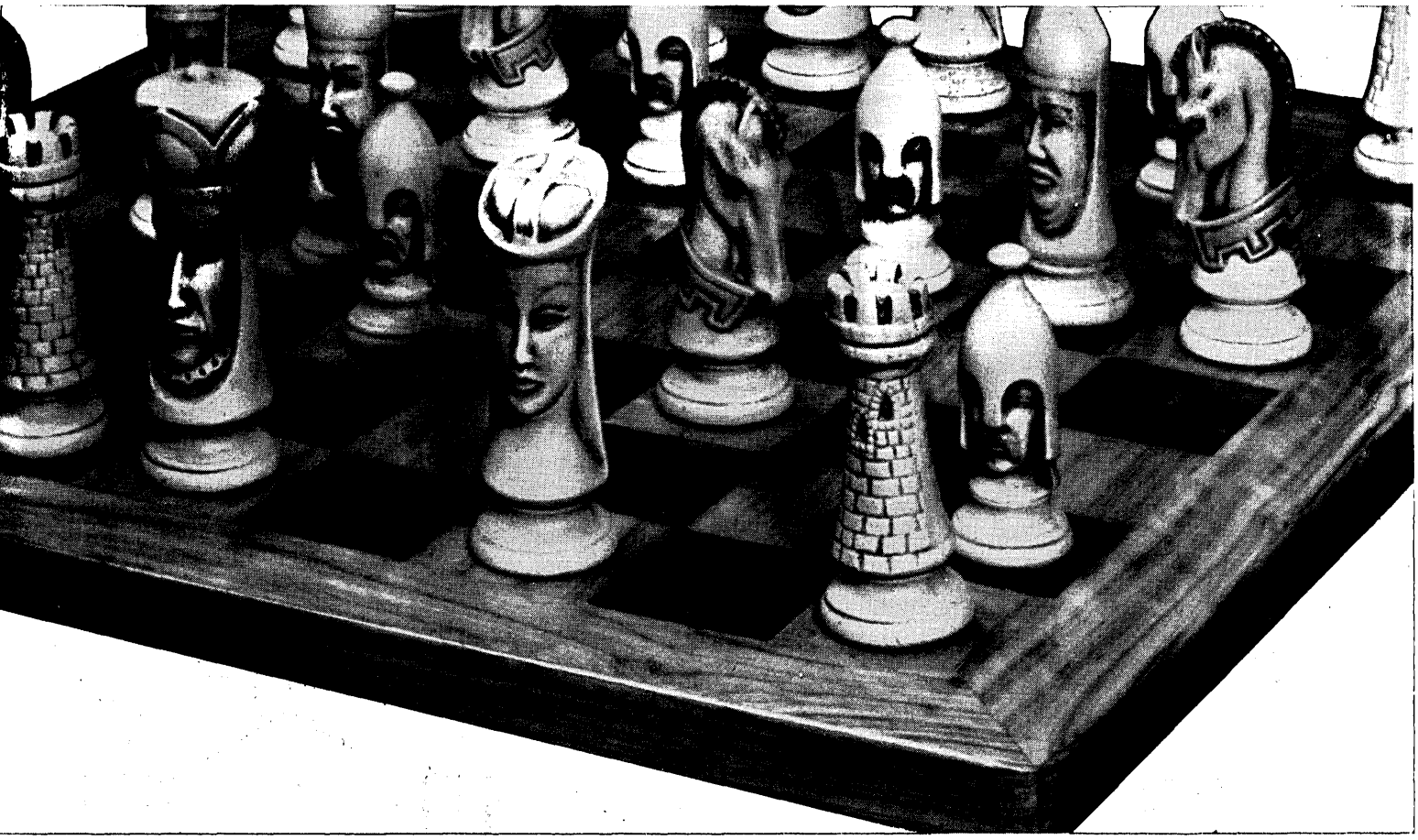
THESE CHARACTERS ARE NØMINALLY 6 UNITS HIGH BY 5 UNITS WIDE. THE WIDTHS VARY FRØM 1 TØ 7 UNITS.



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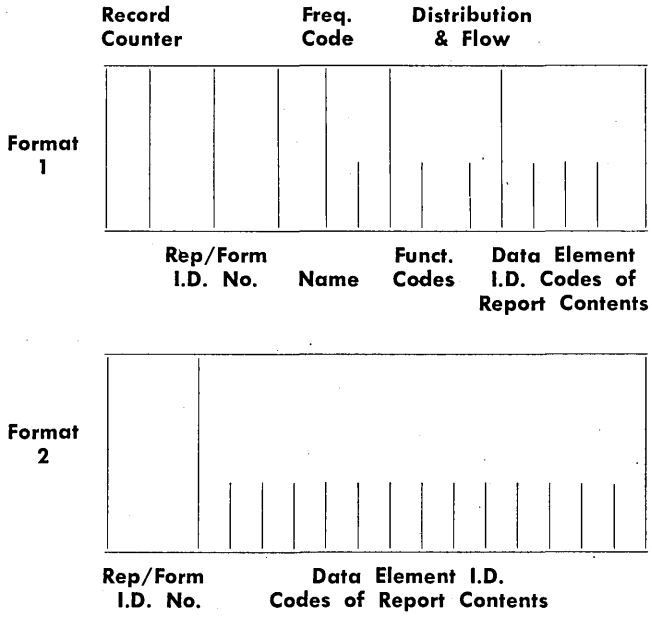
ministration." Although this may be difficult to assign, it is helpful when analyzing functional groups within the total system.



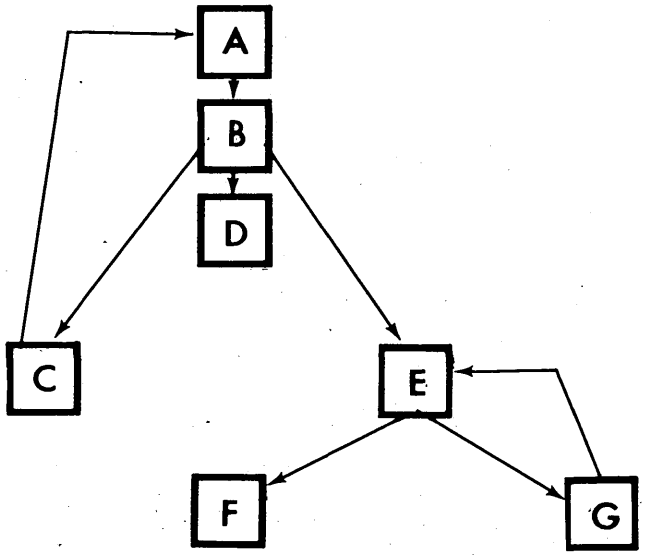
In the distribution flow field appears a series of codes telling who sends this report to whom. Mail station codes, telephone extension, or similar codes can be used to represent the persons involved with a form/report. The flow between these persons can be coded as described in the chart above right, if letters A through G represent persons using a form and the following paper flow is to be recorded. Then the user codes can be written out in any order:

A D E F G C B
(Row Position 1 2 3 4 5 6 7)

Now the positions in this row of letters can be used as coordinates to represent flow. For example, the flow from A to B can be written as the number (01, 07) since A is the first position in our row of letters and B is in the seventh position. Thus, the flow above can be represented as follows:
ADEFGCB (01,07) (07,06) (06,01) (07,02) (07,03) (03,04) (03,05) (05,03)

The data element I.D. codes on this record are the I.D. codes of every data element appearing on the report and correspond to the codes in the data element file. Like the data elements file, the forms and reports file is flexible and expands as new reports or forms are found and added to model.

During the documentation phase of the study, or the "model building" phase, documentation control reports can be generated. For example, listings of reports recorded as sent to or received from a group of persons can be generated and checked for accuracy with the persons involved. Also, the conducting of interviews to find out how each item in the information system is used can be aided by the model. For example, the computer can be used to print out questionnaires which focus attention on each data element in a report. A by-product of this model building phase is the beginning of a dictionary of standard data element definitions and names. This is necessary to avoid duplicating data elements in the model which may appear under different names.



REPORT NAME: EMPLOYEE S-W/H-EX-CERT NUMBER: 11 FREQ. CODE: 1 ORIGINATOR: 484

PRESENT USERS DESIRED FREQ. COMMENTS

521
627
126

TOTAL NO. USERS = 3

SIZE OF REPORT = 9 ELEMENTS

SIMILAR REPORTS:

REPORT NAME	NUMBER	ORIGINATOR	FREQ.	ELEMENT NUMBERS OF DATA MISSING	NUMBER OF ADDITIONAL ELEMENTS
APPLICATION FORM	1	484	1		71
OFC-PERSONNEL-INFO-REC.	27	493	1		42
EMP-W/H-EX-CERT-ST-OF-MO	12	484	1	631	1
ADDRESS FORM	9	484	1	631	3
INS. DEPENDENT FORM	176	321	3	020 003	2

RECOMMENDATIONS:

Fig. 1 Report Analysis

With the model partially completed, an analysis of the information system can begin. To aid in this phase of the study a "report analysis" sheet can be generated for each form or report as shown in Fig. 1. The "report analysis" gives the frequency and main originator of the report. It then lists the present users, leaving space for entering the desired frequency that each of these users would like to

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receive this report and for recording user comments. Next, it gives the size of the report in terms of the number of data elements. Finally, it lists reports in the system which are similar to the report under study. Also, data contents of the report can be listed.

This report analysis has two useful features. First, the comments of the various users concerning the report or its contents can be recorded on it. Second, the "similarity sort" at the bottom of the example can list any other reports within the system which satisfy a prespecified criterion of similarity. This indicates likely candidates for substitution and can point out redundant paperwork. The criterion of similarity used in the study mentioned earlier was to list the 10 reports which were missing the least number of data elements that were on the report under study (the reports could contain any amount of additional data). Other criteria could include such things as percent of identical data elements, frequency of generation, etc.

Concentration on a particular subsystem of the information network is achieved through listings of reports and data elements serving this subsystem. For example, an examination of only the reports used to operate a pension program and the associated data base may be of interest. This is accomplished by sorting on the function fields and distribution-flow fields of the files. Listings are generated telling where this subsystem receives or sends a given form or report and how often. Also, data base listings can give the number of computer and manual reports on which a data element is received or sent by the subsystem, thus focusing on possible redundant information flow.

Another aid in analysis is the "where used" listing for data elements as shown in Fig. 2. The "where used" list gives for every report in the system on which a data element appears: its size in terms of the number of data elements on the report, its frequency of generation, whether it is computer or manually compiled, and a listing of the stations receiving the report.

The generation of data element flowcharts, as shown in Fig. 3, is also feasible. These could be created from the distribution flow fields in the form/report files by linking with the data element files. The data element flow listing shows on which reports an element appears and how it flows through the system. The column headed "operation" is where the analyst can write in a brief summary of what happens to the data element at each step. The column headed "C/M" indicates whether this is a computer or manually generated report and the "FREQ" column contains the appropriate frequency code.

If the new information system resulting from this study is to utilize the computer, the model can aid in the selection of the most efficient input and output of the computer subsystem. Once a preliminary decision has been made of which elements are to be maintained on computer files, a listing showing how often each element is used can help. The "where used" listings (Fig. 2) can aid in determining where each element should be inputted and updated. Then a listing of forms and reports which could be generated from the proposed computer data base can be created (Fig. 4 p. 101). This listing shows which reports have what percentage of their contents on the computer and can be used as an aid in deciding output from a proposed computer data base and in suggesting changes in that data base needed to make further output available.

It is in the design of a new system that the "model" concept is realized. This comes from the ease in changing distribution-flow, frequency, and data-element-contents fields

ELEMENT NAME ADDRESS-CITY-STATE DEFN NO 1

REPORT NAME	NUMBER	SIZE	FREQ.	C/M	STATIONS USING REPORT
APPLICATION-OFFICE	1	112	1	M	484 489 493 513 122 455 479 497
APPLICATION-FACTORY	2	105	1	M	484 491 513 479 497 489
OFC-EMP-PERSONAL-INFO-RECORD	3	71	1	M	484 118 486 521 SPV
FACTORY-PLNT-EMP-PUT-ON-NOTICE	4	23	1	M	484 497 479 491 486 FMN'
ADDRESS FORM	9	7	1	C	484 521

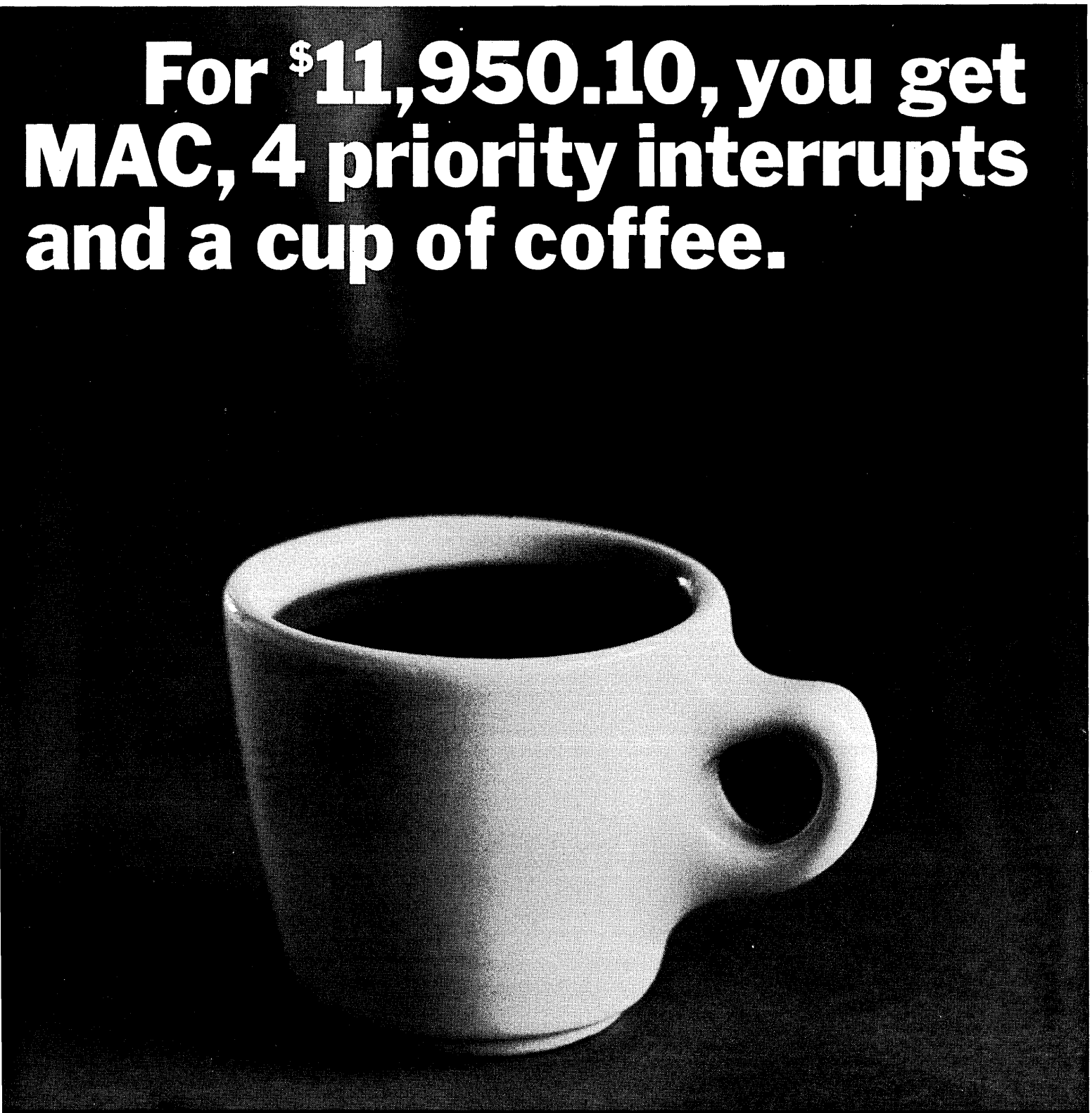
Fig. 2 Where Used List

ELEMENT NAME: SALARY GRADE NUMBER: 171

REPORT	FREQ.	C/M	FLOW	OPERATION
1) SALARY ANALYSIS	2	C	029 → 117, 126 → 213, 214; 914 → EMPL.	
2) PAYROLL DISTRIBUTION	3	C	029 → 217, 117 → 029 → 914, 126	
3) INSURANCE APPLICATION	1	M	EMPL. → 116, 117 → 029, 171	

Fig. 3 Data Element Flow

For $11,950.10, you get MAC, 4 priority interrupts and a cup of coffee.



Why coffee? Because you won't be spending any time programming MAC for priority interrupts – since MAC's interrupts (with automatic store and restore) are in hardware, not software. So you've got to have something to do with your time.

And MAC's internal structure saves you still more time by reducing programming.

On the job, the time saving goes on. MAC responds to interrupts in an average 6 microseconds. Which means it can operate with nearly any real-time or time-sharing system.

And another thing: MAC's 4 basic interrupt levels can expand to 64.

The same goes for MAC's basic 16-bit, 4K memory. It'll expand to 8K in the mainframe and to 65K with additional chassis.

Nothing mentioned here is exclusive with MAC, of course. Other computers offer 4 hardware priority interrupts and most of MAC's other features. They start at around $25,000.

But if you're spending money like that to get a computer like MAC, you may need a strong cup of coffee.

Write to MAC, Lockheed Electronics Company, Data Products Division, 6201 East Randolph Street, Los Angeles, Calif. 90022.

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in the form/report files. Thus, new or redesigned reports can be inserted into the system environment and analyzed for redundancy, possible computer generation, and efficient data flow. Likewise, data elements can be added to and deleted from reports and proposed computer files.

Although the system from which the examples were drawn was involved with the generation of printed reports, the information system model concept can be extended to an on-line system. In this case the "data elements" file would remain essentially the same; however, the "reports" file would be expanded to include the more commonly requested groupings of data elements and many of the elements that might be called for singularly. The flow of information between the on-line system and the supporting manual information system could still be studied through a model.

Another by-product of this model concerns forms control. When new information requirements arise, the model can be examined to see if these needs can be met by existing reports. If not, the model will aid in determining how the data for new reports can most efficiently be compiled.

A final item worth noting is that all of the output reports from the model are easily programmed and many can be obtained from a straight numeric or alphabetic file sort. ■

REPORT NAME	NO.	% DATA ON FILE	C/M	DATA ELEMENTS NOT ON FILE
ADDRESS FORM	10	100%	M	
EMP. ANNUAL PENSION	172	100%	C	
PAYROLL DED. REGISTER	168	100%	C	
•	•	•	•	
•	•	•	•	
•	•	•	•	
WEEKLY ATTENDANCE	112	95%	M	987, 127, 613, 014
QUARTERLY CITY TAX	171	94%	C	127, 018
•	•	•	•	
•	•	•	•	
•	•	•	•	
BLUE CROSS ACCIDENT	213	80%	M	018
•	•	•	•	
•	•	•	•	
•	•	•	•	
BADGE COUNT	060	0%	M	14 ELEMENTS

Fig. 4 Computer Report Candidates

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Better way to handle service calls

Sloppy paperwork often results in sloppy service calls and subsequent ill feeling. Moore has systems for utilizing mark-read to help eliminate errors due to bad handwriting or transcription. Customer gets better service. Internal records are accurate and complete. Correct charges are applied to services performed. Ask about "service calls."

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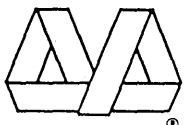
It's quick and easy to remove multiple carbons from continuous forms. Convenient, too, because deleaved sets remain intact for subsequent handling. A Moore Deleaver handles heavy duty deleaving production efficiently—trims one or both margins—refolds into neat packs. Ask about "Deleaver."

Nothing succeeds like success

When you question Moore about any of the ideas discussed here, the first thing we tell you is that they work. They're all in use. Moore has more than 2400 men who are highly skilled at making the same idea work under different circumstances or to achieve a different goal. One Moore idea may be what you need. Call your Moore man.



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INTERNATIONAL JOINT CONFERENCE ON ARTIFICIAL INTELLIGENCE

"Heuristic rather than formal approaches," "deterministic rather than stochastic," and "macroscopic (black-box) rather than microscopic" can probably be used to sketch the general spirit of the International Joint Conference on Artificial Intelligence, held in Washington, D.C., May 7-9, 1969.

Sixty-four papers, two panel sessions, and several evening seminar-type sessions constituted the three-day program. More than 600 scientists and engineers were reigstered, including participants from England, Canada, Italy, Japan, Germany, USSR, Hungary, Sweden, Czechoslovakia, Poland, and France. Unfortunately, the group from the University of Nottingham, England, which had three papers, could not attend the conference. The conference was sponsored by 16 national and international professional societies.

To my knowledge, this is the first attempt at such a conference in the United States. There is no doubt that the organizing committee members of the conference should be congratulated and complimented on their overall efforts in making such a successful conference. The area of artificial intelligence is challenging but controversial. Different schools of thought and different interpretations of terminologies and definitions sometimes make it rather difficult to have a joint conference with broad and unbiased coverage. Consequently, in the past, there have been many smaller scale workshops and symposiums. The emphasis has been on a relatively narrow subject area or on one or several particular approaches. The terms "artificial intelligence," "cybernetics," "bionics," etc., have been rather freely used. With the initiation of the joint conference better communication, which is desperately needed, can be established among mathematicians, computer scientists, engineers, psychologists, physiologists, logicians, etc., working in the area of artificial intelligence. Of course, with the scope and the size of a joint conference, close individual contacts and informal discussions seem less convenient than small scale workshops and symposiums. Nevertheless, these two types of meetings definitely complement each other.

Judging from the technical program, very critically speaking, two groups of papers were less thoroughly represented. One group is the biologically or neurophysiologically-oriented research; the other is the work related to mathematical modeling and algorithms. Since recent publications have indicated an increasing amount of research in technical cybernetics conducted in the USSR, if possible more presentations given by Russian scientists about their latest results would also have been welcomed, and, in addition, would have increased the international flavor of the conference. In the following a brief glance at some of the technical sessions is given.

pattern recognition

Roughly, there were three sessions on pattern recognition. The first session consisted of five primarily theoretical papers with emphasis on signal processing. The paper "Multiple Antenna Array Signal Collecting and Processing" by B. Boverie and W. D. Gregg presented an analysis of an optimal data collection and processing system for detecting a random signal field in a random noisy field using multiple antennas. The result obtained seems interesting. Unfortunately, no computer simulation or experimental results were given. E. A. Patrick and F. P. Fischer's paper (not presented) "A Generalization of the k-Nearest Neighbor Rule" described a family of nonparametric decision rules based on tolerance regions. The family of decision rules, as the authors claimed, could be considered as a generalization of the two-class k-nearest neighbor decision rules. Haar's functions used in orthonormal expansions have been suggested for pattern representation, particularly patterns with discontinuities. L. A. Gerardin and J. Flament, in their paper "Geometrical Pattern Feature Extraction by Projection on Haar Orthonormal Basis" have further illustrated the technique using geometric patterns. An optimal design procedure with adaptive feature for the video preprocessor in optical character recognition was proposed by M. R. Bartz ("Optimizing a Video Pre-Processor for OCR"). The threshold value of the optical scanner was first optimized with respect to the printing quality of characters. Recognition reject rates were used as the performance measure in the adaptive case. Computer simulation results were presented for the constant threshold case.

Ten papers were scheduled in the second session of pattern recognition. This session emphasized special applications rather than general or theoretical results. Geometrical line patterns (including characters) and biomedical applications seemed to dominate the whole session. The only paper giving more theoretical results was "Recognizing Convex Blobs" by J. Sklansky. Unfortunately, no experimental or simulation results were presented. Shape descriptions in terms of conic sections were proposed by K. Paton for chromosome analysis ("Conic Sections in Chromosome Analysis"). The chromosome shape is characterized by five parameters: the abscissa and the ordinate of conic center, the inclinations of the conic major axis to the horizontal axis, the length of the major semi-axis, and the length of the minor

WHERE DO GOOD COMPUTERS GO WHEN THEY DIE?

Well, they don't die, and they don't fade away. They don't even stop working. In fact, Second and early Third Generation computers which have been replaced by newer models are working better and harder than ever.

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semi-axis. A conic skeleton, which reflects the general shape of the denser part of the chromosome, is then used to help to determine appropriate pattern transformations. It should be interesting to see some real-data experimental results for illustration.

W. D. Rowe, in his paper "Gestalt Pattern Recognition with Arrays of Predetermined Neural Functions," proposed a neuron nets approach for pattern recognition. Following von Foester and Babcock's approach of using property filter, arrays of logical nets with predetermined connections were used for recognition of two-dimensional geometrical patterns. Computer simulations of the neuron net were reported. A biologically based line-tracking technique was used by Mori, et al., ("A Dynamic Pattern Recognition Method Using the Preview-Controlled Saccadic Movement of the Detector"), for recognition of geometrical line patterns. The preview controlled curve tracking movement of an optical detector is similar to the saccadic motion of the human eye. A block diagram of the curve tracking system was given, but no experimental or simulation results were presented.

The rest of the session was more or less devoted to the recognition systems for handprinted characters or handwritten numerals. Hoshino and Kiji presented a computer-aided design procedure for handprinted character readers. The extracted geometrical features were arranged sequentially through a man-computer, trial-and-error procedure. The features were selected and arranged according to human experience. Experimental tests were made on 500 handwritten numerals using a stroke end points, curvatures and inflections as features.

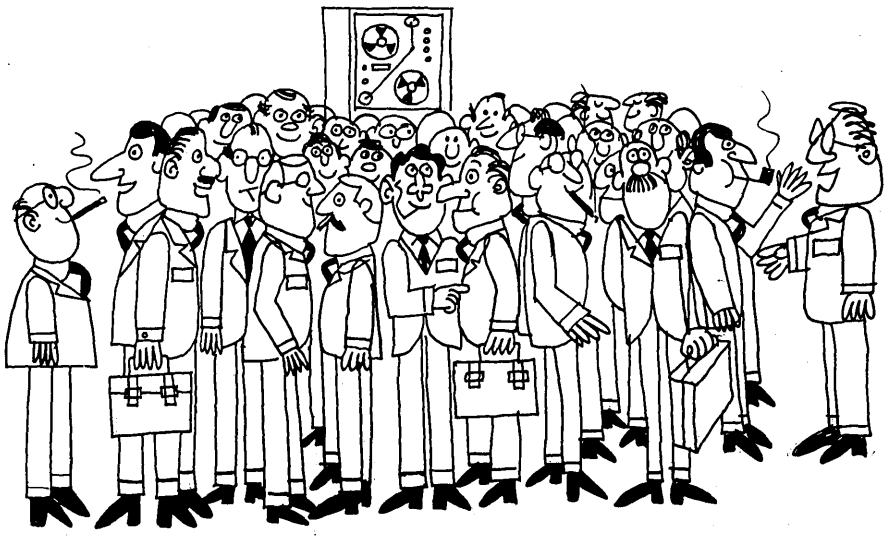
A description of the Tokyo Post Office machines was given in a paper by Katsuragi, et al. Strokes were used as features of handwritten numerals, and the decision-graph matching technique was employed for classification. The decision graph consisted of a set of decision transition diagrams to be compared with the sequence of extracted features and a penalty counting system to detect the optimum match. An edge-following technique with a sequential decision scheme was suggested by Murden and Symons, England, for visual pattern recognition problems. A training mode was also introduced to the system for the estimation of statistical parameters of the patterns. The proposed system has been simulated on a digital computer with an on-line camera input. Handwritten numerals were used in the experimental studies.

Huff and Neidhart reported a character (machine- or hand-printed) recognition system developed at AEG-Telefunken, Germany. The description of the system was rather sketchy. However, experimental results were reported where a test of 25,000 documents generated by various high-speed printers under uncontrolled conditions yielded only 53 rejections.

The third session on pattern recognition emphasized linguistic and contextual methods. This class of approaches has been overlooked for a period of time. Nevertheless, it is gradually gaining its place in pattern recognition research, particularly in the case of picture processing and more complexed patterns. As the enthusiasm for linear discriminant function and Bayes' decision rule are fading away, the linguistic approach has received increasing attention. The first paper, "A Contextual Recognition System for Formal Languages" by S. C. Darden, described a character recognition system that operates by feeding the noisy output of an inexpensive character recognizer through a multiple-stage syntax-directed context analysis in order to produce high-quality final output. The characters to be recognized are limited to those from handprinted formal language, such as programming languages and mathematical notations. A computer-simulated character recognizer was used to test the proposed context analysis system.

J. L. Pfaltz and A. Rosenfeld, in their paper entitled "WEB Grammars," described a class of phrase-structure grammars for picture languages. The languages consist of directed graphs with symbols at their vertices. Examples of context-free and context-sensitive WEB languages were given. Although several theorems concerning the properties of the languages had been proven, the direct relations to pattern recognition were not clearly illustrated.

The last two papers of the session both deal with the description of two-dimensional graphical patterns. A structure description for two-dimensional black and white patterns was defined by C. T. Zahn ("A Formal Description for Two-Dimensional Patterns") as the set of contour lines for an appropriate function which fit the binary pattern representations.



The binary matrix representation of a two-dimensional pattern is transformed into a set of curvature-points (points where the contour lines change direction) of its approximate contour lines. Some advantages of the proposed curvature-point method, as stated by the author, are its generality, simplicity, and efficient implementation. If possible, experimental results should probably be used to demonstrate these advantages.

In the last paper, "Machine Perception and Description of Pictorial Data," M. A. Fischler described a computer system which can perceive a limited class of graphical objects, create linguistic descriptions for the objects, and classify objects by comparison with a reference set of descriptions. Line segments, contours, and interpoint slopes were adopted as features. Handprinted numerals were used to illustrate the proposed recognition procedure.

In recent years, robot research has become one of the major attractions in artificial intelligence. Three major robot research projects are currently located at the three major research centers in artificial intelligence. There is no doubt that true robot research involves almost every aspect of artificial intelligence. This is probably why a robot project is so interesting and challenging. *(Continued on p. 107)*

If the 1108 is a **MAXI,**
And the PDP-8 is a **MINI,**
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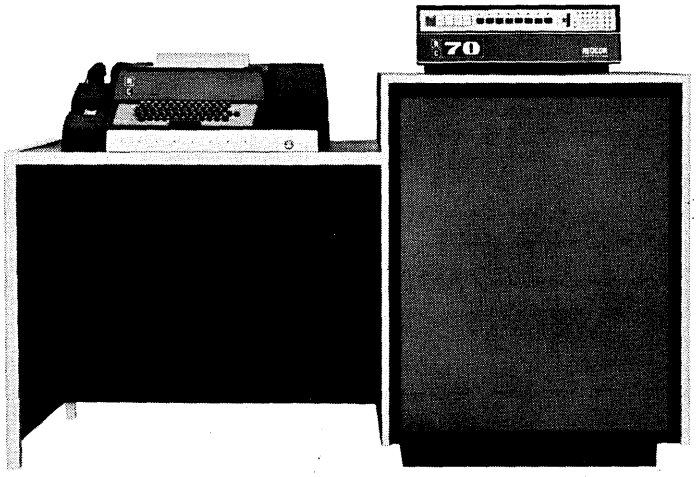

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ARTIFICIAL INTELLIGENCE . . .

In the session Integrated Artificial Intelligence Systems, the recent status of several major robot projects was reported (except Minsky's project at MIT). A man-computer-manipulator system was described by T. B. Sheridan of MIT. D. E. Whitney then presented the state variable formulation of such a system. The man-computer-manipulator system was designed for doing a variety of exploration and assembly tasks. Emphasis of the project was placed upon the allocation of functions to man and machine and the nature of their on-line interaction. Problems of organizing command language (MANTRAN) and designing touch sensors and manipulators were discussed. Human operators serve as supervisory controllers, and their commands may be in the form of symbolic (through Teletype) or analogic (through joystick) signals.

Nils Nilsson reported the status as of early 1969 and the future plans for the SRI robot project. A movie (a revised version with contemporary music) was shown later during lunch time to illustrate some of the typical motions of the SRI robot vehicle. The paper, "Stanford Hand-Eye Project" by J. A. Feldman, et al., described briefly the progress made in the Stanford robot project which was intended to design and implement a system exhibiting some interesting perceptual-motor behavior. In addition, it also mentioned other related artificial intelligence projects at Stanford. L. Friedman reported some results from a study of robot control strategy. The idea is to test a behavioral theory of information processing based on ethological observation by programming a robot control system. The resulting software of such a test can be used to simulate robot operations.

The use of feedback was emphasized by L. Uhr and M. Kochen, in their study of MIKROKOSMS[1], a model of robot. Different from the SRI, MIT and Stanford robot projects, there was no hardware work involved in MIKROKOSMS. The authors believe that there is a lot to discover by simulation and theoretical studies before MIKROKOSMS are ready to be put into the real world.

The session Self-Organizing Systems consisted of four papers dealing with mathematical modeling and algorithms for self-organizing systems. The paper by K. R. Fialkowski ("Cyclic Behavior of Randomly Growing Digital Structures in a Finite Random Environment") presented the results obtained by observation of evolutionary sequences of computer models of simple organisms. The model was represented in terms of randomly growing sequences of positive integers. The growing structures are considered as evolutionary sequences. The results obtained from the simulation showed only the possibility of the real existence of observed environmental influences upon living organisms. Tests of the model in biological experiments are still needed.

Comparisons of three statistical classification techniques based on the information theoretic viewpoint and their discriminant power were made by S. Noguchi and J. Oizumi. The techniques discussed included (i) the Bayesian classifier, (ii) the Regression classifier and (iii) the Fisher classifier. Some computer simulation results were also used in the comparison.

Algorithms for the learning process were approached from two different directions by F. Sloboda and J. Fogel, and L. Uhr and S. Jordan. The

stochastic approximation procedure, which was quite popular in engineering during the last three or four years, was suggested as a learning algorithm by Sloboda and Fogel. A possible way of accelerating the rate of convergence of the algorithm using Kesten's approach was also discussed. Uhr and Jordan presented a feature generation scheme based on Bledsoe-Browning's n-tuple description of patterns. Learning process was introduced to adjust the weights on the generated n-tuple representations. A long and complex computer program, written in SNOBOL, was described, but no extensive runs were made.

The conference closed with a panel discussion. Whereas the conference was a forum for papers of many "third-generation" members of the artificial intelligence community, panel participants were first and second generation. Two predominant themes were generality vs. specificity being manifest in current AI work, and where do we go from here. Ed Feigenbaum (Stanford) looks to the development of better search strategies. Today's he considers general and rather weak. He ascribes to the choice of representation a key role in the efficacy of learning programs. John McCarthy (Stanford) commented that most current work is concerned with heuristics; it starts with a representation and produces a search strategy to achieve a particular solution. Little effort has yet been devoted to epistemological aspects of devising the representations themselves and procedures for going from one to another. The beginnings of a theory will evolve, in his view, with formalisms that can generate such representations. To Allen Newell (Carnegie-Mellon), the amount of detail that has been necessary in developing learning programs has tended to obscure a clear definition of fundamental AI questions. He cited scene analysis as an example of an area in which other techniques could be introduced to enrich existing pattern recognition procedures. Seymour Papert (MIT) sees current work as based on people's concepts of intelligence that range along a spectrum between the extremes of intelligence as a single principle and intelligence as a kludge. He illustrated the kludge idea by observing that what is general to a chess player may be a very small part of what is particular in another context. For 10 years, Papert noted, there has been discussion of what machines might be able to do. The MIT group has elected to examine what a particular class of machines can be algorithmically structured to do. He called for more theorems than definitions in future work, and hopes that larger systems may help in posing problems via robotology.

conclusions

Because of the arrangement of parallel sessions, only about half of the sessions could be attended. Sessions not described in detail in this report include Heuristic Problem-Solving, Theorem-Proving, Question-Answering Systems and Psychological Modeling. It is hoped that this partial coverage will not cause any impression of bias in opinions. In summary, the conference was a success. Now is the time for all artificial intelligentists to volunteer to help the second joint conference.

(The Conference Proceedings are available from the ACM at $10 per copy.)

—K. S. Fu

[1] Models of Inductive Knowledge in Responding Organisms Konstructed from Only Sensation, Memory and Sweat.

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able to solve tall programs in a single run...
more powerful than any other Fortran system...

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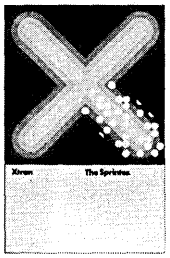

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news scene

an interpretive review of recent important developments in information processing

THEY LAUGHED WHEN VIATRON SAT DOWN AT THE KEYBOARD

Viatron Computer Systems Inc. of Bedford, Mass., is an enigma. You talk to their principals and you are convinced that they will come through with System 21, the very cheap "computer station" that uses large-scale integration. And, more, you're convinced that they will sell tens of thousands of these "Carter's pills," not with salesmen knocking on doors but through the communications media.

Then you talk to people in the industry, and while some have mellowed, some still cry "hoax," or look very skeptical that it can be done, or swear that the company will go bankrupt. Maybe that's the result of an industry that has never really thought in two figures ($39/month for keyboard, crt, microprocessor, cartridge-tape drive). That never really tried to sell through the mass media. That thinks pioneers get little reward but arrows in the derriere. That can't think Sears Roebuck. Maybe. Getcha System 21 right here.

Less than a year ago, Viatron, headed by a couple of computer veterans who had lived in the world of university and government research, came out and told the "real" world through $500,000 in ads about the "sensational" System 21. It's the ultimate in separate pricing: $25/month for the basic processor, $5/month for the tv display, $5/month for the keyboard, $4/month for the tape cartridge drive (all terminal components), plus $100-250 for card and tape converters, plus $20-30/month for the robot printer that attaches to a Selectric for tape-to-hard copy, and so on and so on. Those nickels and dimes add up and without a purchase price, comparisons are confusing, but it still seems much less expensive than any data entry system on the market. (The average terminal being ordered is $50-70/month.)

The question that rankled most is the use of 35 types of LSI/MOS arrays. At announcement there was one supplier, General Instrument. But before the industry could really ask about price, technology, and suppliers, Viatron was covered by the veil of silence required of all companies that go into SEC registration for a public stock offering. It was legitimate. They needed money, and still do — lots of it.

Finally, this spring the stock hit the market, bringing in over $12 million for about 800,000 shares ($15/share). (It's fluctuated between the 20's and 30's since then.) As of mid-June the firm was out of the "silence period," and now it has begun granting press interviews. We spoke to three of its very enthusiastic top executives: Dr. Edward Bennett, president, Dr. Joseph Spiegel, exec vp, and David Sudkin, vp of marketing.

They made commitments. Preproduction models will be out this fall, probably by October. Late this year Viatron will begin production runs building from 200 a month to over 5,000 by late summer 1970. The 500-600 customers accounting for 14,000 letter of intent "orders" will each receive one or two units to try out (this continues up through March 1970). And a walloping prediction is that Viatron will have built between 24,000 and 40,000 System 21's by October 1970, according to Sudkin. He further committed Viatron to maintenance of its low prices. "If they do change, it will only be downward."

mass everything

Mass production (no product without a market of 10,000), mass marketing, and mass servicing (replaces it if it breaks) are the words of Sudkin, but are the philosophy of the men who come from Mitre Corp., Bennett and Spiegel. Both were involved there as managers of the Air Force project AESOP, an advanced real-time data management system. Both had been involved in the military's experimentation and use of advanced techologies, including LSI. When asked how Viatron and System 21 came into being, Bennett simply offered that he and Spiegel had a "desire to put out a terminal of infinite beauty at no cost," that "customers couldn't afford to ignore."

"We sat around and said, how much can you afford to rent a tv display for? $5. How many characters to the line? 20. That's not enough. It has to be re-engineered, cost more? Leave it at 20." The process of least-trouble, least-price analyzing went on until all elements were put together, said Bennett.

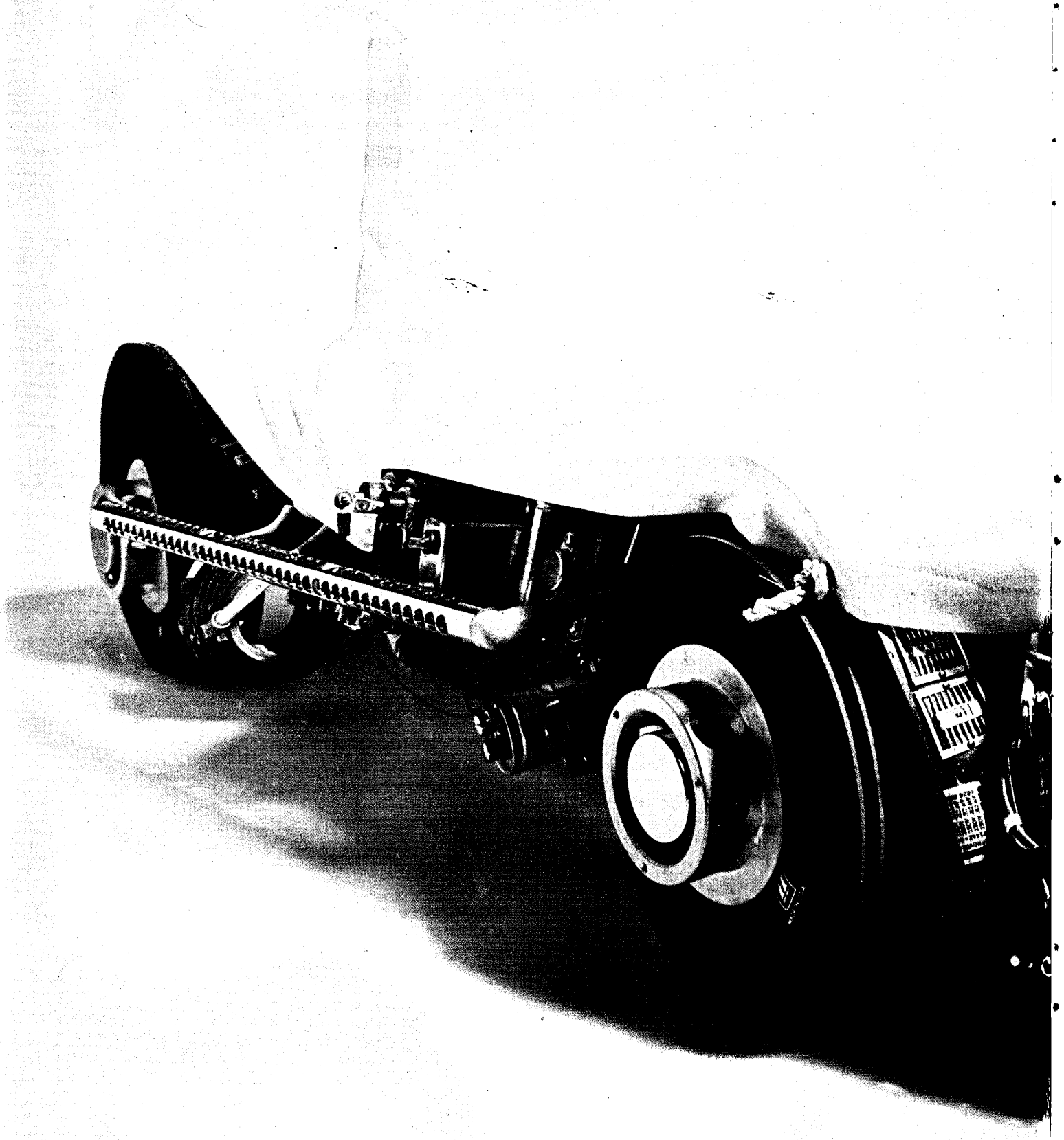
But why use large-scale integration? "LSI has been widely accepted by the military, while the commercial world has lagged in awareness of the validity of the technology. But there is a revolution going on in the large array business. This is the first process-oriented electronic fabrication. It forces massive discrimination of price as a function of volume."

Despite rumors of an on-again off-again contract with General Instrument, GI will be one of the LSI array suppliers. Texas Instrument, Fairchild Semiconductor, Autonetics, Motorola, Reagan, and AMI have been signed, as well. Negotiations are also in process with two other firms. Too, Viatron is developing its own MOS production facility that will produce 1000 arrays a month by fall — a "contingency fund."

The costs and problems of LSI production seem to be the major key to the question of success. As said, there are 35 types of arrays used throughout the system (terminal, converters, printers, etc.). A single full system with one terminal and all options would have about 100. The number of active elements on the Viatron arrays ranges between 150 and 4000. Equating three or four elements to a bit and coming up with the minimum figure we've heard quoted — 3/4c/bit, we asked Bennett if the cost of the chips with the "1000 bits" equivalent, might not be $15-20. He discounted measures of "cost per chip" as invalid, but noted that perhaps $15-20 would be considered a "very good price for high volume and not much complexity." What he meant was that although Viatron, in designing the arrays, has tried to keep them simple, the variance in their complexity and volume defies "pat" measures. We couldn't get much further in defining what arrays would be used in what volume and what costs might be expected.

in full array

Bennett did say that "you can pack 10 times as much logic for the dollar in MOS arrays as in TTL monolithic integrated circuits. That's mass production costs." But the cost in MOS circuits "is in the tooling," which can range from $5,000 to $50,000 per array type, depending on complexity. Further, "it's the systems house that pays for the tooling," meaning Viatron. (Bennett has stated in a stockholders' report that array development will cost $1.3 million.) That's "one rea-



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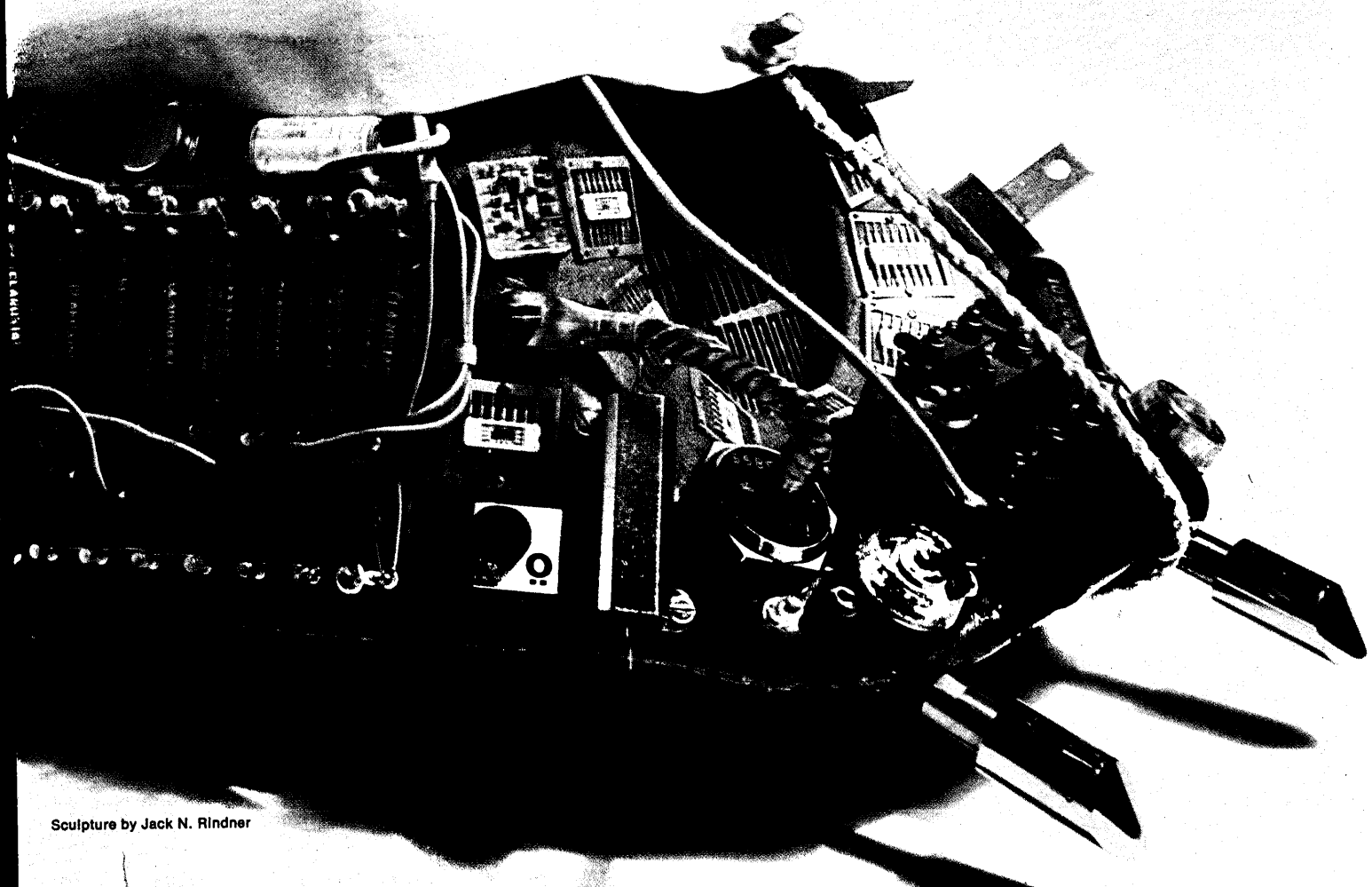

Sculpture by Jack N. Rindner

son why we have no competition yet. Nobody's willing to make the investment. The risks are great with LSI, but the potential rewards are even greater."

Told by an LSI expert that human error in the design and production of masks for the arrays is the most dangerous problem ("errors on two or three arrays could delay a system for months"), we asked Bennett what precautions were being taken. The firm, he said, now has 45 MOS design engineers ("the largest group in the country") and there is constant checking of masks by them and by the contractors. All arrays are in some form of fabrication, he said, and there has been nothing defective as yet. Errors were discovered beforehand. The company has also allowed time in its schedule for re-do of the masks. Test equipment for the chips has also been a problem in the industry, but Bennett feels that the computer technician, using digital equipment, is in the best position to solve that and will be well along by the time Viatron gets into high-volume production.

Semiconductor firms have an impetus to make Viatron succeed, adds Spiegel. "One vice president said 'We can't afford to let another V fail,' meaning the Victor Comptometer effort with the desk top calculator."

what will it profit them?

There are lots of guesses about when Viatron might become profitable, if all goes well. Some say three to five years. The company has 14,000 letters of intent as of April, and expects to have as many as 40,000 units built by October 1970. High volume in a short period of time, of course, means Viatron will have to pay much to the vendors before rentals can accrue. The company has racked up a $2,154,000 loss between October 21, 1967 and January 31, 1969. We asked for the March 31 report, but Bennett said it was being prepared. "I'd be very surprised if we turned the corner," he joked. He would not say, of course, how much money Viatron will need, leaving observers to the "tens of millions" ball-park guesses. It will, however, use the normal avenues: private financing, debentures, etc. Thirty percent of the company is publicly owned. One thing Bennett emphasized is that it would not "share its residuals with a leasing company" but may form its own leasing structure within the corporation, similar to what Honeywell has done for its computer operations. Lloyd Ireland, ex-counsel to Colgate-Palmolive, is financial vp, "bean-counter extraordinaire."

We touched for a moment on the office and manufacturing facilities — five buildings in Bedford, and Burlington with 90K square feet; on personnel — 250 people with plans to increase that to 600-700 by next summer; and on subsidiaries. Viatron Programming, Inc., is a 30-man software firm in Burlington that will work independently of the parent corporation. Photics Research Corp. is an expert on producing the masks for the arrays and some Viatron contractors are using them.

Then we went back to philosophizing about Viatron with Bennett, Spiegel, and Sudkin. "We want to emphasize," they said, "that our initial market is not to replace keypunches, teletypewriters, key-to-tape units. It's to rent to the man who hasn't been able to afford keypunches for data entry. Later the replacement market, once we've shown we can do it, will open up for us." Spiegel went further. He wants System 21 to become "something you need, like a phone. It'll be on all desks. We'll take over the movement of paper."

System 21 isn't all they are basing their fortunes on. A small general purpose computer is the works (4-32K, 18-bit) and it too will follow the "cheaper than anyone" rule. Bennett says that Viatron will straddle the computer and communications businesses — not peripherals. And that we should expect some new product at each of the major computer shows. Many will be logical extensions of the basic system, like the color tv. Others, like the computer, will have to meet the requirement of 10,000-sales potential. One thing Viatron won't do is get into limited, special markets, leaving the interfacing of its equipment to other units, like phototypesetters, to systems houses in those fields.

Of course, the emphasis is on keeping the prices low, which can't be done through technology alone. That's why Viatron has eight marketing managers and no salesmen, why customers are invited to its offices or to demonstrations on tour, why the ad budget is fairly high. The same holds true of servicing and installing so many units. As said, Viatron will replace defective units, drawing from depots established around the country in conjunction with field engineering offices. They have an IBM 360/25 working on inventory control. Renters of 50 systems or more will receive one or two systems extra to protect against failures. Education to supervisors will be given free at Viatron offices, but charged for if done on-site. Systems engineering help will be another priced item of support. Viatron has about 15 people in its offices answering inquiries and developing the "catalogue" documentation on its products.

The three Viatron executives were obviously enamoured with everything and everyone in the firm. They spoke easily, as long as you wanted, and amusingly, with the air that said "we're putting one over on those who think we can't do it." They emphasize concern for their personnel, who, from all indications, have come from a host of different companies all over the country. They hand out free cokes and coffee to save "looking for a dime" and they feed the inventive pride of their designers. Spiegel likes to tell of one of the first demos of System 21 in New York, where the speakers all but ignored the robot printer until its designer, Bill Grinnell, threatened to take it home. "Our people have a right to feel that way," he says.

Viatron does have that elan, charisma, whatever you want to call it. It's exciting to watch a gambler, especially an enthusiastic one, especially when he wins. Even if we're still uncertain about what will come out of Bedford, Mass. this fall, we leave you with Faith in the American Dream.

— AP

PEACE GROUP ATTACKS AT SJCC "DIALOGUE" PANEL SESSION

A paper-panel session at the Spring Joint Computer Conference was billed "URGENT — Increased Dialogue With Society," but the speakers had no idea that an actual dialogue would be attempted at the session itself. Nor did they know that the subject matter would be the military use of computers, rather than the civilian problems covered by the various papers.

As Chairman Harry T. Larson of TRW Systems, Inc., put it, the primary purpose of the session was to focus on "means" toward a "dialogue," not on actually having a dialogue. But the Computer Professionals for Peace had other ideas. The New York-based group, which concerns itself with "the Viet Nam issue ... the related problems of poverty, racism and the misuse of technology," passed out mimeographed sheets to attendees, denouncing the panel as being composed of individuals representing the "military-university-industrial com-

plex," who have a "public relations problem" caused by their "megadeath weapons systems."

The CPP chose heckling as the vehicle to convey its ideas. A question repeatedly asked by CPP members and sympathizers was why the use of computers for war had been omitted. None of the panelists ever really answered this, but Larson insisted that it was the result of "oversight" rather than intentional omission.

The panel and the CPP seemed to be in two different worlds. While panelists discussed vague concepts in a formal manner, the CPP made emotional demands in no uncertain terms, and eventually a few attendees resorted to the use of obscenities. The audience seemed to be divided, with most in opposition to the CPP, although this "opposition" was apparently a manifestation of objection to the CPP's tactics rather than to its objectives. One man was heard to murmur "Oh dry up" at a CPP shout, then to comment to a CPP member, "you're only hurting you cause." One member of the audience drew applause by calling the CPP "bloody impolite," but this was quickly stifled by a CPP retort that "while you've been polite, sixty thousand people have died!"

The first paper was by T. G. Paterson of RCA, who said that we should not fear the computer, and mentioned ways in which people have benefitted from computers, including their use in the auto industry to aid in the production of automobiles with more convenience accessories. This statement brought a sarcastic round of applause from the CPP contingent. At the end of the paper, the CPP demanded it be allowed to ask questions, but this was denied by Larson, who insisted they wait until the regular question and answer period.

The second paper was by Hal Sackman of System Development Corp., who noted that computer professionals are propelled by economic forces and are conservative, not in a political sense, but in that they are technologically rather than socially oriented. He said that conventions, journals, and societies directed toward social implications are needed. The CPP remained silent.

The third speaker was Milton A. Lipton of the Army Electronics Command. Like the other panelists, he chose to ignore the military use of computers, but spoke of such things as job displacement caused by computers. At the conclusion of Lipton's talk, a shouting session began in which Larson had difficulty restoring order, and was able to do so only by promising to eliminate the scheduled panel discussion in order to allow more time for questions, and to extend the session beyond its scheduled termination, if necessary, to allow enough time for everyone to be heard. This temporarily assuaged the CPP, who remained silent throughout the delivery of the remaining three papers.

James M. Brownlow of IBM delivered a paper which noted that moral issues cannot be decided with the aid of computers; A.J. Pennington of Drexel Institute of Technology suggested the need for "humane engineering," meaning the design of machines to serve humans. Finally, William L. Konigsford of IBM chose to forego reading his paper in order to allow still more time for comments from the audience. He did chide the CPP, however, by suggesting that they stop criticizing others for working for corporations which have defense contracts as long as they maintain student status "at such reactive institutions as Harvard and MIT."

hostile questions

As soon as the floor was opened to questions, the CPP monopolized the questioning with such queries as "why weren't peace groups represented?" and "why wasn't the use of computers for war even mentioned?" The panel was continually attacked, and, for the most part, made no effort to defend itself.

Herb Grosch said the panel resembled "a dean and six faculty members" at Columbia Univ. before the first student riots, and everything in their papers had been "irrelevant" and amounted to "a lot of crap."

Another questioner called the panelists "a bunch of lackeys" who had made a "half-assed presentation of philosophical concepts" and could be considered "lesser war criminals; more like the 'pimps' of the war." He then began reading from the May issue of the CPP newsletter, appropriately named *Interrupt*, which reprinted a letter written by Norbert Wiener that had been published in the January, 1947, *Atlantic Monthly*. Wiener wrote of his earlier work with guided missiles, saying "I must take a serious responsibility as to those to whom I disclose my scientific ideas .... I do not expect to publish any future work of mine which may do damage in the hands of irresponsible militarists." The speaker said that this early anti-complicity statement was more relevant to the present situation than anything the panel had said 22 years later. He concluded by telling the panelists that they had confined themselves to "abstract concepts" in order to "conceal your stinking way of doing things." This prompted Sackman to say that the audience should not use the question period "as a toilet for spewing hate."

Shortly thereafter a questioner who criticized the CPP for not carrying out any constructive activities told a CPP member who had shouted at him that "Just because you have long hair and a beard, that doesn't make you mature!" This drew the witty comeback, "*obscenity* you!" Neither Larson nor the panelists voiced any objection to this, although one man in the audience later interrupted a speaker who was using four-letter words to ask, "Do we have to listen to this sort of language?" The orator replied, simply, "You sure as *obscenity* do!"

The only instance of unity amongst all members of the audience, as well as the panel, occurred at the conclusion of a talk given by a girl who identified herself as a programmer for Sylvania. She said she had questioned her co-workers and supervisors about their motivation, and found it to be only money, so that the only dialogue they are likely to have will be with a bank account. She then excused herself for work for a firm which has some defense contracts by saying that "I'm not a very good programmer, so any missiles I wrote programs for probably wouldn't work anyway." This brought a welcome laugh for all.

After the session, copies of Konigsford's paper were available, and his turned out to be the most significant — dare we say "relevant"? — paper. His paper was intended to summarize the session and to make actual recommendations for action, and Konigsford did state more than just philosophies.

the omitted paper

Konigsford emphasizes the word "urgent" with reference to past technologies: "There was a time when the technology of radio and even the technology of large electric generators captured the imagination of the country. It bespeaks the obvious to say that these items are no longer in the forefront of national attention. The lesson ... is clear: There is only a limited amount of time in which our 'computer revolution' will hold the attention of an interested public. If we do not make use of our opportunities now, they (like our youth) will pass."

He was also the only speaker who would have mentioned Viet Nam, although he does so by way of analogy to the computer industry: "The technologists who developed the weed control chemicals 2,4-D and 2,4,5-T some ten years ago could hardly have foreseen the end use of this material (after years of service to farmers) as a

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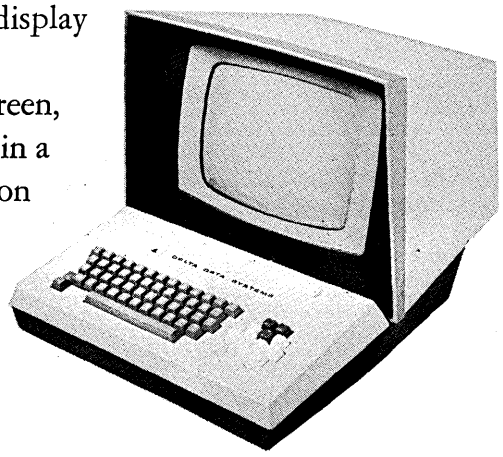

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weapon in Viet Nam. Unfortunately, this lack of complete responsibility cannot serve as a palliative."

Konigsford calls for firm action toward a dialogue with society: "Isolated, intuitively appealing actions may prove ineffective or positively harmful. I would maintain that a case in point is the recent ACM Guidelines for Professional Conduct which were promulgated (with the best of intention) without any means for enforcement or means for assistance to those who risk their jobs in the name of their professional responsibilties."

He makes several significant recommendations: That local chapters of our professional societies hold seminars on the implications of computers for local high school science teachers and parent-teacher associations; that arrangements be made with local newspapers for professional computer people to review articles mentioning computers before they are published and develop a working relationship between local chapters and the science editors of local newspapers; that newspaper advertisements be run, such as an AFIPS ad on the "schools" page listing those local programming schools which meet ACM accreditation standards; that national groups develop programs of lasting interest for National Educational Television and network tv; that tv be used to portray what being a programmer or systems analyst is really like; that the computer industry form an advertising council to sponsor spot commercials on how computers are used and can be used in the service of society.

Konigsford suggests that computer science curriculae in colleges and universities should include one or more courses on computers and society and interdisciplinary electives in technology and society. He recommends that the industry sponsor the development of a text for high schools that stresses the implications of computers.

He further suggests that a great deal more commentary on computers and society should be fostered in our publications, such as *Communications of the ACM* and DATAMATION, and in nonindustry publications as well:

"I recommend that AFIPS coordinate an attempt to actively solicit articles from both friend and foe in other disciplines for publication in our computer magazines. I would like to emphasize the inclusion of articles from articulate opponents of the way we do things. After all, that is the essence of 'dialogue.' Moreover, AFIPS should serve a coordinating function in getting members of the computing community to submit articles to magazines of general interest (such as *Playboy* and *Saturday Review*) and more specialized publications, such as *Foreign Affairs Quarterly.*

"Beyond the requirement to discuss issues that are already recognized as problems in the public's mind, we have a requirement to anticipate and discuss second and third order effects arising from the introduction of computers into society. As one approach to this, I recommend that AFIPS sponsor 'commissions' to draw up alternate scenarios (after the fashion of Herman Kahn's Institute) for discussion and review by the computer public on topics such as: privacy vs. data banks; the effects of a heavy reliance on the Dept. of Defense for funding; the future impact of artificial intelligence; etc. Still another approach would be for AFIPS to adopt the methods of the Dept. of Defense's Operation Hindsight to the investigation of how the computer field got that way."

Had Konigsford delivered his paper, the CPP and other critics might have lost a lot of their steam.

— FBN

LAWSUIT COULD JAR SERVICE BUREAUS BY SETTING UP "STRICT LIABILITY" CONCEPT

A suit filed by Southern California Retailer's Credit Service Co. against Statistical Tabulating Corp. in California Superior Court, Los Angeles County, will introduce a new legal concept affecting service bureau data processing — the "strict liability" for performance that has so far only been applied to manufactured products.

Although the trial is still several months away, the court has already denied, in May, motions by defendant Statistical Tabulating (STC) to deny the claim for punitive damages and to dismiss the demurrer to the amended complaint. The latter action, in effect, means the court agrees that the idea of strict liability should be decided at the trial.

The case has a long history, with the first complaint being filed by Retailer's Credit Service Co. early last year — followed by a countercomplaint from STC.

Retailer's Credit Service (RCS) is in the business of handling accounts receivable for retail establishments that are not large enough or don't want to be bothered with running their own edp facilities. RCS has about 80 such customers, representing some 125,000 individual charge accounts. Starting in June, 1965, the data processing was handled by Integrated Data Corp., using an IBM 1440 with disc packs — on which the master files were maintained. After a year, this service bureau notified RCS that they would have to increase prices — or reduce services — so RCS set out to find a better deal. After getting proposals, they chose Statistic Tabulating Corp. (STC). A contract was signed in August, 1966, for the changeover in processing to take place Sept. 26, 1966. Much of what happened from this point on is in dispute — and is the subject of the pending case — so we now switch to the contents of the original complaint, the countercomplaint, the first amended complaint, and other legal documents. And we begin putting in lots of "alleges."

In March, 1968, RCS filed a complaint for damages and injunction against STC with the Superior Court of the State of California for the County of Los Angeles. Plaintiff STC sought $150,000 for general damages, "not less" than $15,000 for labor required to correct STC's alleged errors, approximately $10,000 for reconverting its programs to the 1440 (STC was to use a System/360 with magnetic tape master files), exemplary damages of $1 million, costs of the suit, and "such other relief as the Court deems equitable." But besides this, RCS asked the court for an injunction ordering the defendants "to surrender to plaintiff intact and untampered, those magnetic tapes relating to plaintiff's business and described as the complete aged-trial-balance as of September 25, 1967 ..."

In nonlegal words, they wanted their master files back. (They had tried to get a preliminary mandatory injunction ordering return of the files — in October, 1967 — but this was denied by the court.)

RCS alleged that the defendants "have at all times failed and refused to surrender or deliver, or promise to surrender or deliver, such cards and/or magnetic tape unless plaintiff execute, among other unlawful things, a general release acquitting defendants of and from any and all damages plaintiff sustained ..." The complaint continued with predictions of the results to be expected if the files were not recovered: "... plaintiff will sustain great and irreparable injury in that the 80 retailers will not be informed as to the status of their 25,000 active charge customers; the said customers will not receive statements and are not likely to pay their bills; and, as a

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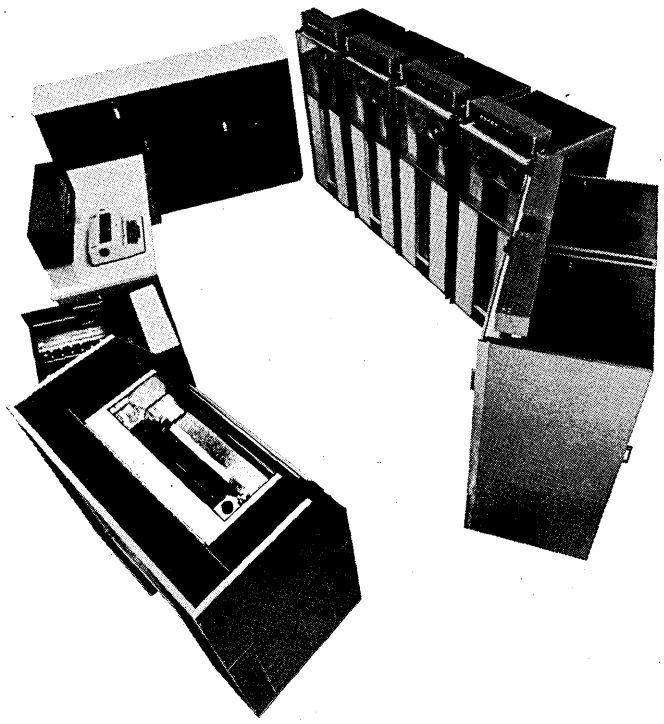

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result thereof, the plaintiff and the retailers will not receive much of $1,500,000 of working capital, causing catastrophic business ruptures and litigation between plaintiff and its retailers — the net effect being the total destruction of plaintiff and its 80 retailers ..."

Comes now the defendant. STC's countercomplaint denied that RCS had been damaged. Then it added, as an "affirmative defense," that on or about "April 27, 1967, plaintiff and defendant entered into an oral accord and satisfaction and oral agreement whereby plaintiff agreed that it did thereby release, waive and discharge any and all claims, causes of action, and demands that it had against the defendant ..." This was alleged to have been carried out through a financial settlement. Answers to some of the other charges included allegations that STC had "committed acts which constituted negligence on its part ... was continually late in supplying the defendant the input and continually supplied improper and erroneous input ..." and "... willfully harrased, interfered with, badgered, annoyed, insulted, cursed and disrupted the defendant's organization and employees and willfully supplied improper input in order to harass defendant ..."

And so on.

Now a long time goes by as everyone waits for the court to set a date for trial. Meantime plaintiff RCS has gone back to its former service bureau and set about re-creating its master files, pretty much by hand. (The extent of the company's troubles and their effects on the business are presumably something to be decided by the court.) Then, about three months ago, RCS filed an amended complaint for damages. It summarized the previous complaint and included a description of the miseries of reconversion without access to the current master files. Further damages sought brought the total sum prayed for to over $2 million.

In May, defendant STC asked for a hearing. They wanted the court to dismiss the amended complaint and give them a summary judgment that would eliminate the punitive damages. These motions were denied, but they brought about the filing of papers that include some interesting legal concepts for the computer industry. One is on the subject of master file ownership; the other is about the nature of data processing done by one organization for another.

When the first attempt to get back the magnetic tapes through an injunction failed back in 1967 (it's a good thing the courts don't run the fire department), the judge noted that he could not grant such relief "in view of defendant's claim of title." So, in opposing defendant's motion for summary judgment in May this year, RCS set out to prove otherwise. (The issue still won't be decided until the eventual trial; dismissing the motion only retains the status quo.) In doing so, they cited various portions of the STC contract and a deposition from STC's board chairman, which RCS alleges establish their ownership of the master files.

However, STC had cited several decisions that an accountant's working papers are the property of the accountant. But RCS dug up the only known case — a British decision in 1953 — that distinguished between an accountant's working papers and a company's ledgers. And the judge had held that, although the working papers belonged to the accountant, the ledgers belonged to the client. The implication, of course, is that the present-day equivalent of ledgers is a computer-readable master file.

The other new idea in the case is the attempt by RCS to establish "the theory of strict liability in tort." This is a concept that has only recently been applied to manufactured products — such as the cases against auto manufacturers holding that the malfunction of the car resulting in injury to the customer is the fault of the manufacturer.

As the legal brief puts it, "defendant designed and manufactured a system to process plaintiff's information so as to produce a final product defined as a series of weekly and monthly reports ... Because the system was defective the said reports were untimely, inaccurate and inappropriate for plaintiff's use; and as a result thereof plaintiff expended time and money to render said reports useful, and further sustained business losses ..." The defendant then tried to establish that the reports are not "goods" but plaintiff noted a section of the Uniform Commercial Code that says "'goods' means all things (including specially manufactured goods) which are movable at the time of indentification ..."

Here again, the final outcome awaits the trial.

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— WR

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NOT SO SUDDEN DEATH OF A SUPERCOMPUTER

In a not totally unexpected development (see June, p.39), IBM closed down its Advanced Computer Systems Lab in Menlo Park, Calif., in late May.

Started in 1965, the Lab's charter was to develop a supercomputer superior to anything on the market. But there were continual reassessments of the program, which was never intended to produce a standard company product-line machine. Originally headed up by Max Paley, the Lab was turned over to key 360 architect and IBM Fellow Gene Amdahl in 1968.

The Menlo Park plant will now become a facility of the San Jose System Development Division activity, and the Lab's roughly 300 employees reassigned to SDD storage product projects.

Paley has been reassigned to the Federal Systems Division as a special assistant to Bob Evans, and Amdahl will remain at Menlo Park as a Fellow.

Death of the project will undoubtedly stimulate the usual spate of rumors amongst IBM watchers. It could mean that IBM is abandoning (again) its attempt to match archrival Control Data in the big, prestigious (but so far unprofitable) supercomputer market. Or it may signal the triumph of the one-line party within IBM. Thus, future supercomputer developments may represent an extension of the New Series, which will probably begin appearing in early '70, featuring more advanced technology than that represented by the ACS machine.

INJUNCTION REQUEST AGAINST IBM DENIED

When Programmatics, Inc., filed its antitrust suit against IBM late in May, it employed a different tactic from the suits filed by the government, CDC, DPF&G, and ADR. It attacked IBM's marketing of a specific product and asked for a hearing and a preliminary injunction to prohibit IBM from distributing without charge its 483 Sort program, a successor to the 450 Sort, with which Programmatics proprietary package, Pi Sort, operates. Pi Sort does not work with the new 483, which IBM developed at a cost of $850K, and Programmatics contends that the 483 is an attempt to shut off the market to Programmatics and force it out of business. In addition to asking for the cessation of 483 distribution, Programmatics asked for a preliminary injunction to prevent IBM from "further distributing, supporting and modifying the DOS tape and disc sort/merge program for System 360 computers."

The four-day hearing was held in early June before Judge Edward C. McLean of the U.S. District Court for the Southern District of New York. Programmatics alleged that IBM's release of its 483 Sort had caused financial difficulties forcing the software firm to look to an acquiring firm for support. An agreement in principle for acquisition by Applied Data Research, one of the firms suing IBM, was reached based largely on the potential of the Pi Sort program, according to Richard C. Jones, president of ADR. But ADR, which has been marketing Pi Sort under an agreement with Programmatics, has been running into resistance from prospective purchasers because of the "free" IBM package. As a result, he said, the acquisition of Programmatics has been postponed.

IBM countered by asking for dismissal on the grounds that Programmatics did not have the standing to sue because of its acquisition by ADR, which was paying the costs of the suit, and therefore ADR should have been the complainant. IBM also denied any intent to damage Programmatics, saying that it had never heard of Pi Sort until the program's introduction last November. By that time, IBM said, it had already budgeted $500K on 483.

Judge McLean denied the request for a preliminary injunction, finding that there was not enough evidence to indicate that IBM's intent in releasing 483 was to harm Programmatics, or that IBM acted illegally under the antitrust law. However, he did rule that Programmatics had standing to sue, paving the way for continuance of the suit.

Dave Ferguson, president of Programmatics, stated after the hearing that he felt the Court had placed too much emphasis on IBM's intent, that IBM still had hurt Programmatics whether or not that had been the intention, and that was the basis for the antitrust suit. He said if Programmatics had not spent $140K it took to develop Pi Sort and had concentrated instead on contract programming, the firm would be in much better shape today. As it is, he asserted, IBM's actions have made it impossible for Programmatics to continue to exist as an

A rare picture of Herb R. J. Grosch actually listening as young Nathaniel Kuhn tries to bridge a couple of generations' gap. Grosch is director of the Center for Computer Sciences and Technology of the National Bureau of Standards. Master Kuhn is manager of software for the R.E.S.I.S.T.O.R.S. (see story on p.122).

news briefs guide

independent corporate entity. He said he definitely would pursue his suit against IBM, but at presstime no decision had been made on whether to appeal the denial of the injunction.

XEROX COPIES MERGER TREND, ACQUIRES SDS

For the record, Xerox Corp. became a mainframe manufacturer on May 15, 1969, when stockholders of both Xerox and Scientific Data Systems overwhelmingly approved the merger of the two companies, with SDS to operate as a wholly owned but independently operated subsidiary of the copy company. Both shareholder meetings were held at the Century Plaza Hotel in Los Angeles, and after assent by the SDS people (about 300), pres. Max Palevsky and his investors trekked down the hall to the main ballroom where Palevsky and his board took their places on the Xerox dais before a welcoming crowd of about 1500.

Under the terms of the merger, Xerox will issue three shares (after a three-for-one split scheduled for June 17) for each two shares of SDS, an exchange of stock valued at more than $910 million. This is more than 90 times SDS earnings for 1968 and a question was asked from the floor during the Xerox meeting why the firm would pay so much for SDS. C. Peter McColough, Xerox president, answered that Palevsky wouldn't have taken any less and Xerox wouldn't have paid any more. He added that the question Xerox had had to decide was whether it wanted to get into the computer business, and having reached a definite affirmative, it could not afford to delay. "By 1975," he said, "the price won't matter."

Palevsky continues as pres. of SDS, and in addition serves on the Xerox board of directors and as pres. of its executive committee. Other SDS officers elected to the Xerox board were Arthur Rock, chairman of the SDS board, Dan McGurk, exec vp, and Sanford Kaplan, senior vp. Kaplan also became senior vp of administration for Xerox.

SDS now will place more emphasis on marketing in the commercial field, competing with IBM on the 360/50 level and larger. The firm increased its marketing force by 50% in 1968, expects to add another 50% in 1969. There will be no common sales force with Xerox, but there will be close cooperation between the technical staffs of the two companies. Xerox spends an estimated $75 million a year on research and development and Palevsky considers this to be a prime source of benefit to SDS.

McColough also is high on the merits of the merger. "Both companies deal in products that have to do with people's minds," he said, "and there's an unlimited market and future in that."

ADAPSO RECOMMENDATIONS TO FCC, COMPUTER MANUFACTURERS

The first in a series of position papers on industry views has been released by the Association of Data Processing Service Organizations. The general position taken by ADAPSO in "Computer Manufacturers Pricing Policies" is that the manufacturers' traditional practice of providing a variety of products and services in a single purchase or rental price represents, in practice, a tie-in sale and a form of price discrimination. ADAPSO stated that the best interests of all users "would be served if all computer manufacturers would separately price any service or function which is or can be available in the marketplace or provided by the user himself." Specifically, ADAPSO recommends that systems engineering support, educational programs, and application-oriented software or programming be separated from the single price and offered to all customers at prices related to the cost of providing each unit of the service.

ADAPSO's Computer Time Sharing Services Section filed its recommendations with the FCC in regard to the inquiry into the interdependence of computer and communication services and facilities. The group asked for encouragement of a uniform nationwide data communications network; exclusion of the communications common carriers in marketing data processing and electronic information services; the rescinding of discrimination telephone rate increases and the development of an equitable rate structure; allowance of network signaling, at the customer's option, as part of the customer-provided terminal or communications equipment; and protection from faulty or badly designed signaling equipment by establishing design specifications. CTSS recommendations to the commission for providing the necessary communications services for dp customers in the future were equally logical and predictable.

R.E.S.I.S.T.O.R.S., BARN, PDP-8 - AND HERB GROSCH LISTENS!

The RESISTORS' are one of the more constructive flakey organizations in the computer industry. And they *are* concerned with computers, despite their official name, Radically Emphatic Students Interested in Science Technology or Research Studies; apparently the acronym came first. The group was formed in 1966 by nine high school students in the Princeton, N.J., area, who were given the use of a barn and a vacuum tube Burroughs 205 owned by Claude Kagan of Western Electric (June '68, p. 92). The

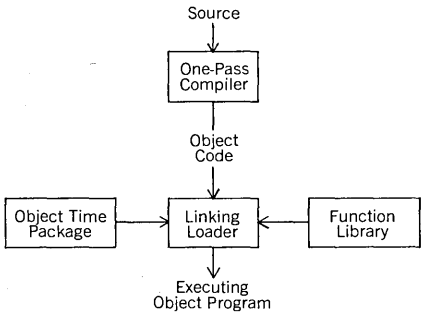
SMALL SINGLE PASS FORTRAN COMPILER SYSTEMS. DIGITEK IS THE COMPANY TO PRODUCE THEM.

Digitek experience in producing compiling systems, particularly FORTRAN compiling systems, is without equal. In the eight years since its incorporation, Digitek has produced thirty-nine (39) compiling systems implementing some version of the FORTRAN language.

Twenty-nine (29) of these FORTRAN compilers are small single pass compiling systems.

Small Compiler System

The Digitek single pass FORTRAN compiling system contains a complete FORTRAN programming system consisting of a one-pass compiler, linking loader, object time package, function library and utility routines. The system can be designed to compile almost any version of FORTRAN, subset or superset. All I/O interfaces are isolated and simple so that the system can operate either standalone or under an operating system. In fact, several compilers are presently operating under time-sharing systems.



One-Pass Compiler

The compiler accepts and interprets the language chosen. Compilation is single pass batch, producing locally optimized object code. Depending on the system environment the object code may be either interpretive or direct machine code. The optional source listing contains complete diagnostics and the object program memory map. The diagnostic messages not only follow the statement to which they are related, but are keyed to the precise character within that statement at which the error was detected by undermarking. The messages themselves are English language descriptions of the errors, not numeric codes.

Core Requirements

The entire compiler is core resident occupying between 3200 words and 7000 words, depending primarily upon word size. For example, an ASA Standard FORTRAN requires 3600 words in a 36 bit machine and 5500 words in a 16 bit machine. About 1000 words additional are required for table space to give a capacity of 500 source cards. Capacity increases rapidly with table areas greater than 1000 words. No backup storage of any kind is required. Compile speed exceeds 1000 cards per minute on most computers.

Linking Loader

The linking loader places object programs in core, performs data initialization, and loads and links required sub-programs from the object time package and function library. It is overlaid by the I/O editor prior to program execution.

Object Time Package

The object time package contains the I/O editor and associated conversions, routines for double precision and complex arithmetic, and miscellaneous FORTRAN routines such as sub-program argument transfer.

Function Library

The function library contains all of the internal and external functions recognized by FORTRAN.

Utility Routines

The utility routines include a system maker, a transliterator and a debug routine. The system maker is used for standalone versions to merge the system components into a single compiler system. The transliterator is used to transform the compiler, written in POP, into a form acceptable to the standard assembler for the particular computer. The debug routine is used to provide trace and dynamic dump services for compiler checkout.

Implementation Technique

The techniques by which Digitek produces compilers and the related programs are highly regarded in the computing industry. Many purchasers of Digitek compilers, including two computer manufacturers, have later used the Digitek methods to produce other software products. From experience in constructing these compilers, Digitek has developed the technique of separating the compiler into:

- The part which is dependent only on the machine on which the compilation is being done.
- The part which is dependent only on the source language and object machine.

The result of this separation is that these parts can be constructed independently. Furthermore, the source language and object machine dependent sections can be written in a language which is machine independent. This machine independent language is called POP and is an exclusive Digitek development.

Digitek POP Code

POP (Programmed Operators and Primitives) is the optimum machine instruction code for a hypothetical computer designed specifically for compilation purposes. The POP language is a single address construction, whose operands are the input language source string, the dynamically allocated last-in first-out tables used as temporary storage by the compiler, and the recursive subroutine structure. Dynamic storage allocation procedures assign storage to individual compiler tables as required, with the result that no single table overflows until all table storage has been used – the limits imposed on the FORTRAN program are therefore much more flexible than is usually the case.

Implementation of the POPs is accomplished by macro-assembly and interpretation. Allocation of storage, saving of backup information, stepping of data position indicators, and general housekeeping is carried on automatically by the programs which underlie the POPs.

Benefits

This approach to compiler construction yields several important benefits for users:

Since POP language is well-defined, the functions of the compilation-machine-dependent portion of the compiler are also well-defined. This allows Digitek to follow standard yet comprehensive procedures for coding and checking out these portions, materially decreasing the cost of implementation and occurrence of errors.

The POP language portion of the compiler is constructed as a functionally organized model. The relationship of the source language being compiled and the POP language description of the procedures for parsing the source language are clearly related and simple to understand so that modifications to the compiler, resulting from changes in the source language specifications, are easily made.

Digitek's method of compiler construction is not automatic or dependent upon syntax tables. Each compiler is handcrafted as is required in a production compiler. Nonetheless, the discipline, compactness, and efficiency derived from use of the POP language give the advantages of standardization. Implementation cost, delivery time, program size, and error rate are drastically reduced. By these methods, Digitek was first to produce an efficient FORTRAN IV compiler that operates completely in 4096 (32 bit) words.

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CIRCLE 167 ON READER CARD

RESISTORS still use the barn as their "computer center," but have added additional hardware and have expanded membership to 18, all aged 11 to 17 years. New chapters have sprung up in such diverse locations as Trenton, West Point, Palo Alto, and Sudbury, Mass.

The Trenton chapter is composed of ten members, most of whom are black. It is the result of a ghetto recruiting effort last summer which began when the RESISTORS conducted a special assembly at Junior High School One, Trenton. Their demonstration aroused such interest that at one point the group was mobbed by students who leaped onto the stage to get a closer look. A second source of ghetto members was a special program being conducted at Princeton Univ. Participating students were youths who met at least two of the following three criteria: I.Q. under 90, at least two years behind in school, and "known troublemakers." From this latter group, two new RESISTORS were recruited, presumably from among those whose I.Q.'s were either above 90, or who had underscored on the tests. Ghetto recruiting having successfully spawned a new chapter, the RESISTORS apparently tired of it, and have no further plans for such activities.

Membership in the RESISTORS is limited to students in high school or lower grades. Significantly, many members seem to be nothing short of prodigies in their knowledge of computers. Most are in the upper third of their classes, but there are no valedictorians — possibly because the RESISTORS spend too much time playing with computers to be really effective grade-grubbers.

The RESISTORS recently distinguished themselves with exhibits at the SJCC, and Barry Klein, then president of the Princeton chapter, spoke at the "Computers and the Underprivileged" panel session, recommending that the computer be used as a "toy" to "expand the environment" of ghetto youth. Also at the SJCC, 11-year-old Nathaniel Kuhn somehow held Herb Grosch's attention long enough for the photo on p. 121 to be taken!

The RESISTORS also attended the annual spring symposium of the Digital Equipment Computer Users Society, where they conducted a two-hour workshop with papers presented by eight members on the TRAC language, which they described as a language that "concerns itself with text manipulation," and derives "high versatility from its interactive subroutine and nesting capabilities.

Meanwhile, back in Claude Kagan's barn, the RESISTORS have supplemented the Burroughs 205 with a PDP-8 donated by DEC, and are negotiating the donation of a Honeywell DDP-116. A CalComp plotter is also in use. Efforts are now under way to interface the PDP-8 and the 205 in order to take advantage of the large memory of the older machine. And, in a move extending beyond the perimeters of computer technology, the group is planning to build a Van de Graff photon beam accelerator in the silo. The accelerator will be monitored by the PDP-8; the basic monitoring system is already prepared. At writing, this project was in jeopardy, however, because the designer of the accelerator was doing so poorly in school that he might be forced to attend summer sessions, thereby precluding his spending enough time to build the accelerator.

Also in the works is a $350 heating unit for the barn. While traditional computer installations have carefully controlled environments, the RESISTORS have until now used a "facility" with neither heat nor air conditioning, much less filtered air. Hardware performance has suffered, however, especially during the winter, although problems have also been encountered in the spring, caused by excessive condensation. Concrete block construction in the area of the barn housing the computers largely insulates them from summer heat.

Finally, five members are collaborating to write a manual on the TRAC language. Although the project is being undertaken for profit and is not an official RESISTORS program, the authors intend to donate 20 per cent of the profits to the organization.

Some of these precocious computermen are even considering going to work in the computer industry when they grow up and get educated.

PUNDITS PAINT PRETTY PICTURE IN PLETHORA OF PREDICTIONS

A rash of predictions and surveys broke out on the computer front last month, some of them contradictory, some of them critical, all of them optimistic ... and, probably, as in the past, will prove to have been modest.

William R. Hoover, exec vp of Computer Sciences Corp., directing his remarks to a panel session at the 22nd annual conference of the Financial Analysts Federation in St. Louis, predicted that software expenditures in the U.S. will exceed $21 billion by 1975, and said that independent software companies will hold a $3 billion share of the 1975 market. He estimated that the market for the independent companies' proprietary packages will grow from less than $50 million this year to $350 million in 1975.

However, Dr. Walter F. Bauer, president of Informatics, Inc., offered a somewhat different set of figures in a speech at a luncheon meeting of Los Angeles security analysts. He predicted an increase in proprietary software product sales "from the current level of $10 million a year to $500 million a year in 1975 and $2 billion in 1980." If IBM unbundles, he said, proprietary software sales will rise to $2 billion in 1975 and $5 billion in 1980. Of this, he predicted that hardware manufacturers would receive about half in 1975 and $2 billion of the $5 billion in 1980, with IBM continuing to take a 70% to 80% split of the revenue.

Another glowing vision of things to come was proffered by James A. Yunker, president of Astrodata, Inc., Ahaheim, Calif., which manufactures computer-controlled circuit switching exchange equipment. "The Department of Commerce predicts that shipments of telecommunication equipment will hit $3.25 billion in 1969," Yunker said. "That is a 10% increase over the year before. We have determined that of this total, about one-third, or more than $1 billion, is for switching equipment."

Applying the same growth factor of 10%, and assuming "all other factors remain the same," Yunker predicted a telecommunication market of $6.3 billion by 1975, or a $2.1 billion switching market, at least half of which will be computer controlled. Yunker conceded that Western Electric would get the bulk of this market supplying equipment to the Bell System, but "By 1975, deliveries of communications switching equipment by suppliers other than Western Electric will reach $365 million — about double the volume indicated in 1969."

A further example of projected industry growth is a prediction based on a study by Honeywell's Electronic Data Processing Division that indicates that about 75% of U.S. hospitals will be time-sharing on a central computer by 1980, compared to 5% of an estimated 7200 hospitals operating at present. James Turner, hospital industry manager for Honeywell, said that less than 10% of existing hospitals are large enough to support their own full-scale systems and staffs. He outlined further findings of the study: Clinical laboratory applications will increase from the present less than 5% of the dollar volume spent on computer systems to nearly 25% by 1980. Business uses will continue to increase, from 25% to nearly 40% over the same

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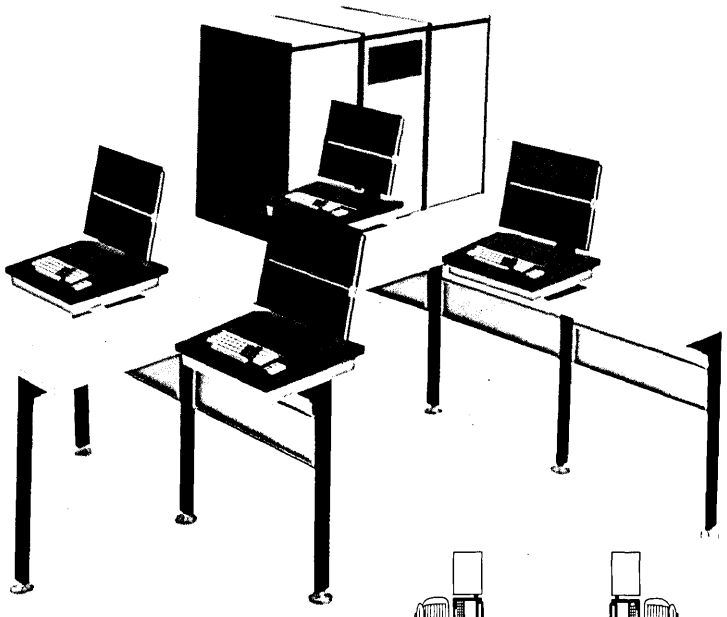

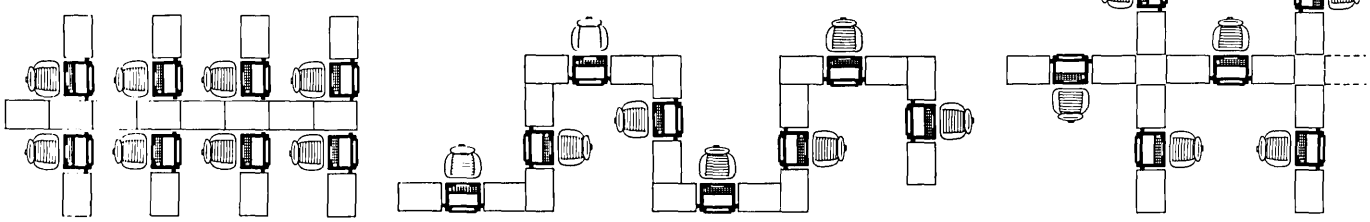

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* Third generation high speed digital computer.
* Key-board multiplexor.
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period. Insurance and medical research, which account for 70% of today's dollar volume, will decrease to less than 40% by 1980.

And yet another limb was gone out on by Robert L. Harmon, vp and general manager of the McDonnell Automation Co., who said in an address at the convention of the International Institute of Municipal Clerks, that within five years nearly every city of 10,000 population will be using a computer for administrative and financial functions. According to Harmon, only 275 of the nation's 1900 cities of 10,000 or more are currently using computers, and most of these have populations of more than 50,000.

But the hazards of industry growth are indicated by the results of a recent survey conducted by the Research Institute of America, New York, indicating that 90% of the computers in industry are not being utilized to their full potential. Today, 63% of the 8000 respondent companies in the survey use a computer or plan to do so within a year, and the routine applications of payroll, bookkeeping, accounts receivable and payable, sales analysis and inventory control are still the dominant functions with 68% of firms with in-house computers and 73% of firms using outside services. Outside service users reportedly were more satisfied than in-house users, only 28% of whom thought the computer was doing a good job, against 54% of the outside users. Proper planning and preparation before installation was the strongest and most prevalent recommendation made by experienced users.

We predict that recommendation won't be followed in lots of cases.

PEOPLE PROBLEMS, PACKAGE USE INCREASE FOR BANKS

The preliminary results of the American Bankers Assn. 1969 Automation Survey have produced findings important to the computer industry's software and hardware marketeers, service bureaus, and operating personnel.

The figures show among other things, that the bankers, who have experienced dramatic growth in computer use in the last six years, are also suffering the attendant problem (listed number one) of getting and keeping edp personnel. This will become more acute because the number of applications to be automated is increasing, because a large number (56%) with on-site computers and off-site services are or intend to offer automated customer services, and because 78% of those with computers intend to replace their systems within the next five years. One solution they appear to have found is "heavier use" of proprietary application packages and software contractors or consultants (38%).

It is also significant to note that the banks' experience with such packages (85% had tried them) has been fairly or very successful (73%), that they are dissatisfied with the manufacturers' packages (96% indicated the need for major or minor modifications), and that they are in favor (67%) of separate pricing of hardware, software, and support services.

To put these general comments into perspective, here are the background figures of the survey. The report, issued in May, showed that 2550 banks out of the 4800 surveyed had thus far responded. They represented 1197 of the nation's 1900 banks with deposits of $25 million or more and 1353 of the 11,600 banks with less than that amount.

Compared to ABA surveys made in '63 and '66, the report showed the banking industry had made "real automation progress." In 1963, only 16% of all banks were computer users (on- and off-premises) or had automation plans. By 1969, this had grown to 52%. It has been off-premises use that has grown dramatically — from 4 to 15 to 41% in the three survey years. Banks with their own installations increased slightly from 3 to 6 to 9%.

The number of banks spending $1.25 million or more a year has grown from nine in 1966 to 33 in 1969. And of those 33, nine spend over $2.5 million annually. Figures on how the edp dollar is spent show that as the size of the bank increases, the equipment rental becomes a smaller percentage of this dollar, while the cost of computer operation and programming grows. Comparing the $10-million-deposit bank with the $500-million-plus bank, the equipment rental declines from 60% to 38%; computer operations increase from 27 to 36%; new program expenditures go from 6-17%, and program maintenance tilts up from 7 to 9%.

In applications, among the 8% who are on-premises computer users, demand deposits, savings, installment credit, and payroll are almost completely automated. The automation of credit/charge cards has increased from 5 to 22% since 1966, showing the "rapid emergence" of these cards. New applications deeply in the planning stages are commercial loan, general ledger, central information files, and mortgages.

Among developments that half or more of the banks considered "an accepted fact" or "just a matter of time" are pre-authorized payments, cash dispensing items, consolidated customer account statements, and automated financial management.

In technological developments, 51% of the banks felt that satellite computers linked to large time-sharing computers were "accepted" or "a matter of time," although it was the larger banks (80% of $500-million-plus) who were most convinced. Some other "newer technologies" are gaining a foothold in the larger banks, which usually start the automation trends. About 58% of the $500-million-plus banks use or plan to use OCR equipment within two years; 35% are or will be generating microfilm directly from computer tape; 63% are using key-to-tape or -disc equipment. Interestingly, in the latter case, 87% of the total number of banks surveyed do not use such equipment.

In software, the banks indicated that assembly language is being used most for new programs (59%), 34% — COBOL, 4% — PL/I, and 3% — other. But 74% of the $500-million banks are using COBOL, 18% using assembly language, 9% — PL/I.

The bankers' five year projections of systems and programming needs showed that they will increase "greatly" (37%) or "somewhat" (50%). They will rely strictly on internal personnel (37%) or go outside for packages (25%) or consultant services (13%). Twenty-five percent are undecided, however.

Of the 56% offering automated customer services, 88% have on-premise computers and 36% use off-premise facilities. The services most frequently used include payroll, account reconciliation, correspondent bank services, and accounts receivable. Professional billing, which was one of the top four in 1966, has dropped, and although the survey didn't say so, speeches heard in the past indicated that bankers have found this type of small-business service to be unsuccessful.

The final tabulation and analysis of the entire survey will be announced later this year.

DOES ANYONE HERE SPEAK THE LANGUAGE?

Beating the crowd into Boston, some four hundred practitioners spent Tuesday, May 13th, in search of enlightenment at the academically-dominated SIGPLAN Extensible Languages Symposium. The majority of the crowd seemed to take the subject with deadly seriousness befitting a new breakthrough in programming languages in spite of the blunt statement by Tom Cheatham that the true goal was to learn more about program-

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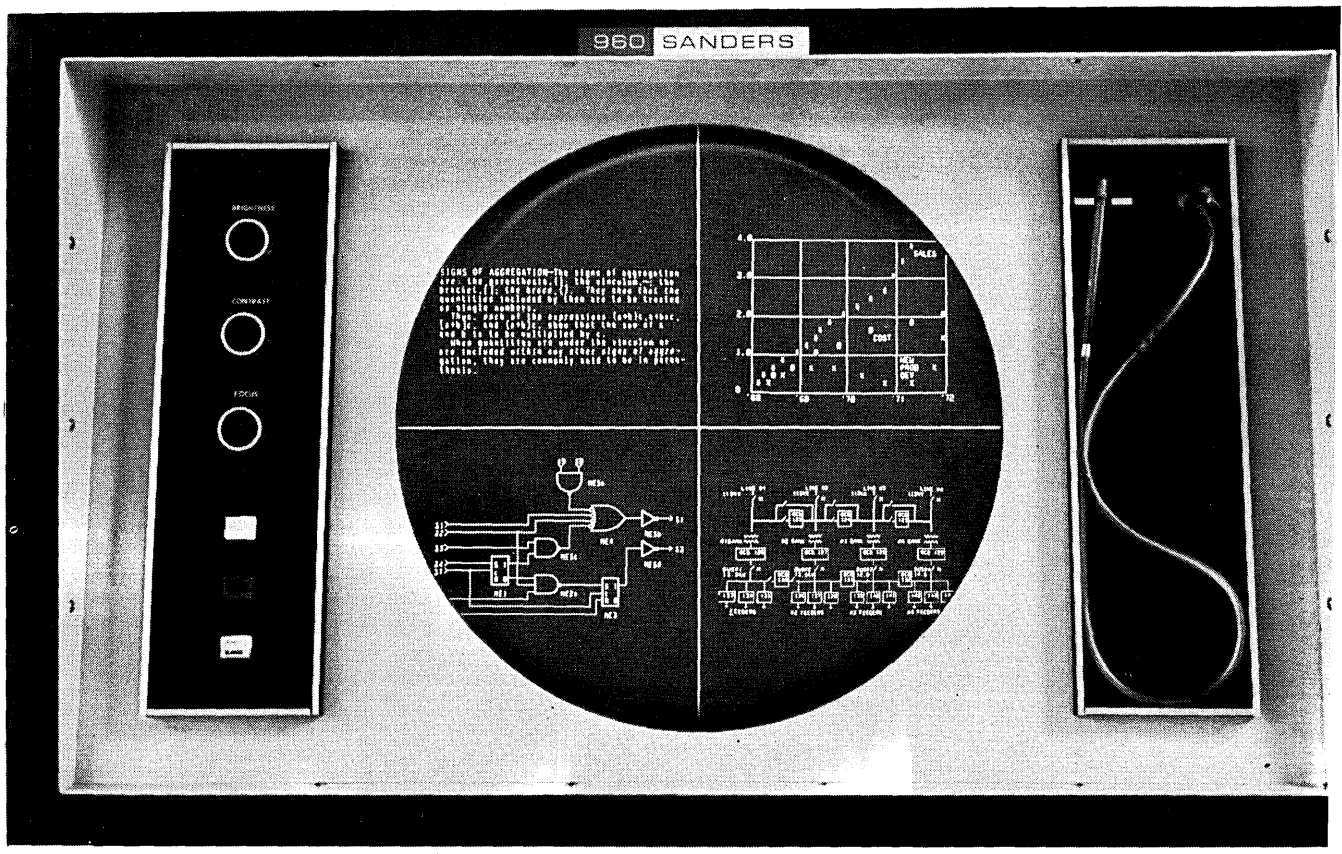


ming and programming languages. In searching for real applications of an extensible language, any extensible language, the crowd came up empty-handed until Jean Sammet's persistent questioning revealed an implementation of LISP done in PROTEUS.

Late in the afternoon, Doug McIlroy, author of the landmark Macro paper in 1960, attempted to put the entire proceedings into a reasonable perspective by pointing out some of the difficulties involved in the entire notion of extensible languages. While not precisely downgrading the work reported on all day, McIlroy reminded the assembled body that such production languages as PL/I have wide utilization and that for extensibility to become important it must interface with these working tools rather than with academic processors. It was further noted by McIlroy, among others, that extensibility is probably a technique for a small subset of the programmers in any installation; that group that develops the tools for the rest of the users.

Languages described at the meeting ranged from the unimplemented EPS of Don MacLaren to PL/I. Considerable heat, if only limited enlightenment, was generated by the mention of ALGOL 68, although it is still not clear if there really is an ALGOL 68 and if so, why. Irons' IMP has been implemented as a system-building tool and perhaps represented a more lucid approach, since the thrust of his development effort was toward specific features with specific functions to perform.

Informal proceedings of the symposium will be published in the August, 1969, issue of SIGPLAN Notices. Copies of the Notices may be requested through ACM headquarters (1133 Avenue of the Americas, New York 10036) for $4 per copy.

NYSE TO AUTOMATE BLOCK STOCK TRADING

The New York Stock Exchange has signed an agreement with Bunker-Ramo Corp. under which B-R will provide some $2 million in desk-top terminal equipment for the NYSE's new Block Automation System. First units are expected to be installed in the offices of subscribers in September and the system should be in operation by the end of the year.

The Block Automation System will provide matching of buy and sell requests for blocks of 5,000 or more shares or with a value of at least $200,000. The system is designed to permit institutions to express interest in trading blocks without revealing either their identity or details of their interest to the network at large. It was designed by Arthur D. Little, Inc.

Hardware supplied by B-R for entry and retrieval of information will consist of the BR2206 crt with a 12-inch screen displaying 24 lines of 37 characters each; the BR2206 keyboard with standard typewriter alphabetic keys, ten numeric keys, and 16 programmable function keys; receive-only teletypewriters; and the BR2223 control unit with delay line memory and printer control logic. The terminals will be in broker offices and institutions, and will be linked to a central computer at the NYSE, using a BR2228 communications control unit which concentrates eight multi-drop circuits at the cpu site, and a BR2238 parallel communications interface to the IBM 360 channel.

The central computer will scan incoming entries of buy and sell interests. When a match is made, designated brokers will be notified on the terminal network and will negotiate details on the size and price of the order in accordance with instructions from their institutional customers. Orders which result will then be sent to the floor of the NYSE for execution, as at present.

RESULTS OF INFORMATION DISSEMINATION STUDY

After completing a three-year study of the processes by which the results of research are disseminated throughout the scientific world, a joint committee of the National Academy of Sciences and National Academy of Engineering has concluded that despite the many criticisms directed at the present system, no evidence of "critically inefficient operation or catastrophic failure" was found.

The Committee on Scientific and Technical Communication (SATCOM) emphasized the need for maintaining the pluralistic, diverse nature of communication activities in science and engineering — as opposed to the creation of any monolithic, centralized system. Even though the basic structure is sound, the many problems brought about by expanding needs (about two million papers now appearing annually in some 30,000 specialized journals) make necessary measures directed toward more effective coordination, planning and management.

SATCOM's first recommendation calls for the establishment of a Joint Commission on Scientific and Technical Communication — which would report directly to NAS and NAE — to stimulate greater coordination among private groups and bring them into closer touch with government agencies. The second recommendation outlines a philosophy of shared responsibility among government and private organizations for the effective communication of scientific and technical information. Those who support R&D work must see to it that the information generated becomes truly available. This should go beyond publishing isolated bits of information; preparation for broad dissemination of information should be an integral part of the research work.

The scientific and technical societies, which were established to provide more effective channels of communication, should accept greater responsibilities along these lines. And the for-profit information-handling organizations could play a critical part in providing specialized information services to smaller groups.

SATCOM was established early in 1966 at the request of the National Science Foundation. A 30-page synopsis of the full report is available from SATCOM, NAS-NAE, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

AFIPS FORMS JCC BOARD

The American Federation of Information Processing Societies has established a Joint Computer Conference Board to control policy for the Spring and Fall JCC's. Operating control of the JCC's will continue to be vested in the AFIPS JCC Committee, however. AFIPS has also formed a Conferences Committee to evaluate and recommend additional conferences to meet the needs of its constituent societies.

The AFIPS Board of Directors revised the constitution and bylaws in order to create the JCC Board, which is expected to facilitate more efficient handling of the JCC's without necessitating on-going involvement of the entire AFIPS Board. Members of the new 6-man JCC Board will be the president, vp, and treasurer of AFIPS, plus one representative each from the three full members of AFIPS; The Institute of Electrical and Electronics Engineers, The Association for Computing Machinery, and Simulation Councils, Inc.

The Conferences Committee will be chaired by Dr. Barry Boehm of the Rand Corp. It will recommend new conferences, including suggested timing, location, and qualified personnel to serve as conference chairmen. The purpose of instituting new conferences is to meet "major needs" of AFIPS constituent societies without running the risk of altering the basic concept of the JCC's, i.e., to place ma-

jor emphasis in the areas of hardware and software development and applications tied directly to such developments. New conferences are expected to be sponsored by AFIPS or by AFIPS in cooperation with other societies, including those that are not now constituent societies.

MICROFILM CONVENTION EMPHASIZES COMPUTERS

The theme of the 18th Annual Convention of the National Microfilm Association was "Instant Information," and interest in the computer-microfilm interface ran high among the nearly 10,000 attendees. Of the more than 250 exhibitors, however, only eight displayed computer-output-microfilm (COM) systems (conversion of magnetic tape data to microfilm). Nevertheless, this represented a 300% increase over the previous convention, at which only two exhibits showed COM equipment.

The convention was held at the Sheraton Boston Hotel and War Memorial Auditorium, May 6-8. It was largely a preview of the SJCC in that the hotel was overcrowded and the auditorium was jammed with people, although only one floor of exhibits was used.

Opinion among microfilm people seems to be that interfacing between computers and microfilm equipment will be the greatest thing that ever happened to their industry, but most of the computer industry is apparently unaware of this potential. There was little evidence of interest in microfilm at the SJCC, although a few NMA exhibitors also showed their wares at the computer show. Eastman Kodak set up its exhibit of the KOM-90 COM system again for the SJCC, even using the same girls, whose forced smiles were causing wrinkles in their faces before the SJCC ended.

Four general session theme papers were presented, one of which was an argument in favor of using microfilm as a medium for "transmitting" very large quantities of data. Entitled "Information Technology for Network Operations," the paper was delivered by John L. Simonds of the Kodak Research Laboratories. He aroused interest with an explanation of how the use of microfilm, physically shipped, could reduce costs of moving masses of data:

"Currently available TELPAK facilities ... represent high-bandwidth services of the type which will be required for network operations. TELPAK D offers transfer rates of one million bits per second at the cost of $45 per mile per month. TELPAK D data sets rent for about $1300 per terminal per month ....

"Let us consider a Boeing 707 jet freighter as a transmission channel. Assume that we wish to ship extensive library materials from New York City to Los Angeles. The cargo capacity of a 707 jet is 6201 cubic feet. Let us load the plan with microfilm on which textual images have been recorded at a modest reduction ratio of 20:1. Assuming that each page of text contains 5000 alphanumeric characters, then, the plane would hold about 5.3×10^{13} bits of information. If we assume an hour for loading and unloading, and a cruising speed of 550 to 600 miles per hour, the data-transfer rate (bandwidth of a sort) would be about 2.5 gigabits per second (2.5×10^9 bits per second)!"

Of the fourteen "workshop" paper-panel-discussions at the NMA Convention, perhaps the best attended was the session on "Computer-Microfilm Interface." At this workshop, Alan Smith of RCA Marketing stated that $25 million was spent for computer-related micrographic systems in 1968, and that this is expected to increase to $235 million by 1973, and $600 million by 1978. I. D. Baumel of Diebold, Inc., predicted that microfilm will soon equal drums and discs in importance as a computer storage medium.

Throughout the convention, a handful of "spies" from computer industry firms that had not exhibited were in evidence, including representatives of several major mainframe makers. At the NMA social hour, they were seen milling about, talking to a few microfilm people, and eyeing each other suspiciously. Maybe there's something to this microfilm business after all.

ENTRIES INVITED FOR 1969 FJCC COMPUTER ART EXHIBIT

The art exhibit at the Fall Joint Computer Conference, to be held Nov. 18-20 in Las Vegas, will display art *about* computing and art prepared *by* computing. The exhibit will be open to the public and conferees on Sunday, Nov. 16, as well as during the show. Prizes will be awarded, and entries may be sold. Entries open on Sept. 2 and close on Sept. 22. For a prospectus giving details, please write to the Special Activities Committee, '69 FJCC, 1209 N. Riedel Ave., Fullerton, Calif. 92631.

ACM SEMINARS BROUGHT BACK FROM BEYOND

The Professional Development Seminars of the Association for Computing Machinery, a bit stained by the red ink in the revenue column, are not dead.

At the May council meeting, ACM, suffering from its overall fiscal misfortunes in 1969 (about a $160,000 loss) and trying to cut back, had all but nailed the door shut on the seminar program. But because of the successful steps that had been taken since December to bring the program back to its feet, the council in June agreed to give it another try, under close scrutiny.

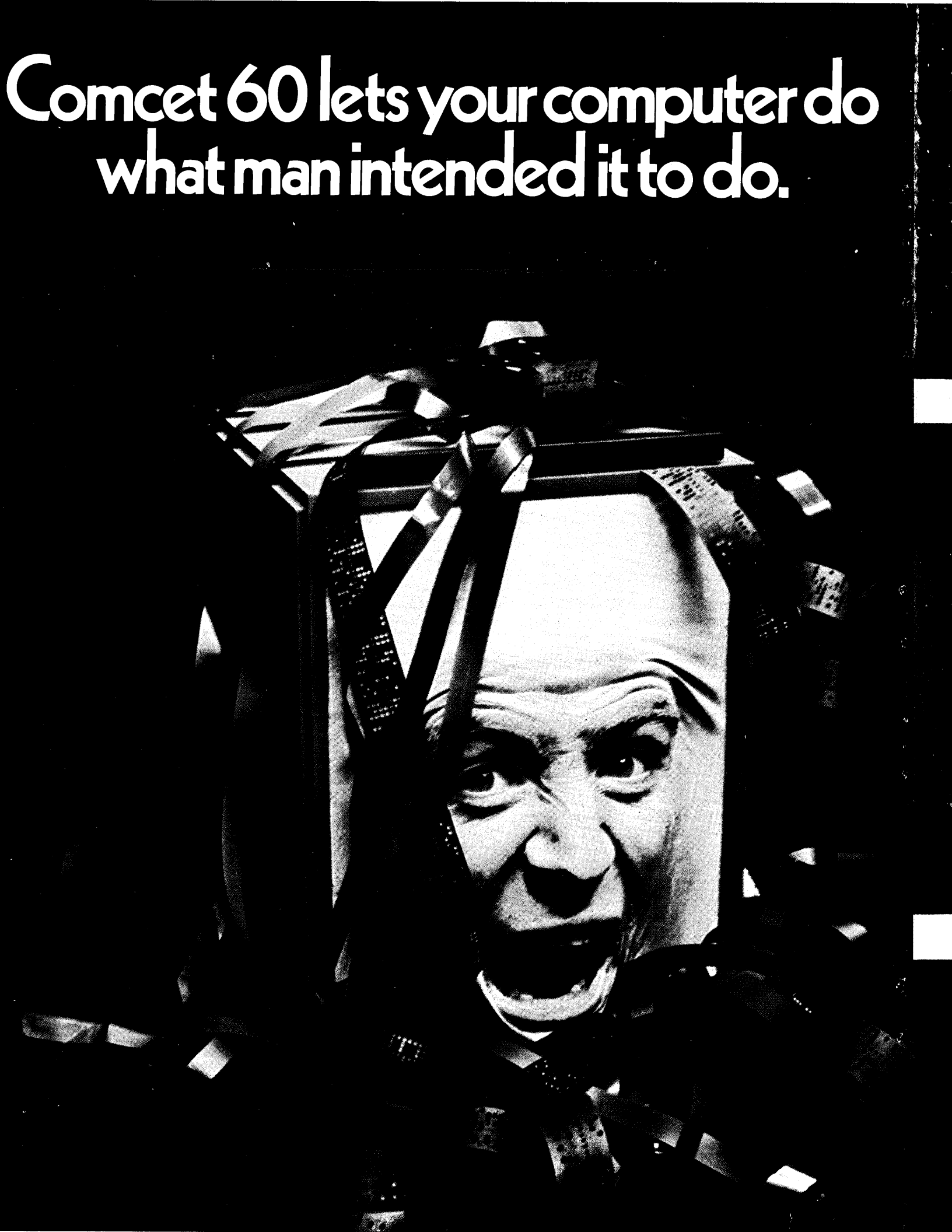
What has happened is that the number of seminars has been cut from 100-plus to 45 for fiscal 1970. The budget has come down from $450,000 to $135,000. For the first quarter, the program is limited to $23,000, enough for three pilot seminars and one tour of a proven course. Richard Canning, chairman of the Professional Development Committee, has been charged with developing a firm plan for the rest of the year by August, when the council meets again.

Essentially, it was in the July-December 1968 period that the seminars had faltered, tallying a $50,000 loss. The previous 18 months of its existence had been break-even, as was the goal. The problems were many. For one, notes Jim Adams, Director of Education, ACM had not seen that the seminar field had become glutted — more than 100 firms were offering competitive courses — and even commercial companies had experienced a drastic drop in attendance during the latter half of '68. But the ACM program also suffered from mistakes in oversaturating some cities with too many seminars, from misjudgment in choice of subjects, and by taking the program to too many small cities that could not support it.

Adams and Canning have made several changes which may be turning the trick. The association hopefully points to the $30,000 net from the program for May and part of June, which will help bring down the $50,000 loss that was thought to be irretrievable. One solution: the seminars will be concentrated now only on the core interests of the membership — hardware and communications, operating systems, programming, data structures and representation, systems analysis and design, and on the perimeter, management. For the time being, "higher risk" topics, like computer-assisted instruction and aerospace software, will not be covered.

The seminars will also bow out of the smaller cities, except perhaps where attendance is guaranteed. Says Don Madden, ACM executive director, "I'm convinced that in trying to take the program to the membership, we haven't run a business. Commercial firms wouldn't think of going to Seattle, Minneapolis, Tampa, Tulsa. It also takes a while to figure out you

Comcet 60 lets your computer do what man intended it to do.



Compute.

Third generation computers were designed to handle computing tasks and take care of their own communications needs too. And they do up to a point.

But as you add more and more terminals to your system, so much of your computer's capacity and memory gets tied up in logging, queuing, store-and-forward, and message switching that there's less and less capacity for your computer to do its most important job—computing.

To head off that inevitable day when the only alternative is to add another enormously expensive central processor, many organizations have turned to special software and "jury-rigged" front-end computers to relieve the communications overload. Until now, the problem has been unanswered.

But not anymore. Comcet has tackled your computer's communications problem head on. And we've come up with the only new, fresh, and economical approach in the business—the Comcet family of Computer Communications Systems.

The Comcet 60 System is designed specifically to handle communications as a separate systems activity. With its own processor, queuing memory and supporting software, it can actually double your central processor's capacity for computing.

And by freeing your computers to compute, the Comcet 60 can lower your costs three ways. First, the need for a larger or second multi-million dollar central processing unit to handle overload is eliminated.

Second, by replacing multiplexors and other conventional line termination equipment, Comcet 60 can offer you significant price performance advantages.

And third, by providing modular hardware and software to interface most remote terminals now on the market, Comcet lets you pick the best terminal for your needs on a cost-performance basis—independent of the manufacturer of your central processor, independent of the terminals used elsewhere in your system.

The Comcet 60 is designed for use with computers in the size range of the IBM System 360/50, 360/65, 360/85 and the Univac 1108. A full line of peripherals is available to permit Comcet Systems to operate as free standing systems for store-and-forward and message switching applications. Other Comcet systems, both smaller and larger, will be available in the very near future.

For full detailed information, write us describing your present or planned on-line system. Or if you would like to discuss the Comcet System in a technical seminar meeting at your offices, followed by demonstration at Comcet, just let us know.

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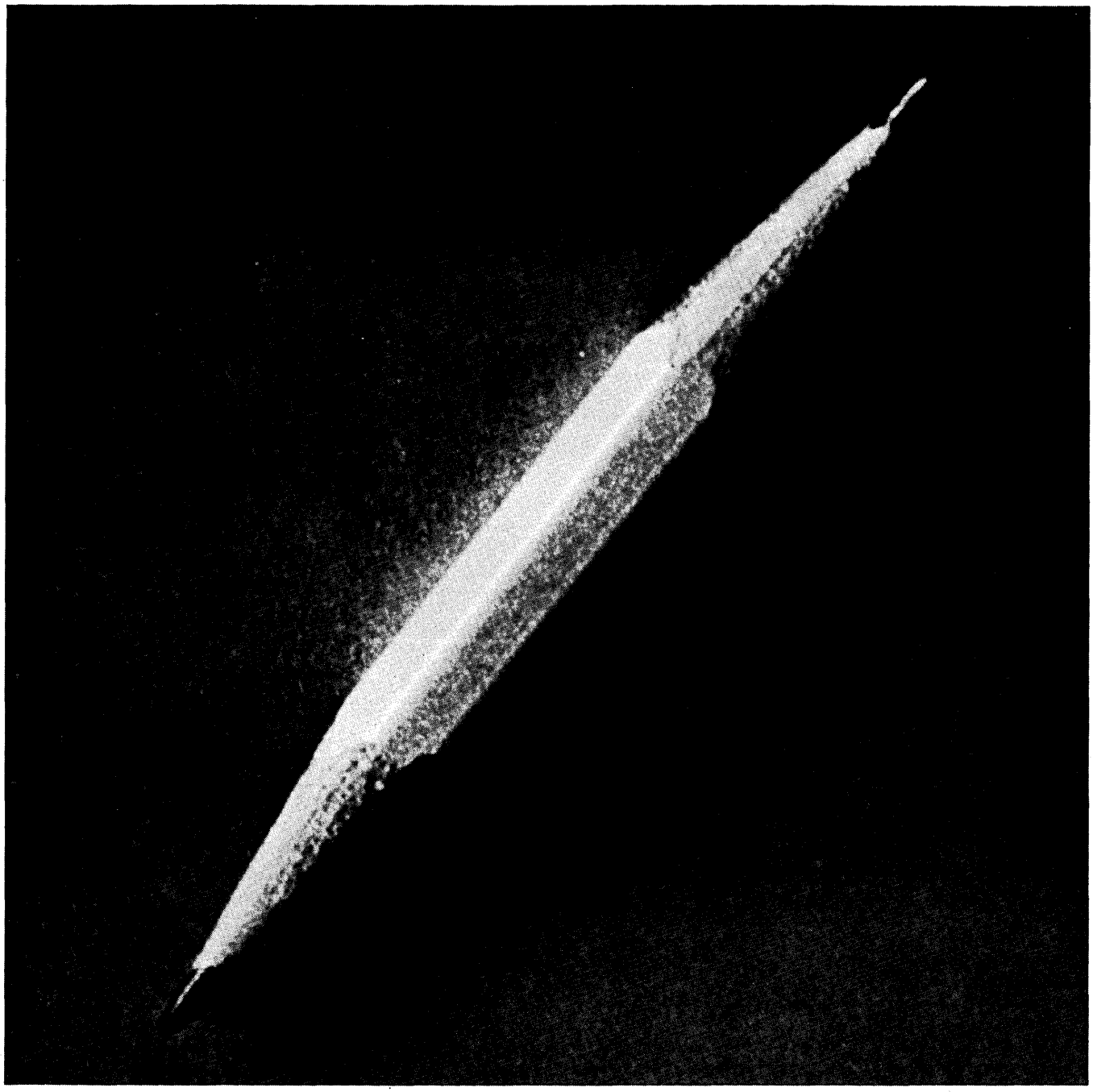
CIRCLE 11 ON READER CARD



You can only push expansion so far.

There's not much built-in expansion in most information exchanges. As the deluge of communications data pours into your computer network, you're forced to install bigger and bigger machines to handle the load. Service gets disrupted, information gets lost, and your investment in equipment dissipates too often, too soon.

Obviously, trading-up can be a questionable answer to expansion. And finally, it's unnecessary too. All you need is a system. Marshall's M1000 Data Communications System. Takes over the complete spectrum of data communications tasks. Lets your computers get back to data processing. M1000 will improve the performance, and extend the life, of every computer in your information exchange. Moves data between all makes of computers, all types of terminals. With all functions and capacities totally expandable. Without disruption of communications. Without sacrificing investments. Without reprogramming or information loss.

Marshall delivers M1000 complete and fully programmed. The system includes hardware, software and customer support—from design through installation, personnel instruction, checkout and contracted maintenance. You just can't beat the system.

MARSHALL COMMUNICATIONS

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The M1000 Systems: on-line or on order for Credit Data Corporation, Delta Air Lines, Federal Reserve Bank of Chicago, Federal Reserve System and Southern Airways.

don't go often to Boston and Los Angeles." These two large cities, it was found, are saturated cities and have produced poor attendance. Half-day seminars have also been eliminated.

Another policy change was the development of course specifications. Commercial firms bid on and present many ACM programs, and the specifications have helped improve the content and quality. Adams notes, however, that course quality has not been the problem, admitting to only a few "bombs."

Beyond the seminar resurrection, the council in June made other budgetary decisions. The profit goal for fiscal '70 was dropped from $250,000 to $150,000, taking a more realistic view of the ability of the association to overcome the '69 deficit while making an irretrievable move to new headquarters, which is costing $75,000. ACM isn't exactly broke right now, although the money in the bank, plus receivables and minus payables, is down to about $98,000. (A part of the moving expense is yet to be paid though.) That's well under the $700,000 ACM says it should have in the bank.

A more concerted membership drive will be begun, with Jim Adams directing. Some plans include the following: more recruitment at national ACM and AFIPS meetings, a direct mail campaign, seminars for industry leaders in an effort to urge firms to take corporate memberships and encourage their employees to become members, and closer interaction with local chapters in the drive. ACM, admitting to not offering a great deal to business data processing professionals, is hoping that *Computing Surveys* tutorials and the new *Data Base* newsletter of the Special Interest Group on Business Data Processing will help correct that problem. Little has been done for this sector via the contents of the ACM national conferences, however.

Although ACM dropped its information service, primarily, said Madden, because it was used most by only the local New York chapter, the association would like to become an information repository of the industry. It has made a proposal to the National Science Foundation for a $120,000 contract for the design and development of an information system on the computer sciences. This, in turn, could lead to the actual implementation and operation of a data base of references to literature on the industry.

ACM did not act, as it earlier indicated, to trim down the pages of *Computing Reviews* or to change it from monthly to quarterly. The other publications remain the same as well. Eight people have been released from the headquarters staff since last July.

Although ACM has been rudely awakened by its financial problems and some failings in management, "the result of analyzing and fixing," says Madden, "has been therapeutic," forcing a review of the operations and goals of the association. It is not out of the woods yet, by any means. Only the next year of operations will tell.

BURROUGHS SHAREHOLDERS SETTLE OUT OF COURT

The Burroughs insider stock case was settled in early June without a trial and with no stockholder objections. Fourteen Burroughs officers and key employees were ordered to repay the company a total of $100,170 (or $5.30 per share). The suit was brought by two minority stockholders on behalf of all stockholders and was settled in the Federal Court in Detroit, about five years after it was filed.

The complaint was against an arrangement under which Burroughs loaned money to its own top officers so they could buy stock (at market prices then ranging from $25.68 to u7.75 a share). The money was borrowed from a bank for the purpose and the officers had 10 years to repay the loan while paying just the interest to the company.

NEW BRAIN MODEL LEADS TO NEW COMPUTER MODEL

"It's not as major a discovery as Von Neumann's, but perhaps it will be comparably useful. I'm about 75% certain it will work." The speaker was Dr. Bernard L. Strehler, a professor from the Univ. of Southern California. He was partially to contradict himself before the discussion was over by saying, "These thinking machines might actually be better at some kinds of computing than present day computers."

Dr. Strehler is not a computer designer, nor a mathematician, not an electrical engineer nor a mechanical engineer. He is a molecular biologist, and the machines he was describing would be "a whole new generation of computers whose design would be based on principles analogous to those operating in the field of molecular genetics."

His discovery, if it is a discovery, is based on 11 years of intensive research into cell and molecular biology as it relates to aging. His earlier studies were spent in such seemingly unrelated realms as luminescence (during which time he expended a good deal of effort just catching fireflies) and photosynthesis (when he showed how a chemical compound used by fireflies to produce light was also produced by plants when they are illuminated). His interest in the aging process led him to a study of DNA, that lifestuff around which living cells are constructed. While attempting to learn why some body cells, like those in the brain, eventually "forget" how to construct more identical cells (like themselves) using the DNA alphabet, a concept of an internal code evolved.

Applying identical principles to those that work at the molecular-genetic level, a detailed model of the operation of the brain and central nervous system was devised. (A detailed description of the model will appear in the Summer issue of "perspectives in Biology and Medicine," printed by the Univ. of Chicago.)

Present brain models consider the organ as a fantastically complicated switching matrix or as a holographic device. The closest known mechanical equivalent is a computer: Present computers, based on Von Neumann's contributions, can do some things well and quickly, but are incapable of performing some relatively simple functions routinely carried out by the brain of even lower forms of animals. Among these are associating, relating, deducing, and predicting. Dr. Strehler's kind of "thinking" machine might do these things, as well as be capable of pattern recognition, learning, and self-programming.

"The striking feature of the model," says Dr. Strehler, "is its essential simplicity and its analogy to well established mechanisms that are known to operate at the molecular-genetic level." In the layman's terms with which we operate, the "essentially simple" hypothesized system works something like this:

Instead of sending enormous numbers of complex messages to the brain to be manipulated simultaneously, sense receptors "code" the inputs through the use of multiple nerve branches. A stimulus travels along one line or ramus from its external source to a nerve cell or neuron that acts as a coder. From the coder, at least three branches of unequal length connect to a single, larger diameter "transmitter" nerve fiber. The coder sends a single impulse along all three ramii simultaneously, but since they are of unequal length, the ramii act as delay lines and what is received at the fiber is a triplet of pulses. This triplet is called a "codon."

At the brain, the coding process is reversed, the original signal reconstructed, and a transmission path automatically taken. "Automatically" is the right work here as no controlling or switching is involved. A vast multi-

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At the end of the day, she sends the cassette to a unit called the DATAPLEX Processor. It edits and formats cassette information and translates it into tape compatible with your computer. (One processor can handle hundreds of terminals.) The unit consists of a cassette reader, a mini-computer, a computer tape transport and an input/output writer (for interrogating and logging). But, the most important component of all is a new proprietary software package that bridges the gap between business language and computer language. We call it FORMOL™ Format Oriented Language. The whole process is fast and simple. No keypunching. No verifying. No room for errors. Think about that. No more requirement to add another key punch. Ever. In fact, why not replace keypunching altogether? Phase the DATAPLEX System in at your own pace. Without changing your existing software or hardware or anything anywhere. (Except your secretary's typewriter.)

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Data Instruments

CIRCLE 16 ON READER CARD

plicity of possible branches exists for the incoming signal. The first time a new stimulus is received, it may not necessarily take the right path (activate the right decoder), but once a successful response is formulated, the tolerance threshold for the path to that response is lowered for the next similar stimulus (codon). Simple memory then becomes only a matter of establishing threshold values.

These branches may become conditioned in an associative manner. If a composite of "A" and "B" signals (codons) are usually found together, and if a cell responds to some mixture of the two signals, its threshold value may become so conditioned that an "A" stimulus will elicit both an "A" and a "B" output response. Hence, associative memory and indexing are possible, phenomena that have not been sufficiently explained through switching theory. Also, if "A" and "B" signals are generally found together and "A" and "C" signals are, too, then an "A" stimulus will yield both a "B" and a "C" response. Hence, deductive reasoning.

Given suitable technology, a machine might be constructed — and Strehler is now dickering with large research firms, including TRW, to do just that — with delay lines, coders, and decoders, approximating the nervous system. Such a machine would be capable of self-learning, associative recall, and prediction. It would also experience some of the same foibles and failures that humans do. As if the prospect of that thinking, learning, predicting machine is not sufficiently staggering, other aspects of the development (of which the computer technology may be a trivial byproduct) lead down science fiction alleys with such eerie stops as personality transfer and sense organ replacements.

"I'm about 75% certain it will work," he said.

THIRD DATAFAIR TO BE HELD IN MANCHESTER AUG. 25-29

Datafair 69 will be the largest conference on computing to be held in Europe this year. Outside the U.S.A., the only other function of comparable size is the tri-annual IFIP Congress. The British Computer Society, organizer of the conference, expects some 1,750 delegates to attend the sessions and several thousand more to visit the industry presentations (exhibits to you).

Part of the success of Datafair, this being the third one, can be attributed to the fact that emphasis in all the lectures and presentations is on practical achievement. Only 16 companies took part and nearly 3,000 persons attended the first Datafair. At Datafair 69, 46 organizations are exhibiting and more than 80 papers (selected from the 250 submitted) will be given at the conference and numerous discussion group panels.

The Institute of Chartered Accountants in England and Wales will hold a special presentation titled "Business Management and Computers." Eight papers in three general categories will be presented: organization and control of computers; the computer as an investment; and management in the future. Discussions will follow the paper presentations.

Eight research presentations will be given by British universities and government research organizations describing work on varous projects in which they are currently engaged. Subjects included range from the computer in marine research to mapping by computer to real-time musical improvisation from a computer.

Approximately 14 discussion sessions are scheduled to cover a wide range of subjects, including: computer privacy, computers in the arts, computer displays, and parallel scheduling and the computer problems involved. There will be 18 regular paper sessions.

In addition, a continuous program of 18 films on data processing will be shown at the Information Sciences Cinema throughout each day. The full program for Friday, Aug. 29, has yet to be announced.

A Class A ticket allows a delegate to attend all activities, including the conference and the industry presentations. A Class B ticket is for exhibits only. For information contact the Datafair 69 Conference Office, British Computer Society, 21 Lamb's Conduit St., London, W.C.1., England.

LOCOMOTIVES WILL HAVE ON-BOARD COMPUTERS

The Seaboard Coast Line Railroad will become the first to use a computer to diagnose repair and maintenance needs for locomotives while they are on the move when the first of 20 new GE engines are delivered next January. The locomotives will utilize an onboard IBM data acquisition system which uses sensors to monitor 96 operating functions while the engines are in motion and records 2.25 seconds of data at 30-minute intervals on magnetic tape cassettes. The cassettes will be removed from the locomotives at strategic stops and the data transmitted by phone lines to an IBM 1800 in Jacksonville, and another cassette will be placed in the engine. The 1800 will produce printout noting any repairs or maintenance needed.

The system will monitor such functions as lubrication of moving parts, compression of the diesel motors, and electrical operations (diesel locomotives actually use the diesel motor only to drive a generator which produces power for an electric motor that actually drives the locomotive). The system is expected to reduce breakdowns and aid in maintenance by pinpointing difficulties which are apparent under load but would be difficult for maintenance personnel to detect while the locomotive is stationary at a shop.

The monitoring equipment is the product of IBM's Federal Systems Div. in Huntsville, Ala., and will be tested by the Seaboard for six months. If results are as expected, systems will eventually be installed on the entire fleet of 1,247 locomotives.

CHINO INMATES GRADUATE, BUT STILL CANNOT WORK

"It is a pleasure to come to a peaceful campus for a change," William Pulyer of IBM said in his commencement address. His audience at the California Institution for Men at Chino probably laughed, but the graduation ceremony held at the Chino minimum security prison was no joke. Eleven students graduated from the seven-month course in data processing of 16 that started. The students were handicapped in not having a computer to even look at — and not being able to go out to see one somewhere else. The course was given gratis by the Electronic Computer Programming Institute of Anaheim, Calif., but follow-on courses will be contracted for. The same program has been used successfully by ECPI at Sing Sing prison and in the Lebanon Correctional Institution in Ohio. Unfortunately, only one Chino inmate can leave to use his new skills, and even he must come back at night.

FIRST CENSUS OF FRENCH DP INSTALLATIONS READY

A directory showing the results of the first census of computers installed in France has been published by Editions Tests; editorial work was done by the staff of a French data processing periodical, 01 Informatique.

The directory, called 01 Scope, shows manufacturer's name, model number, and type of application and information is included on geographical distribution, programming languages, and other characteristics.

Some general conclusions: there were 3271 computers installed in

France as of October, 1968; main categories of users are chemical, aeronautical, and electrical industries, food distributors, banks, insurance companies, service bureaus, and government organizations. Assembly language is used by the majority, with FORTRAN and COBOL in use by about 20% of the installations. About 85% of the machines are leased. Further information can be had from Editions Tests, 41 rue de la Grange-aux-Belles, Paris 10, France.

QUALIFYING MEET HELD FOR BANKING TERMINALS

Three contenders for the banking terminal market competition have presented their credentials and have been qualified by the savings and loan controllers. Responding to specifications for terminals originally released by a joint committee of representatives of the U.S. Savings and Loan League and the National Association of Mutual Savings Banks in September, 1967, Olivetti, Burroughs, and IBM have constructed terminals for consideration. NCR, working diligently, is expected to present its entry in the next few months.

The IBM 2980, which interfaces to a 360 naturally enough and which comes in teller and administrator models, has been out for several months. Burroughs TC 700, which uses disc-based firmware, was introduced in May and has already been sold to six or seven institutions. Olivetti's machines, the TC 380 and the TC 349B, were seen for the first time by the S&L committee.

The TC 349B uses a 512-character buffer and operates on 1200 baud lines to provide response times of under three seconds in a 25-terminal configuration. A hard-wired device, most of its editing functions must be done by the computer to which it links, and interfaces to all major cpu's will be available. A few functions, such as sending end-of-text messages, are controlled directly from the keyboard. It prints at 15 cps. The TC 380 uses a 256-character buffer and has a 383-character memory good for 383 instructions. It will be able to relieve the central site cpu by editing, checking formats, accumulating totals and doing check digit verification, but costs $6900 compared to the 349B's price tag of $5300. Both have paper tape output and input and are the only terminals shown in the qualification trials that meet the price specifications of "under $7500."

The NCR units' specifications have not yet been released, but sources say that they will be compact, MOS/LSI units with relatively easily modified stored programs and light displays that will lead the teller or operator through a transaction step by step.

COMPUTER MISSES FRAUDULENT CLAIMS

If a current investigation into alleged fraud by five osteopaths against Michigan Blue Shield were fiction it might be called: "The Computer Won't Notice." However, since the carrier insures almost half of the people of Michigan and processes eight million medical claims annually, there are post-audit reviews of statistical summaries. These reviews of payments to randomly selected doctors or of procedures may sometimes turn up an unusual trend. The present review has.

The investigation, which involved not only Blue Shield but also federal investigators, was triggered by an unusual number of claims for identical or similar service by one doctor: he had billed Blue Shield for about $100K or 1,800 claims in less than a month in March, 1968. This unusual claim by one doctor led to a suspension of payments to him and an audit. It showed that this doctor had received $489K in a 3-4 year period. The audit also led to four other osteopaths who had billed the carrier for similar treatments, which investigators believe may have never been performed. In slightly over three years, one doctor received $221K and a third $98K. An auditing inquiry showed that two of these doctors reported 18,300 hypodermic treatments for bursitis patients in one year — which is well over half of the 32,104 such treatments reported to Blue Shield by all the doctors in the state for that year. These same two doctors claimed 783 performances of another procedure of a state total of 1,568, and also filed 303 claims (of the statewide 1,440 claims) for a third type.

Involvement of federal investigators came when Blue Shield reported the alleged fraud to the Post Office Dept.'s medical fraud group in Wash., D.C. (since doctors send their claims through the mails). This brought in the Attorney General's office and also the U.S. Attorney's office in Detroit (which refuses to confirm or deny that such an investigation is even taking place).

COMPUTER PRODUCES ART FOR ARTIST'S SAKE

Art in its many forms is taking even newer forms under the direction of sculptor Robert Mallary, associate professor of art at the Univ. of Massachusetts, who believes that he is the first to develop a specific computer program for sculpture that allows the computer to determine the shapes. The program, TRAN2, is used with an IBM 1130 whose output hardware includes a computer-driven plotter that draws a variety of shapes based on input described numerically using X, Y and Z coordinates on punched cards.

"You can take a given form and subject it to various transformation procedures — stretching, compressing or even twisting it like taffy," Mallary states. He predicts that the sculptor "will ultimately use the computer to generate ideas at an extremely rapid rate" that he can then "monitor, sift and evaluate."

The plotter can also draw a set of contour slices, which is photographed, projected onto plastic, plywood or other material, forming the pattern for the finished sculpture. Mallary, himself, cuts out the sections, drills a center axis, and cements the slices into final shape around a metal center rod. Smoothing and polishing complete the sculpting process.

Mallary, who considers the computer an "intelligence amplification device," predicts a big future for computer sculpture. He foresees the ultimate day when a computer may even be able to "learn" the style preferences, temperament and eccentricit-

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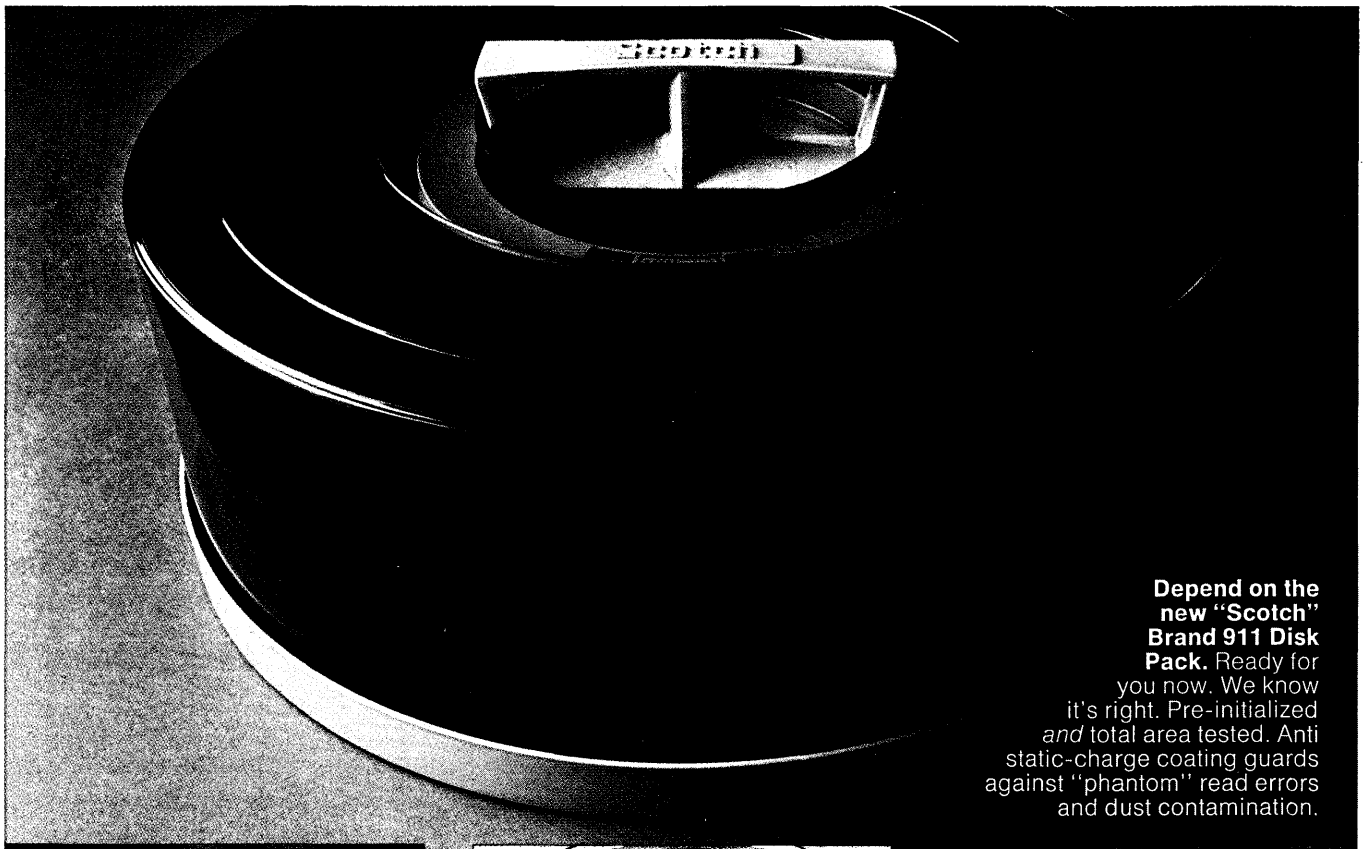

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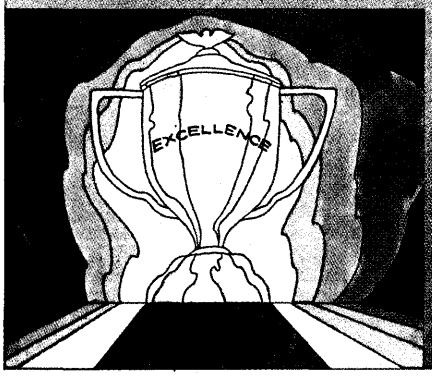

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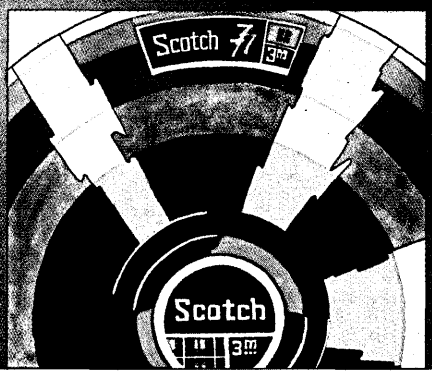

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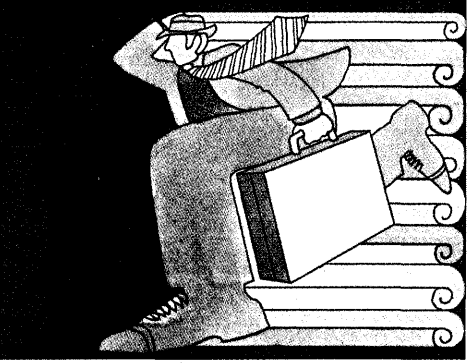

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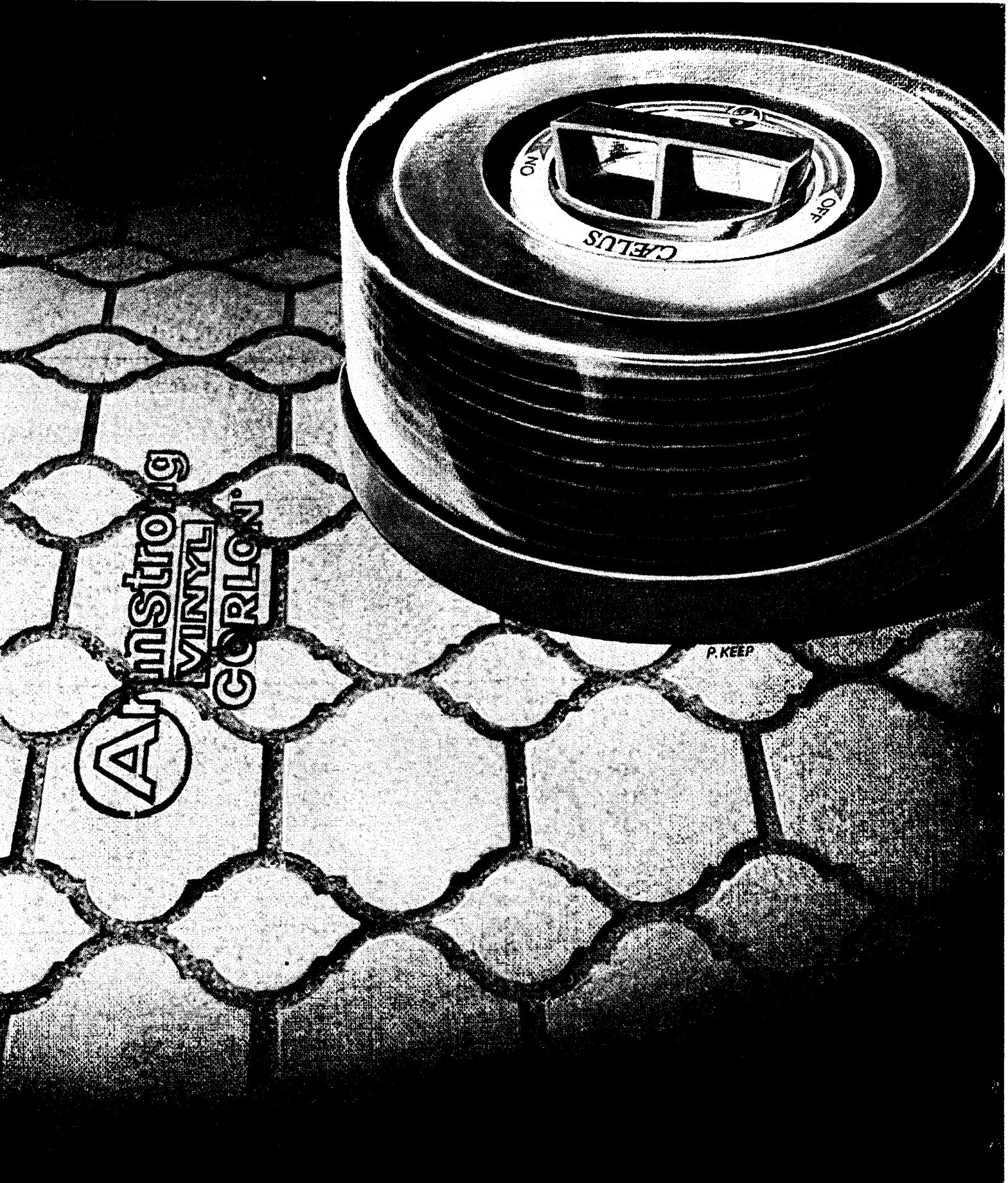

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ies of the sculptor who is using it, retain this information, and be able to produce works "in the manner of" the sculptor. "This may even give rise to a kind of posthumous art in which the artist's creative mind will express itself through the computer after the artist himself is dead," according to Mallary.

The implications are alarming. What if an artist, a horde of artists, sure of their genius but unappreciated in their lifetimes, should get hold of Prof. Mallary's idea and subject the world to a perpetual flow of mediocrity? Art lovers must be protected ... but who is to say which sculptor's core should be dumped?

BEMA RATIFIES X3 REVAMPING

The Business Equipment Manufacturers Association has ratified a new structure for the USASI Standards Committee X3 on Data Processing. The reorganization of X3 is described in the newly-released "Objectives, Organization and Operating Procedures Manual," which supersedes the previous manual published nearly a generation ago in 1965. The new manual delineates all operating procedures and responsibilities for the committee.

The reorganized structure differs principally from the previous X3 organization in that it separates the committee's planning functions from its actual standards development functions. Two new staff committees, the International Advisory Committee and the Standards Planning & Requirements Committee, will be concerned with defining goals and providing direction for the X3 committee. Relieved of these administrative functions, the Standards Steering Committee and the various subcommittees will hopefully have more freedom to pursue the chief objective, which often seems to be tangled in the red tape of committee organizations: the timely development of assigned standards.

DATA INSTRUMENTS OFFERS SOURCE DATA ENTRY SYSTEM

Data Instruments Company, Sepulveda, Calif., has come up with a business dp system called DATAPLEX, consisting of a terminal, a small processor, and a translating software program called FORMOL (FORMat Oriented Language). The terminal contains a modified electric typewriter that can produce the usual hard copy or transmit business data, either by telephone coupler or directly onto mag tape in a cassette recorder within the terminal. The transmission onto tape is accomplished by encoded striking typewriter keys read by a photoelectric cell on contact, which also converts parallel code to serial for telephone communication.

The firm touts the system as a "first generation" source entry system because it considers itself the first to offer it. President Gerald Speen stated that with the system, any secretary or typist can prepare data for computer input while it is originally being typed, as a byproduct of normal typing procedures. The tape is then taken to the processor, normally located at the business facility, which can handle up to ten cassettes at one time and can handle data daily from "hundreds of terminals." The small computer processes the data onto 1/2 inch standard computer mag tape transport. The FORMOL software reorganizes, edits and corrects the data into the format desired by the using business.

DATAPLEX is, in effect, an in-office batch processing system using source entry. The terminal is priced at $2,850 or $84 per month rental. The processor sells for $24,950 or rents for $695 per month. Delivery is 120 days. For information:

← CIRCLE 564 ON READER CARD →

new companies . . .

Data Access Systems has been formed in Landing, N. J., to design and market a line of computer-oriented data communications and terminal equipment for direct electrical connection to standard telephone lines. . . . **Computer Congenerics Corp.**, Oklahoma City, will provide consulting services in operations research, MIS, software development, installation management and educational services. Tulsa and Dallas offices will open soon. . . . **Computer Synetics Inc.**, a new Santa Clara, Calif., firm, is marketing Sum, a monitor to measure the utilization of computing components. The company's line of monitors sells from $2,500 to $36,000. . . . **Rydax, Inc.**, San Rafael, Calif., successor to the C. A. Rypinski Co., will manufacture the specialized digital communications equipment manufactured by Rypinski and introduce other digital message systems. . . . **Telecommunications Technology Inc.** has been established in Palo Alto, Calif., to develop and produce specialized instrumentation for the telephone and telecommunications industry. The firm will concentrate particularly on instrumentation for the maintenance and support of digital and data transmission equipment. . . . **Sierra Research Corp.**, Buffalo, has formed a computer products department in Burlington, Mass. The new facility is specializing in the design, development, and manufacture of computer accessories and dp equipment for both government and industrial applications. . . . Mark Systems, Inc., Cupertino, Calif., has established a subsidiary, **Computer Output Systems Corp.** "COM Corp." will develop, manufacture and sell photoelectric computer peripheral equipment. First products will be a line of computer output microfilm equipment. . . . A new consultancy, **Advanced Management Planning, Inc.**, is open for business in Greenwich, Conn. . . . **Mobark Instruments Corp.**, Mountain View, Calif., will develop and produce digital magnetic tape recording systems based on recent U. S. patents obtained by Moghazi F. Barkouki, founder and president of the new firm. . . . Compumatics, Inc., Chicago software firm, has formed **Compumatics Time-Sharing Service, Inc.**, which will offer turnkey processing to the business community. . . . **Scientific Leasing Services** (SLS), a new division of Sedillo Co., San Jose, Calif., will concentrate on the rental and leasing of small scientific computers, systems, and instruments. The third-party leasing service is offered both to users and manufacturers. . . . **Grace Computer Services**, a new division of W. R. Grace & Co., is fully operational with facilities in New York, St. Louis, Nashville, and Toronto. GCS offers a variety of edp services, including time-sharing, computer supplies, consulting, personnel recruitment, systems and programming, and software development. . . . The formation of the **American Communications Corp.** has been announced as a joint venture by Western Union, New York, and Advanced Research Corp., Washington, D. C. The company was formed to provide research, development, and analysis of communications systems, initially for certain categories of federally funded studies, later in service and commercial contract areas. . . . **Autocode Inc.** has opened in Washington, D. C., and is offering law-government computer services. . . . **Intermetrics, Inc.**, Cambridge, Mass., has been formed by five former staff members of MIT's Instrumentation Laboratory to offer digital computer technology to commercial aviation and other areas of commerce. Their first project will be the development of an air traffic control system. . . . **Univac** has established a new subsidiary, a division of Sperry Rand Espanola S. A., to market and service Univac products in Spain. . . . **Custom Computer Systems, Inc.**, Plainview, L. I., N. Y., is offering hardware and software capability to release the potential of the minicomputer to a broad base of users for a variety of applications. Basic premise of the company's foundation is that many of today's users are experiencing difficulty in effecting system implementation, which usually requires the utilization for a limited period of time of skills not generally available within the user's organization. . . . **Datatrol Inc.**, Hudson, Mass., plans to build a whole family of communications devices and displays. Present products include the

← FOR CAELUS MEMORIES CIRCLE 67 ON READER CARD

The two-f

IT READS...

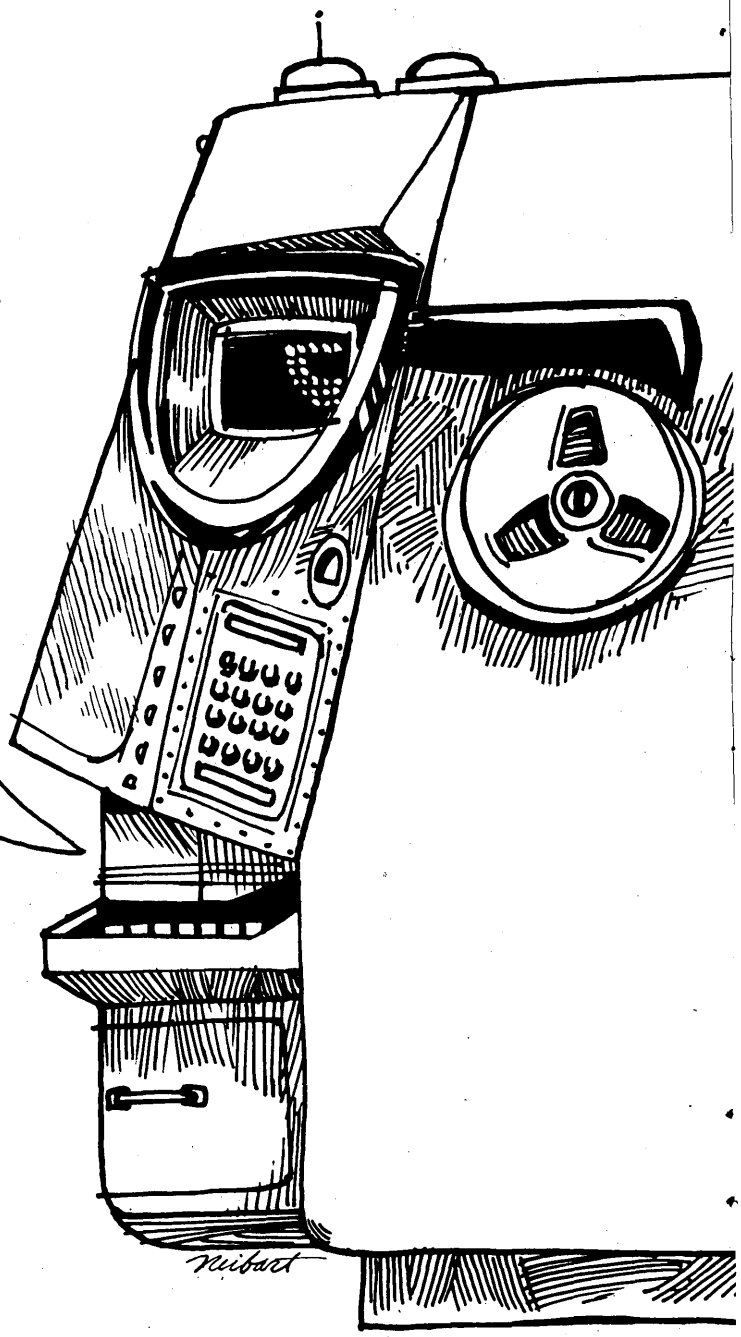
THIS TYPEFACE, OCR-A, DESIGNED TO BE READ BY A MACHINE. OUR NEW 200 KNOWS IT AND READS IT. IN CERTAIN APPLICATIONS, IT SERVES A PURPOSE WELL. UNFORTUNATELY THIS FONT IS DIFFICULT FOR PEOPLE TO READ.

SCAN-DATA GIVES YOU, THE USER, FONT SELECTION. THAT MEANS YOU BUY A MACHINE TO HANDLE THE WORK YOU'RE DOING NOW. IF MOST OF THE INFORMATION YOU READ COMES FROM A COMPUTER, NATURALLY THE FONT YOU SELECT IS LIKELY TO BE A COMPUTER PRINTOUT FONT... 1403. IT MAKES SENSE.

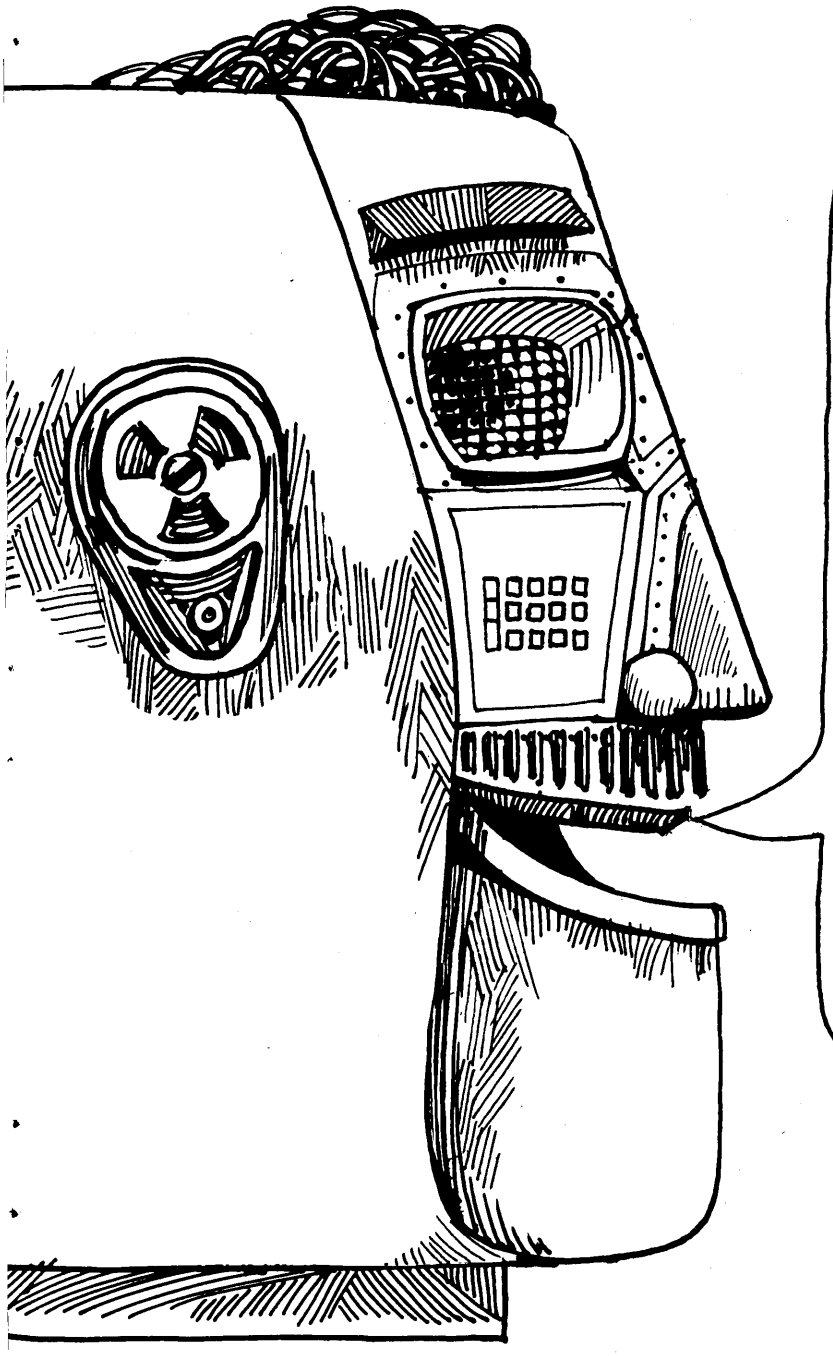
AS YOUR BUSINESS GROWS, ADD NEW TYPEFACES AS THE WORK REQUIRES.

THE TURN-KEY TO OPTICAL CHARACTER RECOGNITION IS RELATING TO PEOPLE.

MACHINES READ. PEOPLE READ. SEE OUR OTHER FACE.



aced 200



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The 200 is a real man/machine system. It will meet your criteria at lower cost than systems that read ONLY highly stylized fonts.

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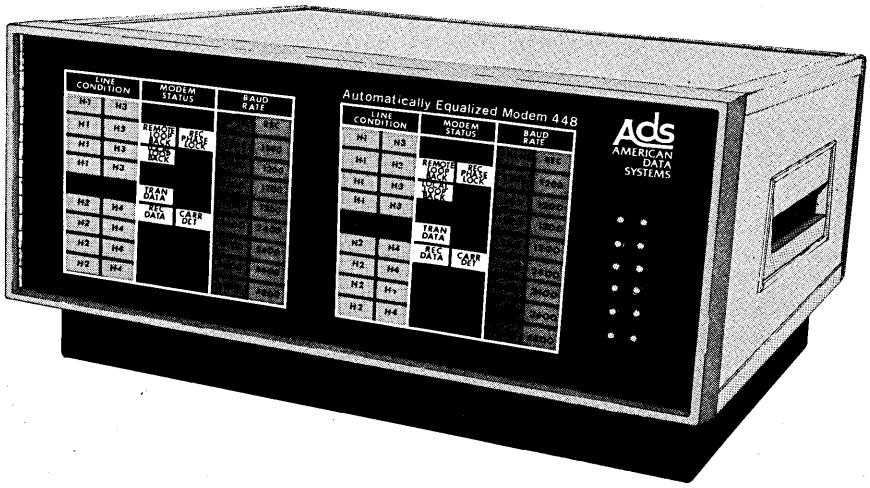

Ads

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news briefs

FASTPLOT pre-viewing device for incremental plotters and three communications interfaces. . . . A programming firm SoftWare Sciences, Inc., has opened offices in Miami. The company is a subsidiary of Computer Controls Corp. . . . **Harrington, Davenport and Curtis, Inc.,** Bedford, Mass., will offer consulting services to industry and government in instrumentation, communications, computer-controlled systems, surveillance and tracking technology, and radio and radar physics. . . . **Systemshare Limited,** a new time-sharing organization serving Scotland and Northern England, is owned jointly by Systems Consultants Limited and Bruce Peebles Industries Limited.

mergers, acquisitions . . .

Consolidated Analysis Centers Inc., Santa Monica, has agreed in principle to acquire **Technology Service Corp.,** another Santa Monica services firm. . . . The **Thompson Book Co.** has been bought by **Information Industries, Inc.,** Wayne, Pa., from F. D. Thompson Publications, Inc., publishers of DATAMATION. . . . **Data Architects, Inc.,** has announced the acquisition of **Osborne Technical Services.** Greyhound Computer Corp. has agreed to purchase Data Architects' interest in the **Greyhound Time-Sharing Corp.** . . . **Information and Computing Centers Corp.,** Dallas, has formed **Systematic Design Inc.** to provide computerized graphics services. ICCC Ltd., ICCC's Canadian subsidiary, will operate **Magnetrace Services Ltd.,** a recent acquisition. Also in Canada, ICCC has purchased the use and exclusive worldwide marketing rights to almost 500 geological and geophysical computer programs from **Computer Data Processors, Ltd.** . . . **Strategic Industries, Inc.** has discontinued its unprofitable operations of **Strategic Careers,** its subsidiary in the personnel agency field. At the same time, the company announced agreements to acquire the Art Award Co., Inc., L. Thaler & Co., and Precise Imports, Inc., three privately owned companies and their subsidiaries in importing and wholesale distribution. . . . **Computer Communications, Inc.,** Inglewood, Calif., will acquire **General Fabrication Corp.,** Forest Lake, Minn., makers of printed circuits, magnetic core memories, and electronic sub-assemblies and wired panels. . . . Cosmo Book Distributing Co. has agreed to merge into **Wellington Computer Graphics Inc.** . . . **Computerology, Inc.,** New York City, has acquired **Electronic Processing Center, Inc.,** and **Computer Systems Machine Accounting Co., Inc.,** both of Philadelphia. . . . **Leasco Data Processing Equipment Corp.** has agreed to acquire **CPM Engineers Inc.,** Philadelphia. . . . **Computing and Software, Inc.,** has sold its Gencom Agency, distributors of electro-optical products manufactured by **E. M. I. Electronics** in the U. S. The business will be continued as a joint venture between **Varian** and E.M.I. . . . Stockholders of **Rixon Electronics,** Silver Spring, Md., have voted approval of an agreement to merge Rixon into **United Utilities, Inc.** . . . **Computer Planning Corp.** has acquired **Technical Information Pacific,** a Honolulu-based service bureau. . . . **URS Systems Corp.** has purchased the Professional Services Group of **Matrix Corp.** and has an option to acquire the balance of Matrix before Feb. 15, 1970. . . . **Diversified Data Services and Sciences Inc.,** New York City, has agreed in principle to acquire an 80% interest in **Bliss Electronics Corp.** of Sussex, N. J., through a Diversified Data subsidiary, Communications Disciplines, Inc. DDSS has also agreed in principle to acquire a 60% interest in **Comspace Corp.,** a manufacturer and distributor of educational training equipment. . . . **The John D. Kettelle Corp.** has acquired **Lifson-Kline Assoc., Inc.,** of Los Angeles, which will become the L.A. operations of Kettelle. . . . **Electrac, Inc.,** Anaheim, Calif., will be merged into **Datatron Inc.,** Santa Ana. . . . **Jersey Tab Card Corp.** has acquired the New York-New Jersey tabulating card business of **Lewis Business Forms, Inc.** . . . **Financial Associates Computer Technical Services of Delaware Inc.,** a software and service company providing portfolio analysis and securities price information to financial institutions, has been acquired by J.P. Morgan & Co., the recently formed holding company that controls Morgan Guaranty Trust Co. . . . **Biodata, Inc.,** Houston manufacturers of physiological data acquisition systems, has acquired **Unimetrics,** a peripheral maker.

• Digital Equipment Corp., Maynard, Mass., has decided that sophisticated electronic technology has penetrated far enough into the industrial control market to justify setting up a Control Products Group, according to vp Stanley C. Olsen. The group will have four sectors: PDP-14 for solid state machine control of repetitive processes; N/C systems for numerically controlled machinery; control modules, and control systems, which will use all product areas to develop specialized concepts. Manager of the new group is Allan T. Devault, who has been with DEC for three years.

Meanwhile, back in workaday operations, DEC recently delivered its 1,000th PDP-8/1 small computer to Teradyne, Inc., Boston, the same company that bought its 1,000th PDP-8 predecessor (the 8/1 has a lower base price and reduces cost of peripherals by extensive use of integrated circuits). The latest milestone was reached less than a year and a half after the 8/1 was introduced. To date DEC has delivered more than 3,500 small computers.

• The American Society for Cybernetics will award two Norbert Wiener medals this year — one gold, one silver — at its annual symposium, Oct. 14-16. The gold medal will go to the scientist, engineer or scholar, age 35 or under, who has contributed the most significant paper on cybernetics during the preceding year, presented at ASC meetings or in ASC publications. The sterling medal will be for the same qualifications, but with no age limit. If the judges think it merited, another silver medal will be given to a national figure for contributions made in the field of cybernetics. The symposium is sponsored by both the National Science Foundation and National Bureau of Standards, and will be held at NBS, Gaithersburg, Md. Papers should be submitted before Sept. 1 to Dr. Alex S. Fraser, Dept. of Biological Sciences, Univ. of Cincinnati, Ohio 45221.

• General Electric is spending $34 million within the U.S. and another $20 million outside to expand its time-sharing services. Much of the internal $34 million will be used to develop a nationwide communications network and to beef up a Cleveland dp center to service more than 40 other metropolitan centers. GE, which has about 40% of the t-s business, estimates today's market for such services at $150 million and estimates 1975's business as in the $1.5-$2 billion category.

• The character set used as input by the Library of Congress on its MARC (Machine Readable Cataloging) magnetic tapes, based upon the government's newly approved ASCII, is being made available through the American Library Association's information science and automation division. Specifications for print graphics reflecting the character set are being offered, comprising an eight-bit extension of ASCII which also can be contracted to six bits. Any Roman alphabet language, or Romanized non-Roman alphabet language for which transliteration tables are available, is reproduced as exactly as possible by the 174 print graphics in the set. The

news briefs

Library of Congress has been sending bibliographical data on magnetic tapes to subscribers each week since March 1.

• IBM has appointed seven new IBM Fellows who will be free to pursue "professional objectives of their own choosing and to act as consultants to scientists and engineers in the company" for a five year period. They were selected on the basis of their "significant contributions to the business." The new Fellows are: E. Alan Brown, Los Gatos, Calif., a holder of 19 patents; Dr. Herman H. Goldstine, Yorktown Heights, N.Y., who established IBM's first mathematics research department in 1958; Dr. Harwood G. Kolsky, Palo Alto, Calif., a pioneer in the architectural design of very large scale computers; Dr. Rolf W. Landauer, Yorktown Heights, N.Y., who has worked in solid state technology and the use of lasers; Charles E. Owen, Hursley, England, who enabled IBM to introduce microprogramming and read-only storage to its products; Dr. Jacob Riseman, East Fishkill, N.Y., who has worked with magnetic thin film devices and semiconductors; and Dr. Wouter Vanderkulk, Owego, N.Y., leader of mathematical analysis projects.

• Remote Computing Corp., Los Angeles, a computer utility company, is now offering PAR (Program Authors' Royalty), a plan that makes various software packages available to its clients that otherwise might languish unknown except to their authors. Under the setup, Remote serves as the marketing rep for independent programmers and small software houses and pays the authors a royalty based on the rate of usage. An author is allotted a specified amount of free system time to convert his program for operation in Remote's t-s system, which uses B5500's. The plan is expected to greatly increase the firm's program library and provide a variety of application tools to its clients.

• An added bonus for Fall Joint Computer Conference visitors this year will be an IEEE workshop for on-line data acquisition and control system technology, which will immediately follow the FJCC in Las Vegas. Scheduled for Nov. 20-21, it is sponsored by the computer group's Data Acquisition and Control Committee, whose chairman is Dr. Albert Hopkins of MIT.

• Honeywell's EDP Div. was awarded a Silver Anvil award by the Public Relations Society of America for "outstanding professional public relations achievement in 1968," in recognition of the division's course in computer programming for inmates at a Mass. state prison. The fact that Honeywell led all computer industry firms in the number of press conferences and announcements last year apparently went unrecognized by the Public Relations Society.

• Commercial Credit Corp., a subsidiary of Control Data Corp., is cooperating with the two edp schools operated by CDC, Automation Institute of America, Inc., and Control Data Institute, by providing installment loans covering up to 95 per cent of a student's tuition. The student begins repaying as little as $25/mo. while completing the 26-week course; then, upon graduation, installments are increased in proportion to his ability to pay.

• The ACM's Special Interest Group on Business Data Processing has released the first edition of its new quarterly, DATA BASE, which features an article by Hugh J. Lynch on the ADS systems documentation technique he developed for NCR. The editor of DATA BASE is Oscar M. Palos of Stanford Research Institute. The magazine is sent without charge to all SIGBDP members; a nonmember subscription is $10 per year. Information can be obtained from the ACM, 1133 Avenue of the Americas, New York, N.Y. 10036.

shortlines ...

The Dow Jones News Service will be equipped with GE TermiNet 300 variable speed printers capable of delivering the news at speeds up to 300 words per minute .... Levin-Townsend Service Corp. will open an edp processing center in Las Vegas; they recently purchased the Bonanza Hotel in that bucolic hamlet .... Western Union is using Honeywell DDP-124 computers in its "bank wire" service, a high speed communications link for 229 banks which has a 50% greater capacity than the semi-automatic system it replaces .... an RCA Spectra 70/45 with 18 video terminals, 62 teleprinter terminals, and a link to Washington, D.C., forms the nucleus of the recently dedicated county law enforcement computer system in Cincinnati .... The Kaiser Foundation Research Institute has replaced two IBM Large Capacity Storage Memories on its 360/50's with Ampex RM extended core memories, supposedly the first time that an independent's products have forced out an LCS .... Frankfurt, Germany, will host a U.S. Department of Commerce edp exhibit at the U.S. Trade Center there, Sept. 22-26 .... fashion note: apparently the days of the standard uniform at IBM are gone; an IBM programmer — female — scored a first one spring day by showing up in a pants suit .... More than 36 purchasers of the Programming Methods, Inc., information retrieval system called SCORE have formed a users' group modeled on SHARE .... Compata, Inc., of Los Angeles, a design/consulting/analysis/-programming firm, has opened a Lexington, Mass., office; does that make them "coast-to-coast?" .... International Business Machines Co. Ltd. (Canada) is changing its name to IBM Canada Ltd. since "everyone calls us IBM anyway" .... other name changes include University Computing Co.'s financial group, previously called Gulf Group, Inc., to UCC Financial Corp..... Intranet Industries, Inc., previously Information Industries, Inc., formally announced that they will do the time-sharing software for Scientific Control Corp.'s 6700 .... Scientific Resources Corp. has signed an order for $23 million worth of Sigma 5's and 7's from Scientific Data Systems; even with the parent firm's (Xerox) help, it will take three years for SDS to run off that many copies .... Superior Motels, Inc., an association of more than 380 independently owned motels, inked a contract with International Reservations Co. (a div. of Planning Research Corp.) which raises the total number of hotel/motel properties serviced by IRC to over 800 .... Senators Stuart Symington and Thomas Eagleton announced a $19,200 National Research Foundation grant award to Dr. S. Charmonman of the Univ. of Missouri-Columbia for research and development of APL .... The asking price of Computer Automation's 808 controller, an 8-usec machine, has been cut to $4,990 .... Peter James, 37-year-old multi-millionaire president of Photo Magnetic Systems of Beltsville, Md., has decided to run for governor of that state .... Scientific Data Systems has leased its 940 time-sharing service bureau in El Segundo, Calif., to Computer Sharing, Inc., a subsidiary of Scientific Resources Corp.; maybe they were unhappy with the manufacturer's support? ....

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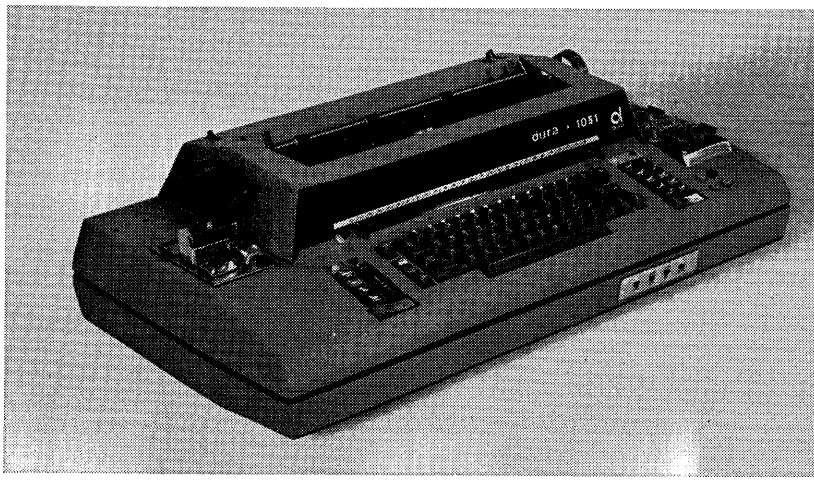

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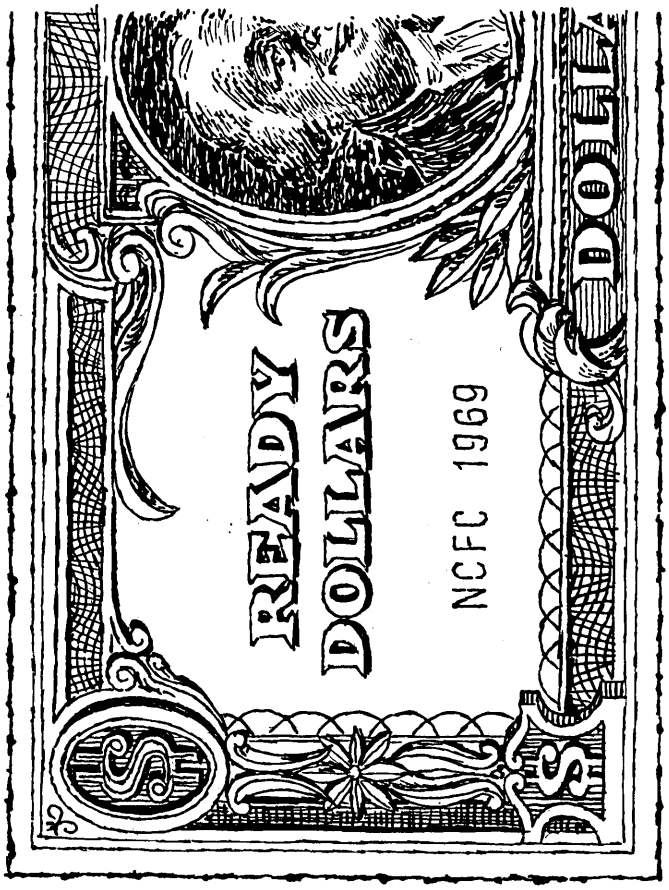

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In Fortran IV and Basic.

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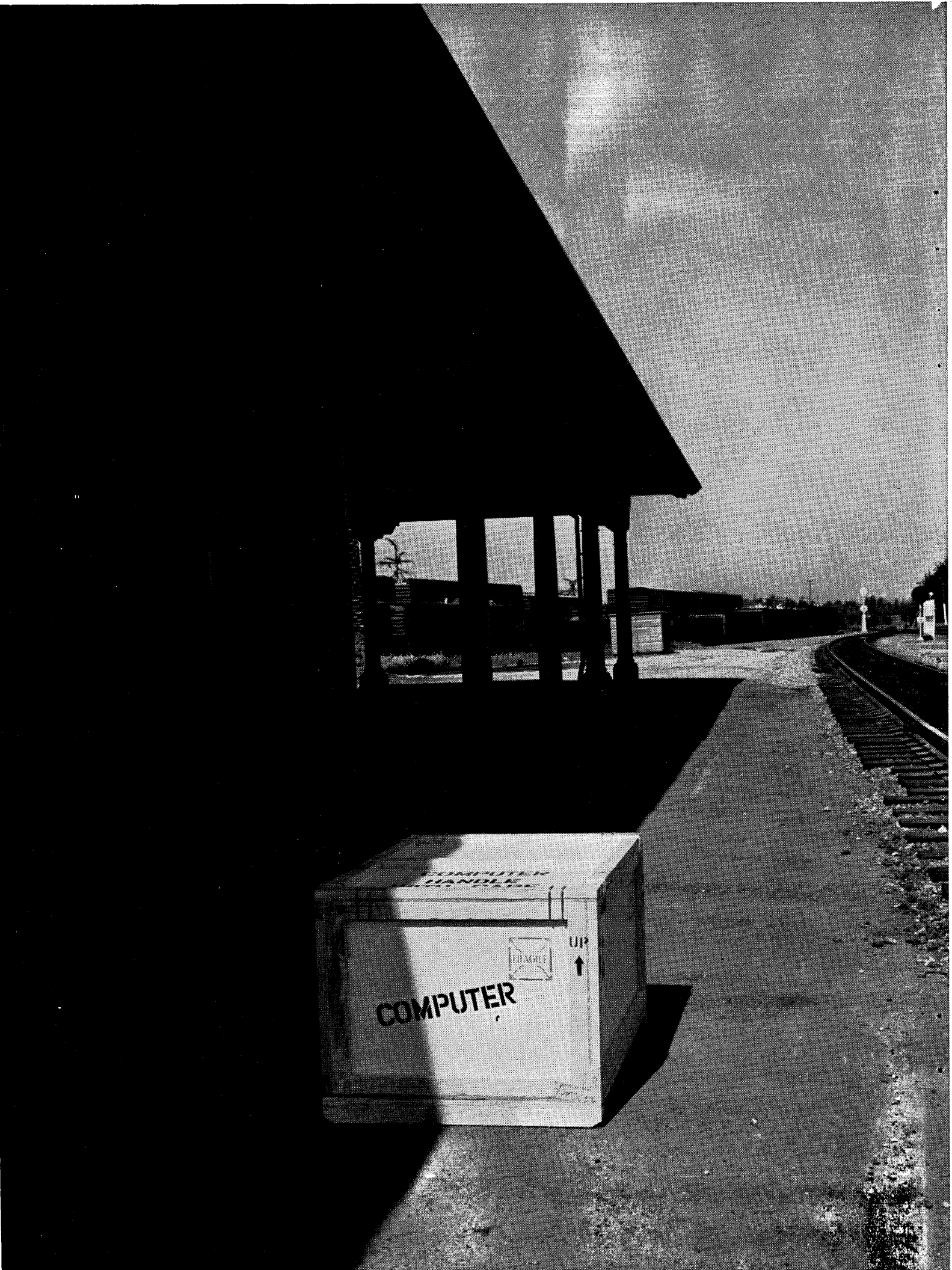
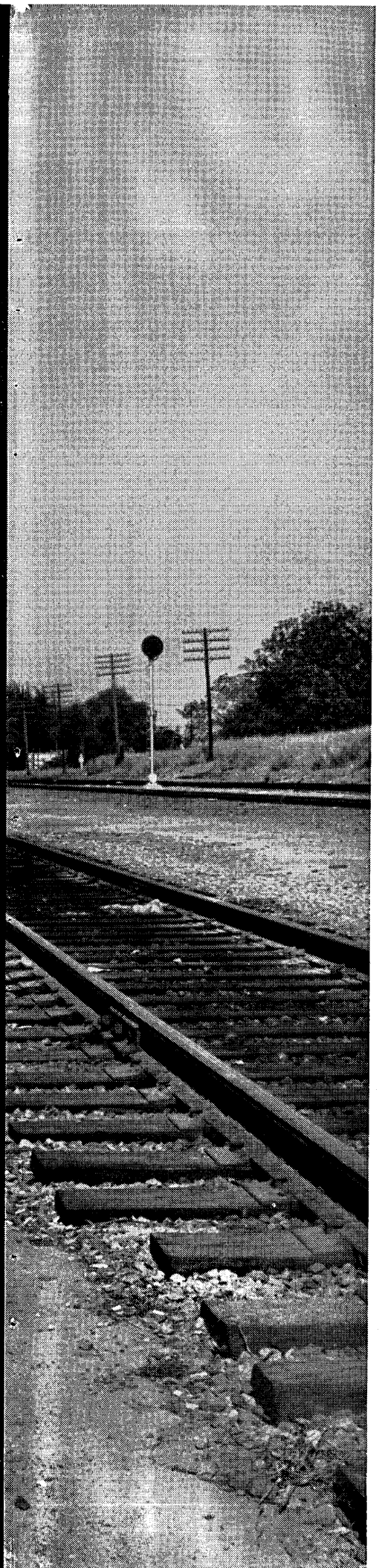
Fair housing is a fact. If you live under a roof or want to, the new law covers you. Find out what the law says. Write: Fair Housing, Washington, D.C. 20410


UP
FRAGILE
COMPUTER



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information for this series is invited applications submitted must be installed and operational

environmental simulation

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computers and peripherals

Two CDC 3300's with 64K words each of core storage; 1.25 usec cycle time
Astrodata Interface hardware plus dedicated line printers, mag tape units, and card equipment and switchable line printers, crt consoles, and CalComp plotters

application

In spite of a 1965 Mariner flight to Mars, our nearest neighbor is still very much a mystery. On Feb. 24 and March 27, Mariners VI and VII were launched by Atlas Centaurs from Cape Kennedy en route to separate rendezvous with Mars. Mariner VI will make an equatorial pass at the red planet on July 30. The "VII" sister ship will make a polar pass on August 4. Each will carry an 800-plus pound payload including: two spectrometers (an infrared and an ultraviolet) for studying the molecular composition of the Martian atmosphere; an infrared radiometer for measuring the planet's temperature; four solar panels; two tv cameras; a positioning rocket motor and several attitude control jets; plus sensing and navigational equipment, tape recorders, temperature controllers, power supplies, a small computer, and a raft of mechanical devices and back-up systems.

To help assure that these expensive experiments will function after a five-month spaceflight, more than a year was spent in pre-flight testing for NASA by the California Institute of Technology Jet Propulsion Laboratory, the Mariner prime contractor. At the JPL Pasadena facility the various subsystems, supplied by numerous aerospace subcontractors, were assembled and subjected to a barrage of tests some conducted in an environmental test chamber. The preflight check-out was conducted using a dual-CDC 3300 configuration running with a program supplied by Informatics, Inc., of Sherman Oaks, Calif. The check-out was continued right up until flight time by moving the entire test facility, including the CDC 3300's, to Cape Kennedy.

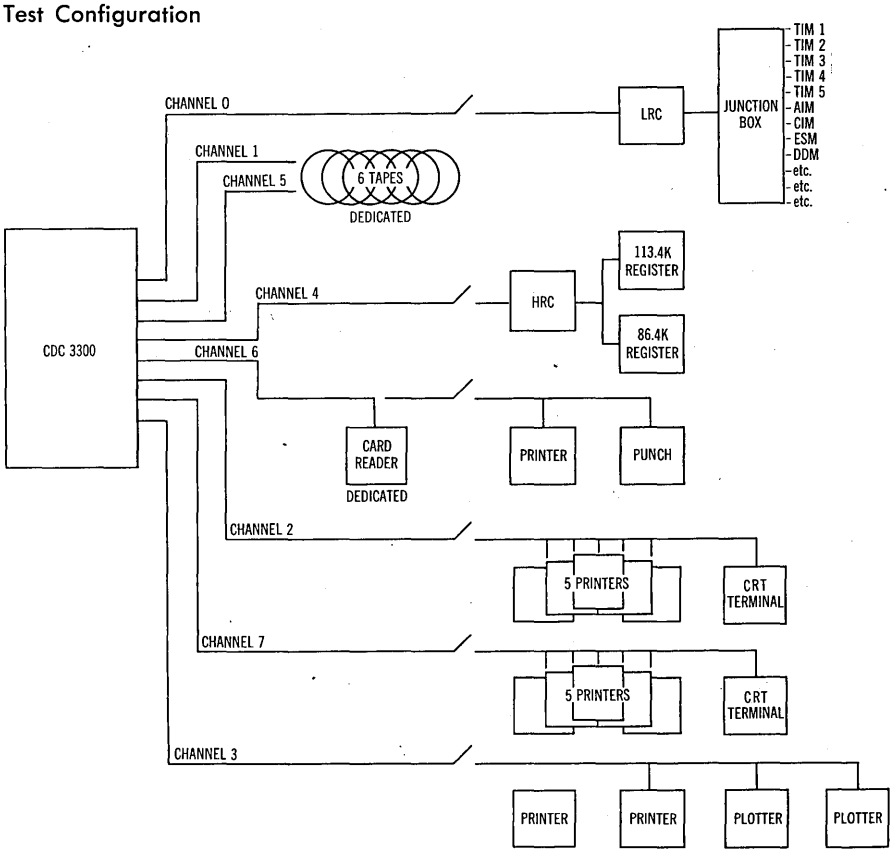
hardware

Each Control Data Corp. 3300 has two 32K core modules, its own bank of six tape drives, a line printer, and a card reader. A card punch, 13 line printers, two CalComp incremental plotters, two crt/keyboard consoles, and various interface components can be switched on to either 3300 to support various engineering and analysis groups.

The 3300's are not connected. Each has its own copy of the operating program and is capable of monitoring the complete real-time testing of one Mariner while processing partial non-real-time testing of another, or processing complete real-time data from an earlier run and monitoring partial data from an on-line craft.

In real-time testing the 3300 is interfaced to the Mariner through a collection of special interface hard-

Test Configuration



ware supplied by Astrodata, Inc.; of Anaheim, Calif., and collectively referred to as "OSE" for Operational Support Equipment. In non-real-time operation, the system is used, with the same operating program, to process the data compiled previously on history tapes.

The OSE interface includes two major components, a low rate controller (LRC) which handles input data rates up to 16,200 bps and a high rate controller (HRC) which can handle 86,400 bps and 113,400 bps data streams. The controllers are allocated their own I/O channels.

The low rate controller connects to five telemetry input modules (TIM's), two analog input modules (AIM's), an event/status module (ESM), a counter input module (CIM), and a digital data module (DDM). The TIM's are actually shift registers which accept serial bit strings and accumulate bits (usually 18) and output them, with a source code, in a 24-bit word. TIM input is received at rates from 8⅓ bps (from engineering telemetry gear monitoring such functions as power, temperature, and pressure) to 16,200 bps (digital video signals from a hardline or "umbilical" cable connection).

The analog input modules are multiplexors which scan cable-connected voltage inputs for a/d conversion. With both AIM's operating, about 140 words/sec are transmitted for checking such things as the attitude control system (roll and pitch outputs from the gyros) and radio gear.

The counter input module is composed of eight 18-bit independent high speed pulse counter registers. These check the frequencies used for transmitting commands to the craft, such as those commands which could be used to override programmed instructions for locking on the star Canopus or for closing panels to regulate the internal temperature.

The event/status module comprises 16 more 18-bit registers, each of which monitors 18 one-bit event or status quantities. (An "event" is simply a pulse signifying something happened; a "status" is a voltage indicating on/off or high/low.) These registers are used to monitor data sent to the craft simulating actual flight data, and to check the responses of the on-board subsystems.

The digital data module again has eight registers. Unlike the other modules which are used to test on-board subsystems, the DDM is used to test the other components of the test equipment.

The second major component of the OSE gear is the high rate controller. It is cable-connected to the craft and has one six-bit parallel register which serializes six 18.9K analog video bit strings into a single 113.4K bit string. A second register operates like a TIM and accepts 18 bits of digital video at 86.4K bps.

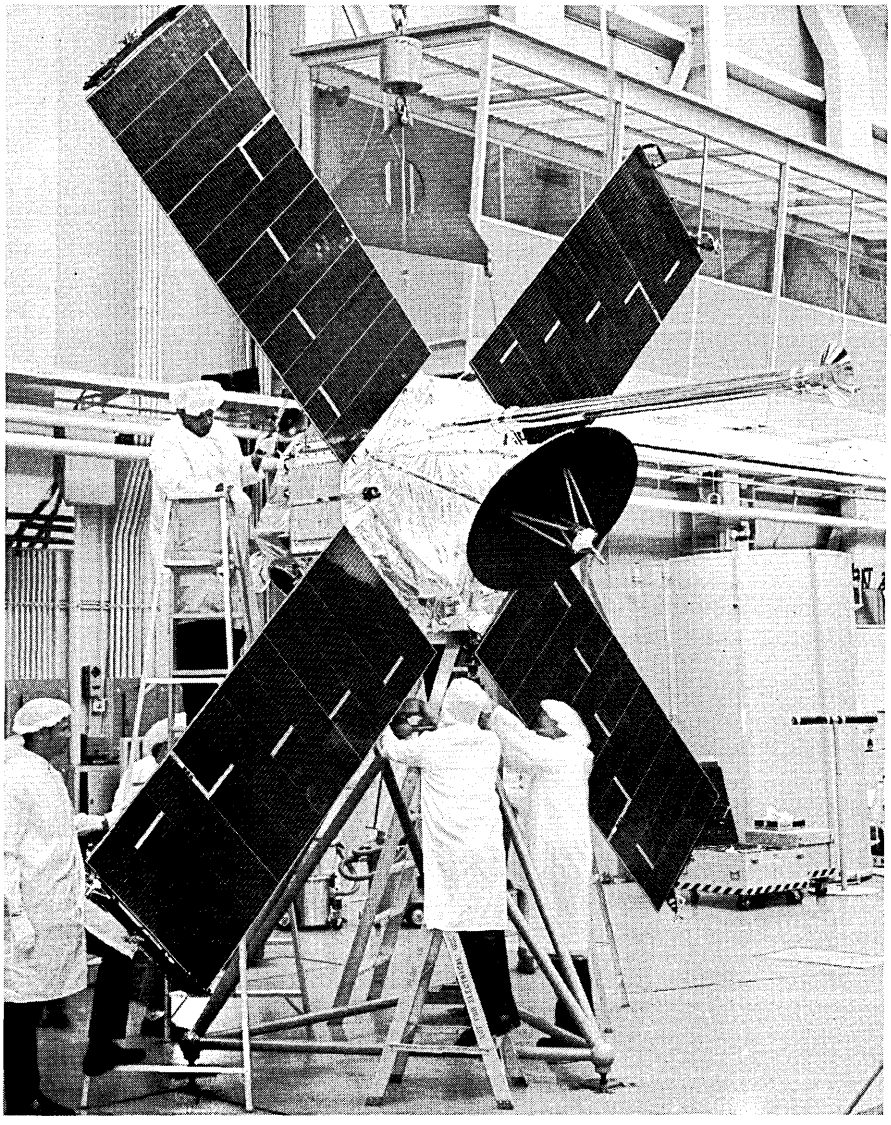
software

The operating system used for Mariner testing is written in CDC 3300 assembly language (COMPASS) and is called, appropriately enough, MARS (which stands for Mariner Analysis and Recording System but which would probably have been used no matter what it stood for). MARS is the sole resident in the dual-memory bank 3300.

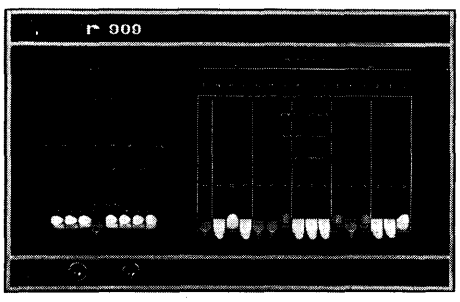
The central driver of the MARS program is an executive loop of less than 12 machine language instructions and two parallel tables, of "enable" words and of routine addresses. The exec scans the enable word table in a round-robin manner, calling those routines which are enabled. This non-priority loop concept makes it easy for a routine to relinquish control with a guarantee that it will be called again later (the routine leaves itself enabled). This is an important consideration for real-time processing since no data can be left waiting at the OSE interface while any routine is hung up waiting for something else, such as a peripheral. Most of the routines in MARS are interruptible, but a second interrupt of one routine is locked out while the first is being processed. No part of the software is designed to be re-entrant.

The program is designed to allow for dynamic control and dynamic parameter specification. Functions are decoupled as much as possible to allow for processing overlap, and even the input streams can be decommutated to allow for processing more than one spacecraft at a time on a single system. ■

Technicians at the California Institute of Technology Jet Propulsion Laboratory, in Pasadena, Calif., are shown preparing a Mariner spacecraft for its center-of-gravity test, only one of long series to which the craft is subjected.



You have never seen a computer like this before



The GRI 909 is the first truly innovative approach to computer architecture since the general-purpose computer was first applied as a control device. It goes beyond traditional design to provide a new level of power and flexibility. A true system controller, it provides the only logical answer to many of the basic problems that face system designers . . . problems like these:

PROBLEM #1

The Real World Interface

In spite of claims to the contrary, the typical small computer is designed primarily as a calculating device, not as a controller. The system designer, after describing his system functionally, must either transcribe his design into the non-functional language of the computer with all its expressed and implied constraints, or turn over the programming responsibility to a specialist whose background usually is not related to the system application. Result: substantial expense, long delays and occasionally, built-in software limitations.

No problem with gri-909

The GRI 909, designed as a system controller, is organized functionally. *ALL* data registers, whether associated with the processor, firmware options or input/output devices, are equally accessible to the system designer. *ALL* data registers may be incremented, shifted or algebraically tested: the traditional arithmetic operator, with its associated registers, is optional. The GRI 909 programming language is tailored to the functional organization of the processor itself. Input/output devices are operated with the same basic language code. The system designer can both design a system and implement its application in this functional language.

PROBLEM #2

The Data Flow Maze

Conventional computer architecture is designed around an instruction repertoire, with maximum computing power as the major criterion. The input/output instructions are a secondary consideration and instruction power is limited. The flow of data in and out is impeded by the "implied" operations of the instructions. Free communication between internal computer elements and external devices is not possible.

No problem with gri-909

Here the problem is solved by extending the I/O bus system into the heart of the central processing unit itself. Data is free to flow directly between devices external to the computer and the arithmetic unit, memory, or any of the internal registers without stopping along the way in special accumulators. This free direct flow cuts down on time consumed in moving data about, and reduces or eliminates the need for temporary storage. A unique advantage is GRI 909's ability to perform certain simple operations — increment, complement, shift left or right — on the fly.

PROBLEM #3

The Black Box Hang-Up

Once a computer is selected the system designer is locked into a preestablished set of capabilities. The CPU is essentially a black box, and there is little that can be done to alter its basic structure. If the system requirements change to include say a "hardware multiply", or "hardware square root", or "hardware byte swap", or "hardware anything", the only alternative is to go to a bigger, more expensive computer possibly requiring a complete new interface design with all new software.

No problem with gri-909

The GRI 909 has provision for the addition of firmware options. And by firmware we mean, not merely the substitution of read-only memory for software, but a broad range of hard-wired plug-in functions which can replace a variety of software routines. This gives the system designer complete freedom to adapt the computer to changing system needs, and to evaluate trade-offs between speed and economy in individual cases.

Basic characteristics

The GRI 909 cannot be fully evaluated in conventional computer terms. But for those who like to play the numbers game, the following characteristics are listed:

- Full Cycle Time: 1.76 μsec for a 16-bit word
- Memory Reference Instruction: 32K directly addressable — not page oriented.
- Memory Addressing Modes:
  - A. Direct Mode: Single Address Instruction, 32 bits (16 bit op. code, 16 bits address)
  - B. Immediate Mode: 32 bits (16 bits op. code, 16 bits data)
  - C. Deferred Address Mode: One level of indirect addressing with 32K of auto-indexable locations
- Every device in the system, both inside and outside the computer, is directly addressable by programmed instructions.
- Direct memory access channel is available on the same data and control lines as the programmed input/output channel (I/O rate: 1.76 μs/word). No DMA multiplexer is required for multiple DMA devices.
- Priority interrupt system has full capability to be used as a single channel interrupt or as a full hardware interrupt at the option of the system designer.

The GRI 909 with 4K 16-bit words of memory and ASR33 Teletype sells for under $10,000. Basic units start at $3600.

August deliveries will include: basic assemblers which can be assembled in the GRI 909 or the IBM 360, programming aids, math routines and utility routines.

Let us tell you more — Because GRI 909 is a completely new breed of computer, it is impossible, here, to cover its many unique features and their implications for the system designer. If you build control or instrumentation systems let us tell you what GRI 909 can do for you. For a copy of our new brochure write to:

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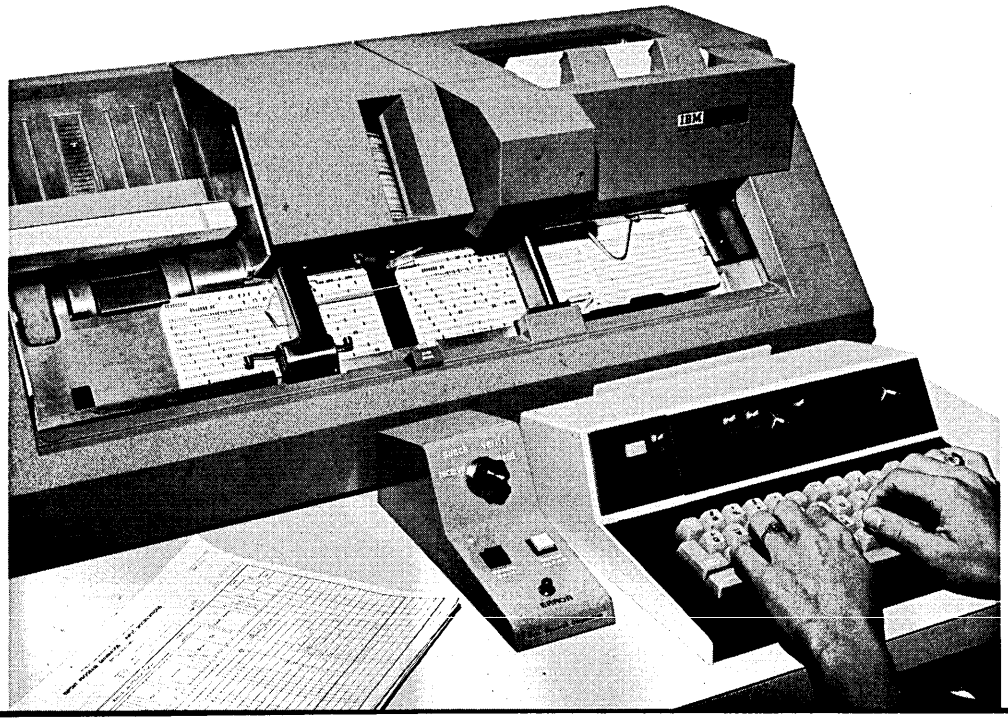


new products

multi-font reader

Processing paper at a rate of 18 ips, CDC's Multi-Font Page Reader goes through 14,000 cps of input submitted on mixed form sizes and recorded in mixed fonts. This figures out to scanning and recording on mag tape an 8½ x 11-inch form, single-spaced typewritten, in two-thirds of a second. The input is fed from either a unit form document feeder or from the

continuous form input hopper. Two output stackers are available for the unit forms. Five conventional type fonts are read by the system: two typewriter fonts (IBM Prestige and Royal Elite), one card interpreter font (IBM 557), one adding machine font (Monroe 400), and a high-speed printer font (IBM 1403). In addition, the machine has a mark sense reading capability and can also read text in the standard magnetic ink font MICR E-13B.

Document sizes can vary from a 3 x 4-inch card to 12 x 14-inch forms with a copy width of 10 inches. Continuous forms from 4-12 inches wide can also be accommodated. Lines skewed by as much as one-sixth inch over five inches of text can be read, as can characters jumped from their normal position by as much as half a normal character height.

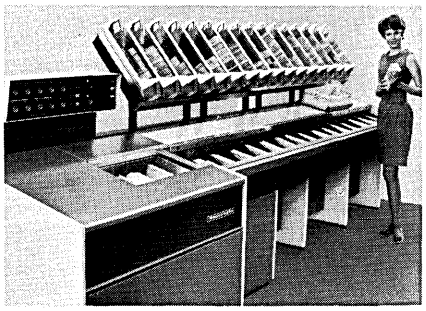
The first two serial numbers of the system belong to the Bank of America, but interested parties can get their copies for around $1,500,000. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 501 ON READER CARD

optical/magnetic sorter

A mixture of documents such as utility bills, credit card slips, insurance premium notices, loan coupons, bank checks and deposit slips can be read and sorted at the same time on the Burroughs Reader Sorter. Information read can be in the OCR A (United States standard) or OCR B (international standard) optical fonts, or may be recorded in the standard magnetic character recognition code E13B. In a single pass of an on-line version of the system, the reader sorter can pull off two lines of similarly recorded information, or one line of magnetic characters and one of optical characters, or one line of each type of optical characters. Off-line sorting can be expanded over this.

The maximum read rate for the system is 1,625 documents/min. The materials read can be fed into from 4-32 pockets (expandable in modules of four). Options include an endorser, batch ticket detector, short document read capability, outsorting capability



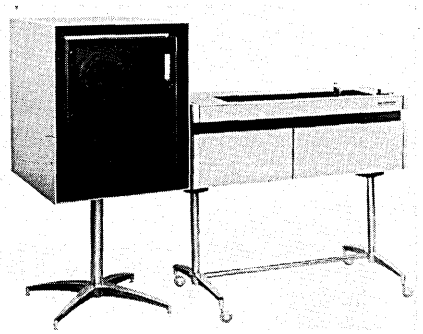
for rejecting specified items, and character validity check. Purchase prices range from about $67,000-$244,000; a 12-pocket system would go for about $97,000. Deliveries are scheduled for late this year. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 502 ON READER CARD

fast plotter

Variable speed control allows this incremental plotting system, the Delta System, to move at 2000 steps/sec. in any direction in increments of 0.0025, 0.005, or 0.010-inch. Billed modestly as the "world's fastest incremental plotter," the unit can be slowed to 1600 or 1200 or 800 or even 400 steps/sec. for the less adventurous. The standard plotting width of 29½ inches can be cut to 11 inches with a special paper adapter. Pen-up and pen-down times are not extremely fast, 20 msec and 50 msec, but the plotter picks up a lot of speed from a blocked tape format in which a single command can move the pen up to 1023 steps in X and/or Y. The vendor claims that the computer write time for the blocked format records is cut to 1/10 or even 1/500th of conventional plot generating times.

A mag tape unit based on Peripheral Equipment Corp.'s model 4810-7 or -9 (for seven- or nine-track tapes) is offered to complete the configuration. With the drive the system sells for $38,500 (or $11,500 for the plotter



alone). FORTRAN-compatible driving software for all major computers is available. COMPUTER INDUSTRIES INC., Van Nuys, Calif. For information:

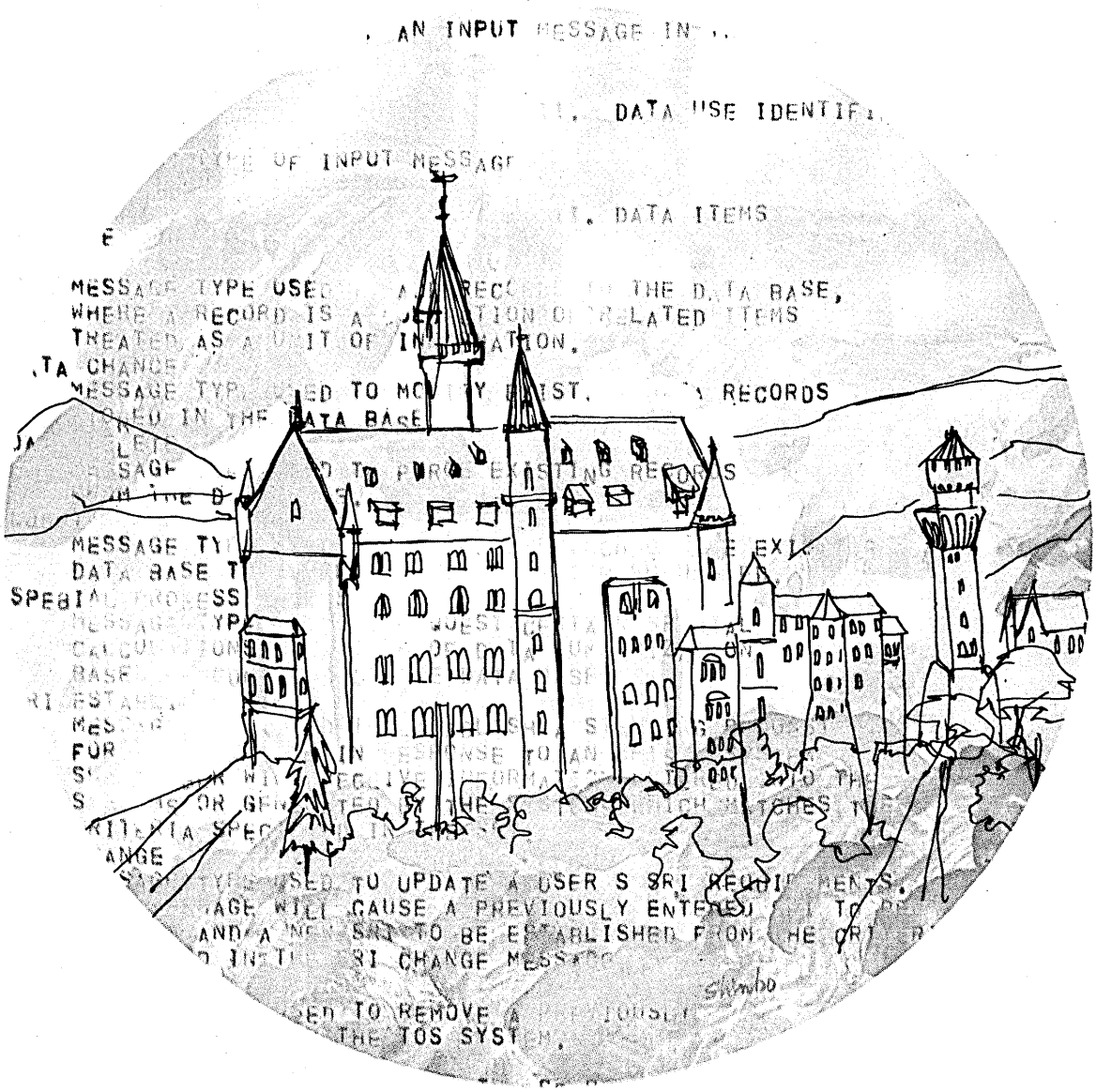
CIRCLE 503 ON READER CARD

video terminal

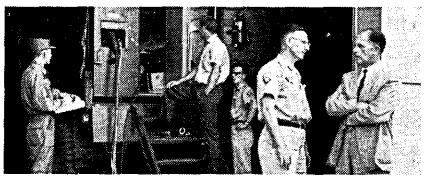
This year will either be known in computer annals as the "year of the key-to-cassette recorder" or as the "year of the crt terminal," and so far it's difficult to tell which manufacturers have been most active. Score one more for the crt builders with the introduction of the Delta 1. Three components make up the Delta standard configuration, a 12-inch crt, a keyboard, and a controller. It takes a controller to handle one keyboard, but multiple-display systems are easy to construct since the system uses standard EIA composite video signals. The screen can either display 24 lines of 40 5 x 7 dot matrix characters or a graphic display formed from a 128 x 64 dot matrix. Special edit features are incorporated to facilitate text correction and manipulation. An erase command works on lines, messages, or the entire screen. There is also a character and line delete/insert command and a roll and crawl function which allows for moving text up and down or right and left.

The Delta 1 systems can interface to modems for synchronous or asynchronous transmissions up to 2,400 baud, or can link to an IBM 2701 for polled, unpolled, or contention operation. Standard parallel transmission speeds of up to 15KHz are offered.

(Continued on p. 163)



What is Bunker-Ramo programming on the plains of Germany?



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Other options include color displays ($1,500 extra), and a light pen and track feature (another $1,500). The standard system goes for $6,500, but users who do not require the keyboard get $500 off, and stripped versions go for as little as $5,000 total. Extra displays sell for $300. DELTA DATA SYSTEMS, Philadelphia, Pa. For information:

CIRCLE 506 ON READER CARD

color display

A $35/month color display terminal is the latest "sensation" out of Viatron Computer Systems, which showed the new unit at the Spring Joint Computer Conference. Operators get a choice of eight colors for processed data and eight background colors on the 12-inch screen. The capability is achieved by decoding color characters and generating color signals which are fed into a "slightly modified" standard color receiver.

In the Color A mode, the operator enters the color coding into the system via a keyboard. No color code and the screen shows black and white. In the Color B mode, the colors are present and there is no choice of colors; in this mode upper and lower case data is represented by color change. Upper is aqua, lower is green. Communications characters will be shown in red, numerics in yellow. The product was developed actually before a market was defined, although the firm notes that there are several applications, such as financial statements (deficits in red, etc.), and wherever the viewer must be able to spot "urgent data." VIATRON COMPUTER SYSTEMS CORP., Bedford, Mass. For information:

CIRCLE 504 ON READER CARD

midi-computer

The term midi-computer may not be very well accepted, but some of the 16-bit machines have numbers in their specification sheets that are too big for the mini category. One such machine is the SCC 5700, which, although predicated on a 16-bit mainframe, is constructed to connect to as many as 16 remote terminals of the DCT-132 variety for remote batch processing. (The DCT-132 has a 200 cpm card reader, a 300 lpm printer, and a 100 cpm card punch.) The 5700 will come with two 8K memory modules (with 920 nsec cycle time), four terminal channels, the 16-channel communications controller, a memory map unit (hardware), an ASR 33 Teletype, a four-line modem, and a 16 million-byte disc (built by Burroughs) with an access time of 17 ms. That configuration, which will run buyers something less than $120,000, is advertised as having one-sixth the power of a Univac 1108 at one-thirtieth the cost.

The 5700 also comes with nine registers (two more are optional) including: three utility, one accumulator, one extended accumulator, one address, one location counter, one index, and one "data holding" register. The machine has a selector channel (1 million bytes/sec.), a direct memory access channel (two million), and a multiplexer channel (90KC). The disc rate is 300KC.

FORTRAN IV and BASIC will be de-

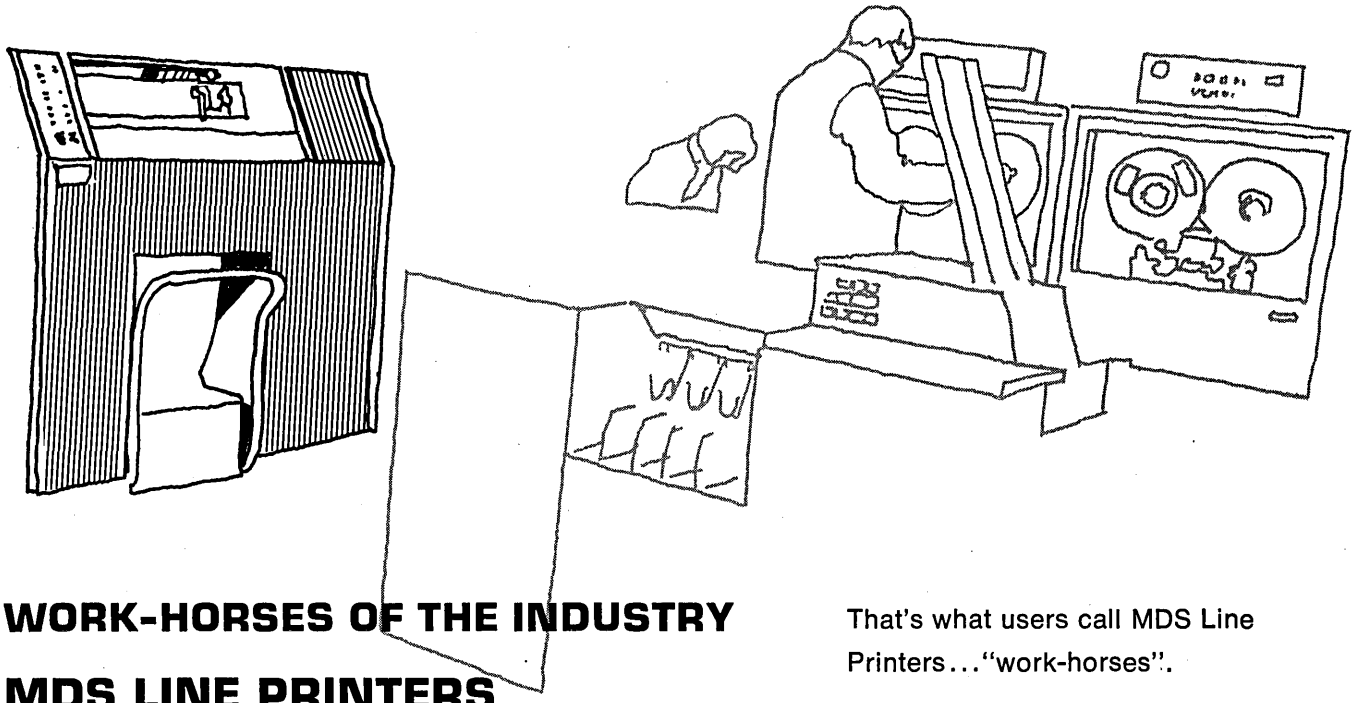
livered with the first machines in January. COBOL—SCC is trying to shake off its engineering/scientific label somewhat—should come sometime in the middle of next year. SCIENTIFIC CONTROL CORP., Carrollton, Texas. For information:

CIRCLE 505 ON READER CARD

cheaper key-cartridge

Plagued by the unfavorable price comparisons between competitive key-to-tape cartridge devices and its "more sophisticated" units, Communitype has stripped away some features to come up with a $7,000 model called the Data Jotter, Model 90. Unlike the model 105, which costs about $14K, the Data Jotter has neither a send-receive capability nor the ability to play back from the cartridge tape to the typewriter. The latter means that the new unit cannot handle error corrections to information entered "a few pages ago." It can, however, space back to correct characters just inputted, although it cannot correct errors of omission.

The unit is a 45 x 30-inch pedestal desk using an IBM Selectric typewriter, which, of course, provides visual



WORK-HORSES OF THE INDUSTRY

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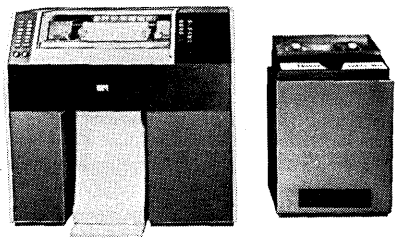
Present models of MDS Line Printers incorporate both the "most wanted" features listed by users, and recent innovations developed by MDS engineers. The result is a family of rugged printers that produce consistently good copy under the most demanding schedules.

Phone or write for full details about MDS Line Printers, and how they can work for you. Check the Yellow Pages of your telephone directory for the nearest MDS office.

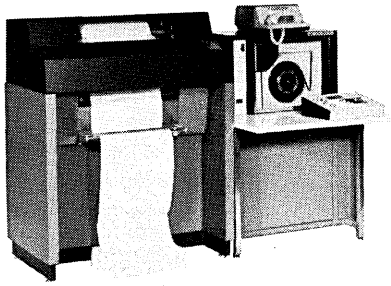
MDS 7160 and 9160 OFF-LINE PRINTERS

Both models are complete off-line Magnetic Tape Print Stations, printing 1250 lines per minute. The 7160 operates with certain IBM Magnetic Tape Units, or the MDS 2207 Magnetic Tape Unit (7-channel tape). The 9160 operates with certain IBM Magnetic Tape Units, or the MDS 3207 Magnetic Tape Unit (9-channel tape). Standard 160 characters per line... 19" maximum form width (both models).



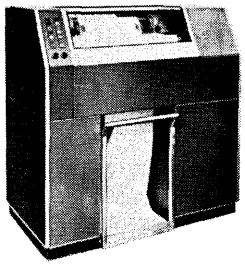
MDS 1320 BLP BUFFERED LINE PRINTER

A fully buffered off-line printer which operates with any of a variety of Series 1100 and 6400 Mohawk Data-Recorders. The 1320 is a 132-column printer, prints at nominal rate of 300 lines per minute. Control logic in the 1320 permits operation in Edit Mode, from special edit control characters . . . or in List Mode as a Line Printer.



MDS 3160 ON-LINE PRINTER

An on-line, 1250 lines per minute buffered printer. Attaches to and operates on a Multiplexer I/O channel of an IBM 360/Model 30 or larger. Operation can be in Multiplex Mode or Burst Mode. Standard 160 characters per line . . . 20" maximum form width.



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verification through the hardcopy produced. The 16 millimeter, double-sprocketed, incremental tape will store up to 200,000 characters in a cartridge. As with the other units (models 94, 95, 100, and 105), the cartridge data must be passed through a converter to magnetic tape. Cost of this unit ranges from $18K for a 556 bpi, 7-channel unit to $24K for an 800-bpi, 9-channel converter. Rentals of all units are available. Data Jotter deliveries begin "later this year." COMMUNITYPE CORP., N.Y., N.Y. For information:

CIRCLE 507 ON READER CARD

cheap crt

The Uniscope 100 is the latest and cheapest display in the Univac line of terminals. It rents at less than $100/month, and in "large quantities" sells for $3,000. The alphanumeric crt displays a 96-character set, upper and lower case, and has a 5 x 10-inch viewing area. Display capacity is 480, 512, 960, or 1024 characters in formats ranging from six lines by 80 characters to 16 lines by 64 characters. The 85-pound unit is "modular" so that it can operate as either a data entry or display-only device. Up to 31 terminals can be connected to an I/O channel or communications line through a special-purpose multiplexor. UNIVAC, Philadelphia, Pa. For information:

CIRCLE 508 ON READER CARD

mini-time-sharing

MINI-TOK is the specialized calculator language used to address the MC232 Time-Sharing Computer System. The language includes machine instructions and functions to the level of hyperbolics. The only other language the MC232 understands so far is one developed for electrical engineers, but a BASIC is expected to be ready by the time systems ordered today are installed.

The t-s system can accommodate up to 32 users and holds response times to a "worst case" of a few seconds through the use of a 3 usec 16K-byte memory. At least the first systems delivered will be based on the Business Information Technology 480 processor; later systems might be based on the forthcoming BIT processor which uses a 1 usec core, but "the manufacturer reserves the right to change the cpu model number (or manufacturer)."

Fixed or floating point arithmetic is

PRODUCT OF THE MONTH

DUAL IMAGE TERMINAL

Once in awhile a new device comes on the market which makes quite a stir by mixing known technologies to get a new end result. The key-to-cassette recorder was one of these. The dual image terminal may be another. Paper tape, in its old form with holes punched in it, has lived on despite those who have long predicted its imminent doom because it has several good features: it makes for cheap permanent storage; it can be read by a human and by a machine; and it is produced on machines which allow for creating a file off-line at a slow speed and then inputting the file on-line at a higher speed. For all these reasons and more, the dual image recorder/reader may be well received.

The new strip recorder/reader, however, prints on tape in machine- and human-readable characters, foregoing the punching of holes. This method of recording seems easier to do, less susceptible to failure, and capable of higher speeds than punched tape preparation. The device can produce tape at a rate of 75 cps from keystroke inputs or from digital inputs, and transmit to a cpu at up to 1200 cps. It reads asynchronously or synchronously at 120 cps. Its code, for machine optical reading, looks like a vertical string of bits with some elements misplaced. The upper and lower case humanly readable characters look just like those on a typewriter, but are on the top edge of the 11/16-inch tape instead.

The unit can be used to send text with as much white space as desired; this space can then later be used for adding update data or handwritten messages regarding the processing of the run. If desired, a computer edit of the transmitted text can output a new tape with blanked-out areas where the input was in error. The spaces can be filled in by the terminal operator and the tape then resent.

A standard version of the terminal, with a tape printer, tape reader, and keyboard, sells for about $1,900 in quantity (or about $2,300 in single units) and leases for less than $60/mo. The components are also available separately. INTERFACE MECHANISMS, Mountlake Terrace, Wash. For information:

CIRCLE 500 ON READER CARD

new products...

handled in the standard configuration, but going to BASIC will require an optional mass store. Arithmetic is accurate to 12 places, and users are assigned 26 registers and one accumulator each. A byte-oriented machine, the processor uses variable-length words. Prices for an eight-terminal system run around $45,000-$50,000 including the tty's. The same configuration would run about $200/mo. on a three-year lease. MINI-COMP, INC., Natick, Mass. For information:

CIRCLE 509 ON READER CARD

multi-programming cpu

For users who require a real-time controller plus additional cpu time for compiling, assembling, and debugging, the HP 2005A Real-Time Executive was created. The name "Executive" almost implies that the product is a software monitor; this is not the case. The 2005A system includes a monitor built for real-time and non-real-time simultaneous multi-programming, but it also includes: an HP 2116B computer (Hewlett-Packard's 16-bit 1.6 usec cycle machine with the optional 16K memory); a head-per-track disc (Digital Development Corp. models 7301 and 7302 are used to provide from 174K-696K of mass storage); a Teletype (Model 33 or 35); and a punched-tape reader. In addition to these, the 2005A includes some features as standard which are offered as options to the base 2116B, including a direct memory access capability, hardware multiply and divide, memory protect, and a time base generator.

The resulting system offers up to 99 levels of priority interrupt; more than one program can be grouped into the same priority level, too. Programs are classed as core resident or disc resident and as foreground (real-time) or background, and are selected for execution on either a time schedule or event basis. The number of programs is limited only by the disc space selected. Programs may be written in either Assembly Language or FORTRAN. Delivery of the 2005A requires approximately 20 weeks and a promise to pay something like $74,100. HEWLETT-PACKARD CO., Palo Alto, Calif. For information:

CIRCLE 510 ON READER CARD

another crt

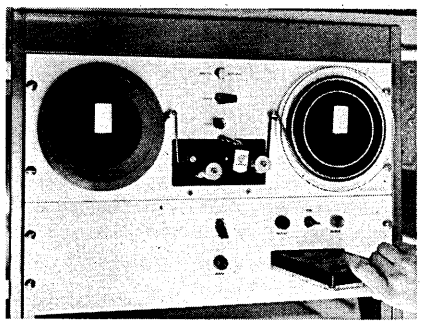
Probably no one should be surprised that so many terminals are being put on the market, since remote data access is going to be the name of the game in this industry for awhile, but they really seem to be everywhere you turn. In this corner is the Logiport 300, which offers a crt display, full alpha keyboard, and a built-in acoustic coupler for less than $2,000. Its 5 x 7 inch tube face displays 512 characters in 16 lines of 32. The L-300 can pretend to be a Model 35 tty transmitting in full- or half-duplex mode. When doing this, the display is automatically shifted upwards to accommodate each new line, dropping out the previous top line from each full page. Taking advantage of faster transmission media (it can use 300 bps lines instead of 110), the L-300 can also operate in a page-by-page transmission mode to cut down on on-line time usage.

The unit uses ASCII code, produces its displayed characters from a 5 x 7 dot matrix, and refreshes the display at a rate of 60 Hz. EBCDIC and odd-parity checking can be ordered as options. It is constructed with a delay-line memory and has 11 console-controlled functions including line erase. The unit price is given as $1,950 and the OEM price as $1,850. LOGITRON INC., Cambridge, Mass. For information:

CIRCLE 511 ON READER CARD

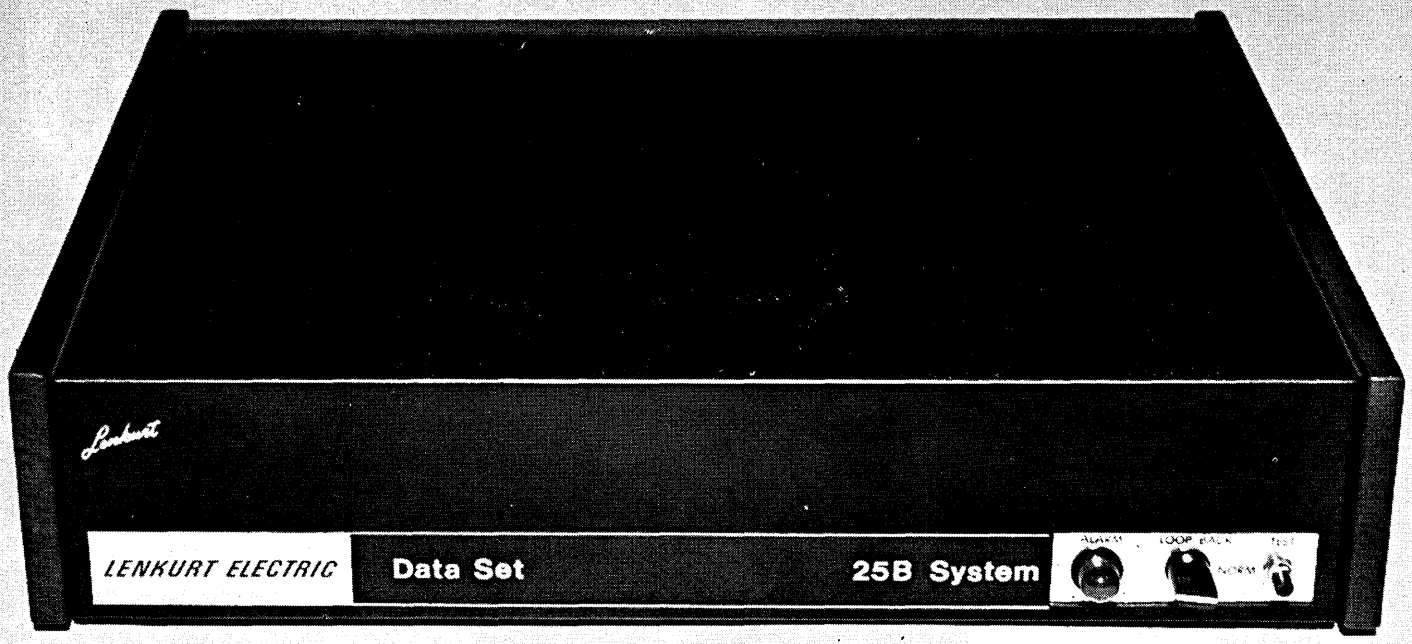
cassette-to-tape

The RJ Delta-Corder 500 series of ¼-inch magnetic tape cartridge drives, oriented towards data communications systems, are designed to mount in card readers, keyboard terminals, acoustic couplers and other terminal devices. Input to the recorder can be any bit serial code. Tape storage capacity is equivalent to over an hour



and a half of steady data entry at 10 cps (approximately 22,400 characters at 11 bits per character on 400 feet of tape). Cartridges may be read out over a Western Electric data set or similar modem or an acoustic coupler. Or the cartridge can be mailed to a central processing area. Reader output is either 110 bps for remote transmission or approximately 1000 bps for the converter. A specially designed input card on the standard Delta-Corder IIA makes it possible to con-

Announcing the little black box to end all little black boxes.



The Lenkurt 25B may be the only data modem that really deserves to be called a little black box.

For a modest-sized piece of equipment, it does an amazing job.

It handles computer, telegraph, and telemeter data . . . individually or in combination.

You can transmit up to 25 channels over a single voice circuit. Plug-in filters give you a choice of five data speeds from 75 b/s to 600 b/s.

And you get 20% more speed for a given channel spacing than you've ever had before.

You can use it for single-channel or multi-channel operation. Or as terminal equipment to work into other modems.

People who know our other video, voice, and data equipment won't be surprised to learn that the 25B is fully compatible with Western Electric's 43A/43B. (We've always been very easy to get along with.)

The 25B is a great little black box, designed by a company that really knows data transmission. (And microwave, multiplex, cable carrier, and coaxial cable systems, too.)

Even though to us, it will always be a computer-telegraph-telemeter data modem to end all computer-telegraph-telemeter data modems.

LENKURT ELECTRIC
Subsidiary of GENERAL TELEPHONE & ELECTRONICS

Lenkurt Electric Co., Inc., San Carlos, California.

Data Transmission Systems from Lenkurt

CIRCLE 29 ON READER CARD

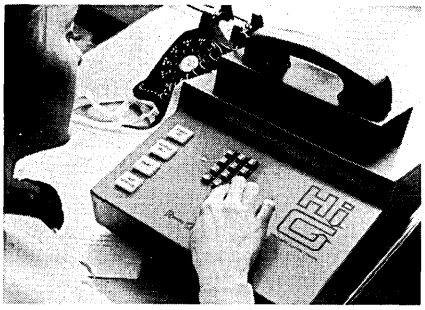
new products...

vert the standard 11-bit serial USASCII code from the ¼-inch cartridge into ½-inch IBM-compatible magnetic tape. Intended primarily for the OEM market, the Model 500W write-only unit is priced at under $500 in quantity. The OEM package measures less than 6 x 6 x 4 inches. The Model 500R is a separate read-only machine. The Model 500C read/write unit currently under development will cost less than $800 in quantity. RJ COMMUNICATION PRODUCTS, INC., Phoenix, Ariz. For information:

CIRCLE 512 ON READER CARD

tiny, hard-copy terminal

The feature that sets the Hi-G RCT-203 apart from other low-cost terminals is the ¾-inch paper tape printout. This vendor, a subsidiary of Hi-G Inc., the components manufacturer, is not the first to add paper tape printout to its keyboard terminal. Omnitek, for one, has done it for years. However,



the RCT-203 is priced at less than $1,000, and this qualifies it for a "first" of some sort. The tape printout is produced electrochemically at a rate of 10 cps from inputs from the 12-character keyboard or from on-line computer outputs, or from another keyboard in a computerless communications network. A built-in telephone coupler operates either acoustically or inductively to link to any kind of phone line.

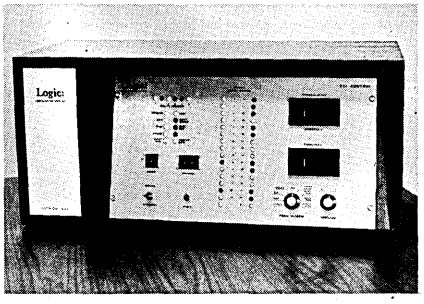
Billed as a tty replacement, the unit can be rented for less than $25/month. Options to increase the number of keyboard characters (now two symbolic and 10 numeric) are offered. The unit's small size and 15-pound weight make it easily portable. TRANSCOM INC., Windsor Locks, Conn. For information:

CIRCLE 531 ON READER CARD

communications front end

Even a fast computer can be given a mainframe ache by having to keep track of and interface with 256 mixed speed data lines, but the CCI takes that kind of work in stride. The Com-

puter Communications Interface can link to lines with speeds to 9600 baud with varying message formats and at the same time keep track of those messy housekeeping tasks that can



keep an expensive mainframe busy. The unit handles all control signals from the dataset, such as tests for carrier drop-out, establishes connection with the terminal, and makes the disconnects. It can assign a permanent "on" condition to one dataset and a permanent "off" to another. Through the use of a "lines active" register and a "capacity" register, it can make certain that the number of input lines is kept to a figure that the central cpu can work with. The CCI collects bits to form characters and sends them to the cpu at a rate of 1 char/5 usec (200KC if the arithmetic is right).

The unit operates in a stand-alone mode, reducing the software requirements of the host machine. It has a display console which contains monitors for detecting control signals for a particular line, and a readout panel to permit visual monitoring of signals and of the number of users. Available in models for accommodating users in increments of 32, the end cost per channel runs something like $1,000. COMMUNICATIONS LOGIC, INC., Houston, Texas. For information:

CIRCLE 513 ON READER CARD

back office system

PROFIT IV is another software system which includes a "free" minicomputer. It's a real-time accounting and cage control system designed for use by brokerages handling between one- and three-thousand trades daily. The software provides real-time confirmations, full size blotters, complete ledger accounting, stock record updates, trading records, control of receipts and deliveries, and various take off sheets, failure reports, and monthly statements. Input is provided by Teletypes, with a Varian Data 620/i 12K cpu, plus two magnetic tape drives, a 300 lpm printer, and a Cartrifile four-cassette tape transport. Price is under $110,000 for most medium-size firms, with rental of less than $2,500/mo. Lower prices are in effect for smaller firms' needs. First deliveries are scheduled to begin in six months. FUTURISTIC APPLICATIONS CORP., Wayne, N.J. For information:

CIRCLE 532 ON READER CARD

a/d acquisition

First deliveries of the ADAC Analog and Digital Data Acquisition and Control Systems are slated for September. The base system can be ready in about 60 days, but specialized equipment tailored to a user's needs requires 120-day delivery schedules. Systems like this are designed for hooking on every conceivable kind of test gear, and probably not many will ever go out in basic trim. A 10-channel low-level multiplexor for signals in the millivolt range can handle input sample rates to 10,000 Hz and is field-expandable to 100 channels in increments of 10. The high-level multiplexor assembly can handle 128 single-ended or 64 differential inputs, as a maximum, and works with inputs in the 0.5-10.0 v range.

The ADAC system consists of an analog input section, an intercoupler, a small gp computer (presently a PDP-8/L), and an ASR-33 teletypewriter. A configuration with these ele-

ments only, plus a mag tape drive, would be priced around $30,000. In systems of this nature, that's called a "modest" price. The analog converter runs at about 100 KHz and is accurate to 0.06% The intercoupler, which is the most expensive component now that the price for a small cpu has fallen so drastically, connects the peripheral devices with the analog section with the cpu.

The 8/L, which seems to be seen everywhere these days, has a 1.6 usec cycle time, a 4K core of 12-bit words (expandable to 8K), eight index registers, and eight basic instructions with more than 200 augmented commands.

Software includes two assemblers, FORTRAN (4K and 8K versions), FOCAL, ALGOL, BASIC, diagnostics, math routines, a symbolic tape editor, and utility routines. ASTRODATA, Anaheim, Calif. For information:

CIRCLE 514 ON READER CARD

strip printer

Strip printers have a little niche of the market which is all their own. No one wants to read a core dump printed on several hundred feet of ½-inch or ¼-inch tape; but on the other hand, line printers and tty terminals cannot compete in price, speed, and convenience with the "ticker tape" kind of printer for perishable message transmission. Printers like the "Informer" model SP-20 alphanumeric teleprinter are designed to carry those short messages regarding stock quotations, order affirmations, and test monitoring. Capable of printing at rates up to 20 cps, the SP-20 uses a 5/16-inch tape and a 64-character set. Transmissions can be accepted in either six-level parallel or serial bit stream form for all the common codes, such as ASCII or Baudot. Rack-mounted units without power supplies are priced beginning at $1,150 and desk-top models running off wall power go for about $1,300. CLARY CORP., San Gabriel, Calif. For information:

CIRCLE 533 ON READER CARD

cassette tape units

Building a cassette tape recorder for small cpu's looks like a promising pastime, but not too many people are in it yet. This entry, the model 344, has three separate cassette drives, each capable of having on-line 180,000 8-bit characters on 150 feet of tape. The vendor explains that three is the magic number of tapes to have on-line, not two and not four. One is for the source program, one for a source library, and one for link-edit functions. Once you have the right configuration, you aim for a small cpu market that includes 4,000 Digital Equipment Corp. PDP-8's.

The tape speed for the 344 is 10 ips, which is equivalent at 500 bpi to 500 cps synchronous and up to 400 cps asynchronous. The unit accepts parallel data on-line, serial off-, a built-in tty interface, a start time of 10 msec and a stop time of 15 msec. The cassettes supplied by the vendor will be certified, but the unit is obviously compatible with other suppliers' wares. The three-deck unit is marketed for less than $3,000; two-deck units ($2,000) and single-deck units ($1,000), although less talked about, will be found on his shelves too. The smallish company will open sales offices in New England, California, and Chicago very soon. Service will probably be contracted.

To break into the market, the vendor expects to supply software for the host cpu, too. For instance, FORTRAN for the Varian 620i was mentioned. DICOM INDUSTRIES, INC., Mountain View, Calif. For information:

CIRCLE 515 ON READER CARD

remote terminals

COPE terminals are built to input to an IBM 360, Univac 494, GE 635, CDC 6000, or Univac 1108. Previously available in models .32, .36, .38, and .45, they can now be bought in models .30 and .34 too. The .30 offers the controller, typeprinter console, communications interface (for a dial-up line), a 200-240 lpm line printer, 200 cpm card reader, and a 4K memory. It sells outright for $48,760 or can be leased for a total monthly charge, including $210 maintenance, of $1,270.

The bigger brother model .34 interfaces to a full-duplex 4,800 baud line, or to the dial-up line to run a faster printer (300-360 lpm), a faster card reader (300 cpm), the same kind of typeprinter and a 4K memory. Its prices are: $61,200 purchase; $1,360 base monthly rental; $240 maintenance. COMPUTER INDUSTRIES INC., Dallas Texas. For information:

CIRCLE 517 ON READER CARD

teleprinter terminal

The MTP-6000 accepts serial or parallel (optional) USASCII inputs (other languages optional), and generates permanent, non-smear hard copy at a maximum rate of 240 80-character lines/min. The character set consists of 95 printable characters including space. Each character is formed from a 5x7 dot matrix. According to the company, the printer makes about the same amount of noise "as a goldfish bowl."

The terminal contains a typewriter-size printer and a compact programmable controller with 4K memory. The controller functions as modem interface, language translator, printer interface, speed translator, communications line supervisor, and signal configurator. Optionally, the MTP-6000 can be supplied with a keyboard for output character generation. The keyboard model is especially suited to time-sharing.

Transmission rate in the asynchronous mode is 120 cps at 1200 baud or 200 cps at 2000 baud (240 cps at 2400 baud is optional). The unit may be used with Data-Phone data sets 202C2 or 202D2 or equivalent. Purchase price is about $12K; monthly rental, about $300. MOTOROLA INSTRUMENTATION AND CONTROL INC., Phoenix, Ariz. For information:

CIRCLE 516 ON READER CARD

software timing checkout

The Software Timing Checkout Unit Model 1700 is simple to use despite its name. It's said to be the first test equipment ever developed specifically for use by programmers, and is intended for use in the design of real-time systems. The Checkout permits a statistical analysis of any program, routine, or subroutine. The unit measures five parameters: actual time period, longest time period to date, shortest time period to date, number of times the high limit has been exceeded, and the number of times the low limit has been exceeded. Measurement of these parameters is said to permit accurate prediction of the performance of a real-time program under all possible input conditions. An internal quartz crystal clock measures time in intervals from 1 usec up to 10 msec; longest time that can be measured is 9.999 sec. Connection of the 1700 to a computer is effected by a two-wire hook-up actuated by an external control instruction on most computers. Price is $5,900, and delivery requires 60 days ARO. LOGIC CORP., Haddonfield, N.J. For information:

CIRCLE 534 ON READER CARD

mini control system

The H1603 control system for data acquisition, monitoring, supervisory control, automatic testing, and production control includes the H316

mini-computer and a real-time interface. Software includes a basic operating package, Op-16, and more than 500 programs. The H316 has a 1.6 usec cycle and 4K 16-bit word memory, expandable to 16K, with a 72-command instruction repertoire.

Available with the H1603 is the complete line of Series 16 peripherals, including disc files, drums, displays, communications interfaces, and special-purpose devices. Options include a real-time clock, arithmetic package, and direct multiplex control. The real-time interface provides the connection with sensors, field contacts, logic signals, peripherals, and subsystems. It handles multiplexing, isolation, and signal conditioning for up to 2,048 analog and 4,096 digital inputs. I/O options include thermocouple isothermal units, current-to-voltage networks, high-level 1-10v and low-level 50mv analog input modules and a variety of digital I/O modules. The unit will scan up to 125 random input points per second for low-level analog signals and up to 20,000 input points per second for high-level analog signals.

The Op-16 package functions in a core-only or core-disc environment. It schedules programs, handles interrupts, coordinates devices, scans digital inputs and outputs digital commands, scans analog inputs and outputs analog signals, and communicates with an operator's console. The Series 16 library includes FORTRAN IV, assemblers, math routines, and utility programs. Price of the digital version of the H1603 is about $26,000, while an analog system starts at about $31,000 and a/d configurations begin around $35,000. First deliveries are scheduled for the end of the year. HONEYWELL COMPUTER CONTROL DIV., Framingham, Mass. For information:

CIRCLE 520 ON READER CARD

20-column printer

The MDS 2016 Digital Lister Printer is a 1,200 lpm unit intended for marketing to OEM's. The 2016 interface includes external paper feed, a lock-out signal generated by receipt of print command, out-of-paper indicator, manual paper advance, print test switch, and a printer off-line signal. In addition, a fifth line for each character position is provided for format control. The unit is fully buffered, has a programmable zero suppress controlled by front access switches, and features asynchronous operation and parallel entry of numeric data. The unit can be converted by the user from 115v/60Hz to 240v/50Hz by changing a single tap in the power supply. He may also specify any number of columns from 8 to 20. A self-inking action paper is standard; inked silk ribbon with automatic reversal for use with standard papers is available optionally. The 2016 measures 7 x 19 x 17 inches, and weighs about 55 lbs. Price is $2,700 per unit for five or less, with reductions in larger quantities. Delivery is "prompt." MOHAWK DATA SCIENCES CORP., Herkimer, N.Y. For information:

CIRCLE 535 ON READER CARD

37.5 ips tape unit

Most low-cost tape decks are run at about 25 ips, and good ones, like Ampex's TM-Z, go for about $3,500. For not much more in OEM quantities ($3,750 in 100 lots or $4,700 for single units, the 6x40 tape transport delivers a 37.5 ips (or 25 ips or 12.5 ips) read-after-write capability. The 37.5 ips tape speed works out to give a 30 KC data rate for 800 bpi tapes. The 6x40 can be ordered in 9-track 800 bpi or 7-track dual density models. It is compatible with IBM 729 and 2401 (Model 1) and IBM 2415 (Models 1-3 and 1-6) tape handlers. A rewind speed of 150 ips is realized through the single-capstan velocity servo drive. Other features of the 6x40 include all control and read/

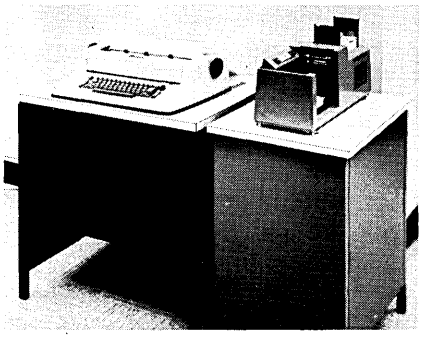
write electronics, and logic for multidrive operation.

A 25 ips version of the 6x40 can be purchased at a 100-quantity price of $3,500. A 6x60 unit, with a single read/write head is also available; it operates at 25 ips and 12.5 ips. PERIPHERAL EQUIPMENT CORP., Chatsworth, Calif. For information:

CIRCLE 522 ON READER CARD

remote card reader

Transmitting at the standard Teletype rate of 15 cps, the CT41 and CT33 card readers are compatible with IBM 2741's or with Teletype lines. For this



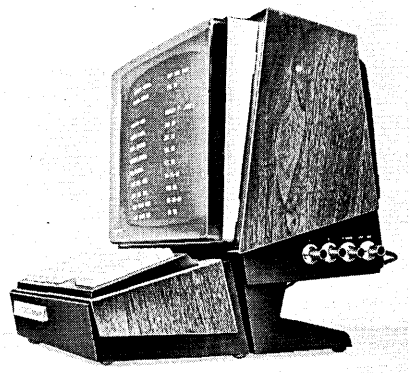
reason they are touted for use with IBM's Service Bureau Corp. CALL 360/BASIC or DATATEXT. The CT41 plugs into the 2741 and sells for $4,508; the CT33 is the teleprinter counterpart for Teletype models 33 and 35 and sells at the same list price. With ASR versions of the teleprinters, the CT33 can be used as half of a card-to-punched tape system, too. Either version of the card reader is available on lease. WESTERN TELEMATIC INC., Arcadia, Calif. For information:

CIRCLE 518 ON READER CARD

video terminal

The Videomaster 7000 general purpose alphanumeric display system is both software and hardware compatible with IBM System 360's. It will operate with computers other than the 360, and an OEM agreement is also available. The terminal includes a display monitor and a standard alphanumeric keyboard. The 960 5x7 dot matrix characters may be presented on the 74-sq. in. screen in either 12 rows of 80 characters or 15 rows of 64 characters. Refresh rate is 60Hz. The display logic, memory, character generator and power supply unit may be separately located to conserve desk space. No special power or air conditioning is required.

The stand-alone terminal is specifically designed to operate with existing software in a remote mode. It interfaces to either a 1200 or 2400 baud communications circuit terminating into the user's IBM 2701 Type III communications adapter. For users requiring clusters of terminals in each remote location, the Ultronic communications concentrator interfaces multiple displays as one drop on the multidrop communications circuit. Other



peripherals may be interfaced to the remote programmable concentrator. Besides standard editing features, Videomaster 7000 offers format and hard-copy options. The terminal, equivalent to the IBM 2265, sells for $4980. ULTRONIC SYSTEMS CORP., Moorestown, N.J. For information:

CIRCLE 523 ON READER CARD

(Continued on p. 174)

new products...

teletype buffer

Data in any of the standard Teletype codes up to 1050 bps can be accepted and stored in the Series 41 Teletype Buffer Memories. An eight-track flying-head drum is used to store up to 10K 5-bit characters for later transmission or access. Readout rates can be from 1-600,000 cps. The memory takes up less than nine inches of panel space and is base-priced at $5,800. DATA TECHNOLOGY CORP., Palo Alto, Calif. For information:

CIRCLE 521 ON READER CARD

9600 bps modem

First in the Modem 5500 series of data sets is the 5500/96, capable of operating at 9600 bps over voice-grade Type C2 (4B) telephone lines without requiring complex automatic equalizers. The 5500/96, priced at $11,500, is especially suitable for time-sharing and other fields which depend heavily on maximum exchange of information. Orders are being accepted for December delivery. INTERNATIONAL COMMUNICATIONS CORP., Miami, Fla. For information:

CIRCLE 526 ON READER CARD

25 ips drive

Controls and electronics for operation in asynchronous or continuous modes are included in the Model 100 drive. The unit uses 10½-inch reels and features continuous tape speeds to 25 ips and asynchronous data rates to 1,000 cps. Packing densities go to 800 bpi. The 100's basic price is listed as $4,300. CIPHER DATA PRODUCTS, INC., San Diego, Calif. For information:

CIRCLE 527 ON READER CARD

modems

If you ever test yourself on your knowledge of acronyms, abbreviations, and "cute" names, you already know, for instance, that "modem" means modulator-demodulator and is related to FM, frequency modulation just like in radio terms. But how would you ever guess that an "Astroset 296" was a modem and not some science fiction device? Once you get into it, it is not really that bad. The Astroset 296 data set is the top of the line in the 200 series, and its 296 designation means that it can receive and transmit at rates to 9,600 bits per sec. The low end of the line is the 220, which is good to

2,000 bits per sec.

The 200 series of modems is designed for synchronous operation using a digital modulation system on a narrow total bandwidth. They can be ordered for simplex, half- or full-duplex, or party line transmissions. Built-in repeaters make it possible to relay a signal to multiple receiving terminals, such as from one cpu to several crt stations in an airlines reservations system. The repeaters are standard equipment, but several options, including ring indicators and remote control, are offered. Approximate unit prices start around $1,560. ASTROCOM CORP., St. Paul, Minn. For information:

CIRCLE 537 ON READER CARD

keyboard

The Ikor Keyboard features a one-key memory which holds the key code in an output buffer until cleared by the operation of the next key, eliminating the need for a supplementary memory unit. Each key carries its own built-in code, so keys may be rearranged at will without wiring or circuitry changes. When two keys are struck simultaneously, a two-key roll-over feature prevents garbled encoding by stopping data output from both keys instead of transmitting one key or the other. Available in production quantities, the company is quoting $150 per unit for a keyboard arranged to user's specifications. IKOR INC., Burlington, Mass. For information:

CIRCLE 528 ON READER CARD

2 usec memory

Ampex numbers its products in a straightforward way, so that by reading the designation given this memory system, the 3DM-2000, it's easy to see that it is a three-dimensional design memory (3DM) with a 2-usec full cycle time. Not shown is the fact that access time for the up-to-five million bit memory is 800 nsec and that its price ranges from less than $40,000 to approximately $140,000. The core memory is offered for OEM or end users who want to extend the storage potential of their mainframe. AMPEX CORP., Culver City, Calif. For information:

CIRCLE 529 ON READER CARD

modem

One of the design criteria for the QB48 Modem was an error rate of less than one in one million bits. Working from that up to a finished product, the manufacturer produced a synchronous 4,800 baud device which operates in either half- or full-duplex modes on a switched network or dedicated line. The QB48 is transparent to data and uses what is called a forward operating error corrector. Rack-mounting or desk-top models are available and are priced at less than $7,000 in small quantities. One nice feature the specs list is instantaneous dynamic line equalization. The supplier hopes the unit will represent the first in a long line of communications equipment. DATAMAX CORP., Ann Arbor, Mich. For information:

CIRCLE 530 ON READER CARD

a/d converter-multiplexer

Voltage analog inputs, including four-quadrant resolver, or Scott-transformed synchro inputs, AC ratios, or bi-polar DC voltages, are digitized to 13-bits by the AN5413. The system may be set to accept any sequence of disparate analogs together with the appropriate internal or external reference voltage. Direct conversion of raw AC or AC sine-cosine inputs, without an intermediate conversion to DC, provides a speed of 50 usec for synchro/digital operations. Overall system accuracy is claimed to be 0.05% with

The micro-revolution in disc memories

Data Disc's new Micro-space heads skim a measured half wavelength of light above the disc—far closer than heads in any other disc memory. That precision brings new reliability and new economy to disc memories. New reliability because heads so close to the disc can record sharp, well-defined magnetic regions and reproduce strong, clean signals. New economy because bits are packed closer—100,000 per track—to give you 50% more capacity per dollar invested.

As one of many rigorous tests, our quality control technician reads light interference patterns through a microscope to measure the space between head and disc precisely. Only heads spaced 10 to 15 microinches pass.

Data Disc's Computer Products Division memories store 100,000 bits on each of 8, 16, 32 or 64 tracks for a maximum capacity of 6.4 million bits per disc. Data Disc's Display Division memories store a whole TV frame on each of 72 tracks—in either digital or analog form. Complete memories usually occupy 10½ inches of rack space.

Data Disc helps you design our memories into your system and provides all necessary service at a modest fee.

For complete information contact Dave Redick, Computer Products Division or Chuck Masters, Display Division, 1275 California Ave., Palo Alto, Calif. 94304. Phone (415) 326-7602.

DATA DISC

Micro-space precision creates more memory for your money.

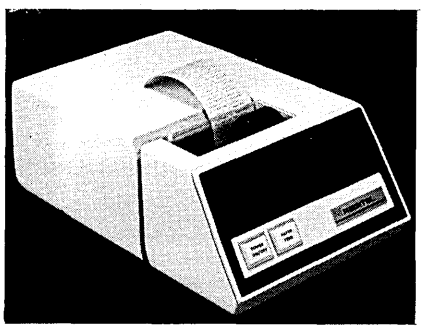
resolution of 2.7 minutes of arc for synchro channels and 0.1% for AC or DC channels. The basic AN5413 unit includes two dual multiplex channels for accepting two sine-cosine synchro or resolver inputs or

AC signals and their references, and one channel of DC analog input. In this configuration the unit sells for $2,400. Eight more dual resolver AC multiplex channels can be added for $480; nine more DC multiplex channels can be added for $315. ANALOGIC CO., Wakefield, Mass. For information:

CIRCLE 539 ON READER CARD

little printer

The 4440 Series printers have a 44-character set and print at a rate of about 40 cps. They are available in console, mobile, ticket, or validation models and can come with a facility for inserting tickets or forms from the



top or side. Input data can be character serial, bit serial, ASCII or Baudot, and is line asynchronous. (The picture shows about 17 columns.) Prices range from $400-$1,100 in OEM quantities. AMERICAN REGITEL CORP., San Carlos, Calif. For information:

CIRCLE 524 ON READER CARD

keyboard

The most difficult thing to build into the Keykode KA series keyboards, says a company spokesman, was a protection against coffee. Most keyboards are fairly reliable devices. The KA series, for instance, is rated at five million keystrokes per key. About the only real destructive force keyboards are subjected to is an operator. The result of the designers' efforts was a coffee-proof one-inch high keyboard which has an extremely short (.1-inch) key movement and a light touch (3-5 ounces contact pressure). The price is $1.75 per key in quantity in a user-specified configuration. NUTRONICS, Paramus, N.J. For information:

CIRCLE 536 ON READER CARD

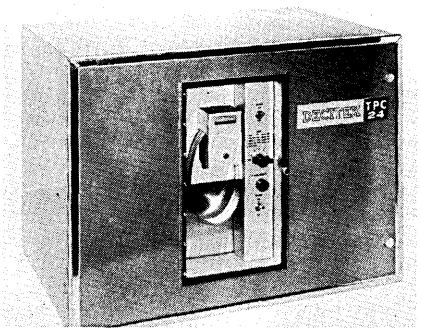
impact printers

The Models 400A and 400B are rotating drum impact printers with capabilities of printing 80 and 132 columns, respectively. They employ IC and LSI logic and feature 64 or 128 alphanumeric character sets with speeds of 1,200 lpm and 600 lpm. Both accept bit parallel, character serial data, using ASCII code. The 400A measures 41 inches wide, while the 400B is 46 inches wide; both are 47½ inches high and 29 inches deep. The 400B sells for $26,000; price of the 400A was not announced. VOGUE INSTRUMENT CORP., Summit, N.J. For information:

CIRCLE 538 ON READER CARD

tape sequence controller

The TPC-24 is a controller intended for machine tool and process control applications, and represents an effort by the manufacturer to fill the "void between mini-computer and hard-wired relay systems." The device photo-electrically reads punched tape instructions, coordinating sequence



throughout 24 inputs and 24 outputs. Use of paper tape is said to eliminate the problem of a sequence race, which often occurs in relay systems, and makes the changing of sequence instructions possible merely by punching a new tape, making the system ideal for one-time applications. Identical sequence charts to those used to set up relay systems are used for the TPC-24. Input and outputs are rated at 110V 60 Hz and are compatible with sensing and drive elements. Price is $2,500 for a single unit, with delivery time of about one month. DECITEK, INC., Worcester, Mass. For information:

CIRCLE 540 ON READER CARD

4-usec memory

The access time for the FI-2 memory is listed at 600 nsec, and full cycle time is given as 4-usec for the 1K by 8-bit system. Built on five interconnected circuit cards, the system contains all decoding, drive, data and timing logic. All I/O lines are terminated at a single connector and a mating 64-pin wire wrap connector is supplied. The resulting package is about 8½ x 5 x 3½ inches, and is priced at $620. FERROXCUBE CORP., Englewood, Colo. For information:

CIRCLE 541 ON READER CARD

phone attachment

Compared to most other acoustic/inductive couplers, the Fordata 1200 is extremely unobtrusive. The unit mounts directly on a telephone for picking up the transmitted signals, but is small enough that it will not interfere with normal voice usage. The telephone handset rests in the coupler, which is cable-connected to an electronic control package which mounts on the outside or inside of the terminal being used. The 1200 works with all models of teletypewriters and can be modified for use with other terminal equipment conforming to that magic EIA standard RS232B which seems to show up everywhere. Standard options of the $245 device include full- or half-duplex operation. FORD INDUSTRIES, INC., Portland, Ore. For information:

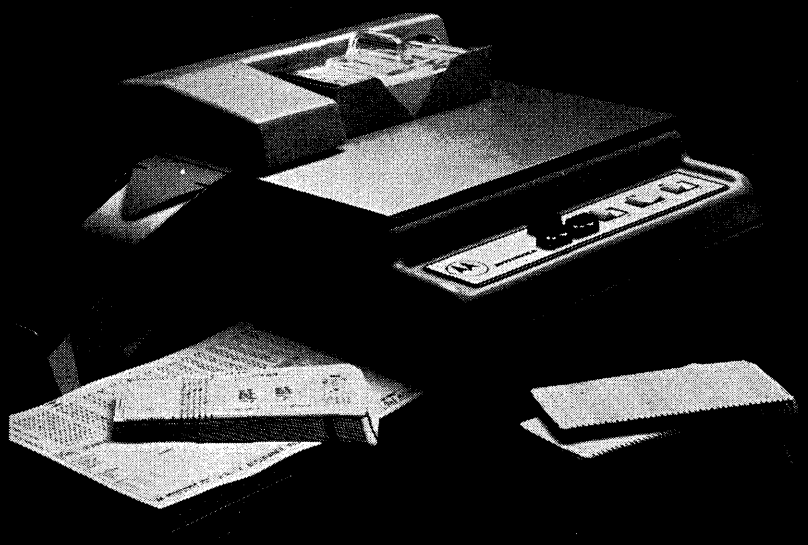
CIRCLE 542 ON READER CARD

mini modem

The TT-103 Data Set is a low-speed asynchronous modem built on a single PC card that transmits and receives data up to 300 bps. It's compatible with the Bell 103 and provides full duplex data transmission over a two-wire circuit. To permit transmission of data on a dial-up network, the modem has been designed to operate with the Bell Data Access Arrangement. The majority of the data set is composed of TTL IC logic, which makes it possible to package the TT-103 in a card measuring approximately 4½ x 10 x 1 inches, which should be small enough to permit incorporation into virtually any terminal. Small quantity price is $200 with reduction for large OEM purchases. TEL-TECH CORP., Silver Spring, Md. For information:

CIRCLE 543 ON READER CARD

The Indiscriminate Reader.



It reads practically everything.
Ordinary pencil-marked data.
Keypunched data.
Preprinted data.
In any combination.
In any column-spacing format.
On tab cards.
On snap-out forms.
On page-size documents of any length.

But what does it do for an encore?

Operates unattended. With automatic feed. And automatic end-of-data card injection.

But even without these options, the basic manual-feed machine can buy you extraordinary efficiency. Consider, for a moment, just a few possibilities.

Source documents designed to fit the task, not machine requirements. Data can be marked with ordinary pencils, and you can include instructions right on the form itself.

A strategically dispersed source-data collection system with a 'built-in' audit trail. The input documents serve as their own hard copy.

Direct data entry without conversion and verifying. The MDR reader provides an output in standard USASCII language or, optionally, other binary decimal codes. It interfaces with various standard modems.

Et cetera.

Now, what about cost? Remarkably modest for an optical reader of such versatility: $3600 to $5000. Lease rates are attractive too. Our MDR literature kit describes the various Indiscriminate Readers and their application. Write us for a copy. Motorola Instrumentation and Control Inc., P.O. Box 5409, Phoenix, Arizona 85010. 4327

MOTOROLA Information Systems

new software

os disc file utility

Boise Cascade, a company more known for trees (the kind seen in forests rather than in data structures) accidentally became a supplier of proprietary software systems in 1966. Two of its programmers developed a 1410-360 conversion program which the firm found to be a saleable item and which is marketed for BC by Computer Sciences Corp. under the name of EXODUS. The same two guys backed up their program with EXODUS II for 1401-360 conversions.

Same two guys again, but with a friend this time, have put together a package called CVM (for Catalog and VTOC Maintenance) which will be marketed by Boise's new wholly owned subsidiary. CVM operates under OS/360 to keep track of data files and to search out, delete, or add linkage to disc-based files in a single or multi-processor MFT or MVT system. The program can be called from the operator's console to list VTOC contents, change file names, locate files or list allocation statuses. The price (around $2,500) is expected to look good to users now trying to perform any of these functions with the IBM utilities (IEHPROGM and IEHLIST) and JCL. One major attribute of CVM is that it does not interrupt the normal job stream; a major attribute of the marketing campaign is that a 30-day free trial is offered. BOISE CASCADE COMPUTING, INC., Boise, Idaho. For information:

CIRCLE 545 ON READER CARD

cobol for the pdp-10

Digital Equipment Corp.'s software announcements are beginning to sound more like IBM's in one respect. If you have noticed, IBM's announcements are often for products to be ready for delivery a year later. DEC's announcement of PDP-10 COBOL is similarly timed. It will be ready for users about April of next year. Whenever it comes, it will find a ready home in the 65-plus PDP-10 systems already installed and those that will be in within the next year.

The PDP-10 COBOL is based on the USASI standards. It will be expandable to use the full 262K 36-bit word memory of the 10, and will definitely require a minimum of 16K user core area and disc storage in excess of 100,000 words. The package will consist of the compiler, operating system, source library maintenance, and sort/merge. Among other capabilities, calls can be initiated within the compiler to FORTRAN or macro subroutines. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 546 ON READER CARD

bit manipulating

The first thing that an advocate of machine language coding will point to in describing the deficiencies of FORTRAN or COBOL is their shared inability to manipulate bits. BEEF2/360 should give the higher level language programmers a way to fight back. The program provides the capability of manipulating and testing character or bit strings with the ease of PL/I coding. BEEF2/360 allows the user to ignore word and/or byte boundaries and concentrate on accessing data relative to any defined symbolic location; strings to be played with are limited in length only by the assignable memory space.

The package consists of 52 callable operations for word movement, decision making, searching, character transformation, data conversion, etc. It is offered on a purchase basis at $4,750, or for $2,500 for the first year's use and then $2,500 for purchase. The 360 version is the only one presently being marketed, but packages for the 1108, Spectra/70, CDC 6600, Burroughs 500, and GE 600 are on the way. COMPUTATION PLANNING, INC., Bethesda, Md. For information:

CIRCLE 547 ON READER CARD

material control

Utilizing a materials data bank accessed through any 128K byte or larger third-generation machine, this COBOL package apportions the available production materials to planned production needs yielding maximum materials availability with a minimum inventory investment. First produced for large electronics manufacturers, the Material Control System is convertible to any large-scale manufacturing operation. Using manufacturing delivery plan data and bills of material as input, weekly inventory requirement schedules are constructed. Pick lists are automatically generated for the stockroom. Management visibility is gained through many available reports, including: inventory status, work-in-progress pricing, purchasing expedite data, cost center loading and scheduling, drafting part number, assembly breakdown, back-order status, etc. Depending on the size of the operation supported, installation of the system can run from $200K to over $400K. CHILTON COMPUTER CO., Dallas, Texas. For information:

CIRCLE 548 ON READER CARD

clinical lab

Some clinical tests—like the "rabbit" test, for instance—will probably resist being computerized, but for those that do lend themselves to automatic handling, this leased hardware/software system might fill the bill. Capable of taking readings from up to 24 instrumented test devices, the system makes available to physicians instant access to all recorded tests on any given patient, and—in a foreground mode—runs the lab's accounting and billing work. The software half of the offering is mostly written in FORTRAN for adaptability; the hardware half, at least for the first systems, will be built around a Digital Equipment Corp. PDP-12. The basic system will be leased on a five-year basis for $3,000 and will be available for September deliveries. U.S. SYSTEMS & SOFTWARE, INC., Los Angeles, Calif. For information:

CIRCLE 549 ON READER CARD

file editor

Using sequence numbers from columns 1-6 or 73-80 of a source card, QUICK UPDATE can extract programs or portions of them, combine file elements, and create an output file that will be accepted by a compiler or assembler. Program options include file resequencing, listing suppression and specialized file format operations. Written in COBOL, the $500 package is marketed with a manual, source deck, and maintenance. NATIONAL COMPUTER ANALYSTS, INC., Princeton, N.J. For information:

CIRCLE 551 ON READER CARD

resource management

The vendor claims that more than $300K has been spent in developing RMS, a resource management system for 64K and up IBM 360's. The product that cost them that much, and which will cost customers about $20K, comes in two modules, one for operations control and one for project con-

new software...

trol. Among its many tasks, the operations control module balances all input jobs against all equipment work stations available to process them. In this part of the system, a work station can be anything from a Teletype station to a partition of a large 360.

The project control system is somewhat the same, but even programmers can be identified as work stations and the final results are an estimate and description of the job assignments on a total project. Under this module, the user breaks down jobs into tasks and subtasks and people into work stations. The system schedules the people and the machines and gives an automatic budget estimate. Either subsystem can be purchased separately for $12K. BRANDON APPLIED SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 550 ON READER CARD

media selection model

The Media Selection and Program Schedule (MSPS) model is aimed at making possible optimum performance of the advertising budget, based on one of four media criteria—net reach, average frequency, cost per thousand (CPM) for the audience reached, and a combination of average frequency and CPM. MSPS may use any combination of vehicles outside of the 400 accommodated on the model to produce an optimal media schedule and to test existing or newly formulated schedules. Each processing is temporarily limited to 150 vehicles, although more than 150 are seldom needed, according to the company. A normal 150-vehicle case can be run in less than two minutes.

MSPS, written in FORTRAN IV, runs on a 360/65-size computer using 300K bytes of main memory under PCP or HASP. Purchase price is $15,000; lease price, $10,000 annually. Demographic product or brand tape processor may be attached to MSPS for an additional $5,000. INNOVATION RESEARCH CORP., New York, N.Y. For information:

CIRCLE 552 ON READER CARD

text processor addition

Publishers and printers using the IBM System/360 Text Processor program will be able to do page layout in addition to typesetting and copy editing with PAGINATION/360. A module of Text Processor, it runs under DOS, enabling the computer to handle copy while performing other jobs not con-

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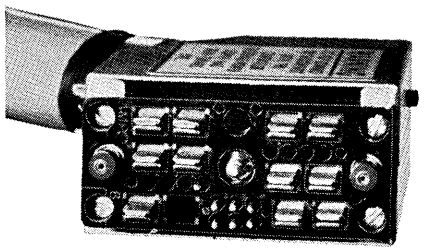
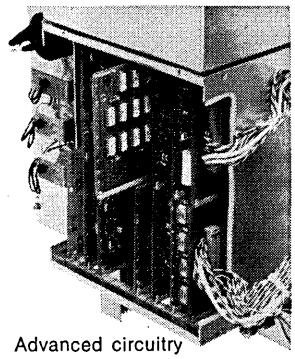


Plug-to-plug compatibility

Greyhound Computer Corporation introduces the new GCC 3311 disc storage unit for System 360 users. The 3311 is made for us by General Electric to our specifications. And since we're the world's largest computer leasing company, we knew exactly what was needed. So if you're in the data processing business, and you can use a disc storage unit that could save you as much as 50% monthly, is easily maintained, readily serviced by skilled GE field engineers, has plug-to-plug compatibility with the IBM 2311, and can be leased or purchased, pick up a pen or phone. And wait 'til you hear what we'll think of next in the peripheral equipment area.



Advanced circuitry

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new software...

nected with the text processing operation. The complete Text Processor, including the COMPOSITION/360, HYPHENATION/360, EDIT/360 and PAGINATION/360 modules, will require a 128K 360/40. IBM CORP., White Plains, N.Y. For information:

CIRCLE 553 ON READER CARD

report retrieval

Management report generators exist in large numbers in varying degrees of complexity for users who differ in their computer-using sophistication. This system, called 3R for Request, Report and Retrieve, requires the user to fill out the blanks in only three forms. Given that input, the 3R system goes to disc or mag tape files and generates the desired report. Written in COBOL for the IBM 360, the program can be transferred to any other third generation machine. To operate, it needs two disc packs (or tapes) and can handle up to four files simultaneously. If the customer has already prepared punched card files, the vendor will transfer them to tape or disc for him. The $8,750 purchase price gives the user the system, training, two modifications during the first year, and a one-year guarantee. Additional insurance can also be purchased. SYSTEM DEVELOPMENT CORP., Santa Monica, Calif. For information:

CIRCLE 555 ON READER CARD

bond trade analyzer

BID is an interactive program which provides an immediate analysis of the income and capital effects of a bond trade, including all tax effects. It requires the use of IBM's CALL/360 time-sharing system. The package is used to compare alternative fixed-income securities in the process of replacing presently held bonds with new ones for greater income. With BID, data is entered and received in bond-trader's language; for example, dates, prices and rates do not have to be converted to decimal form.

Output is received in both dollar income and percentage yield, before and after taxes, as well as time to recover loss due to trade. Alternative depreciation methods, different buy and sell rates, and coupon, capital gains, and ordinary income taxes are also handled. The price for the program which is written in pl/i, is $15K, and includes technical support, installation, modifications, and subsequent maintenance and support. It was developed by State Street Bank and Trust Co., Boston, and is also used at other banks. CULLINANE CORP., Boston, Mass. For information:

CIRCLE 557 ON READER CARD

accounts receivable

A/R-70 generates five accounts receivable reports including an edit report, accounts receivable posting, aged trial balance report, past due listing, and a customer status report. It's said to be unique because it provides the flexibility of specifying either open item or balance forward method of accounting by an individual account. It operates on any IBM 360 system with a minimum of 32K core under either DOS or OS. The $16K price includes documentation, installation, and four days of on-site support. Computer Processing Corp., Hartford, Conn., developed it. NATIONAL SOFTWARE EXCHANGE, INC., Great Neck, N.Y. For information:

CIRCLE 556 ON READER CARD

disc file i/o

Using IBM's own 360 assembly language, the vendor claims to have produced a disc file I/O package that is three times as fast as that written by IBM (IBM's ISAM: Indexed Sequential Access Method). Called RAM, for Random Access Method, the program allows for inserting or deleting records or reordering records which are either random or sequentially linked. RAM allows for both variable and fixed-length records and keys and requires no other I/O system. On the other hand, RAM may be used *by* other I/O systems to handle that kind of processing for COBOL or assembly language programs. All of RAM's logical records are blocked and unblocked automatically.

The program requires a little less than 9K of core (3K of which is buffer space). The purchase price of $5,000 covers a reference manual and three man-days of installation and training support. In addition, a 30-day free trial is offered. ISAACS-DOBBS SYSTEMS, INC., Los Angeles, Calif. For information:

CIRCLE 558 ON READER CARD

management reporting

Automated Management Reports is a package for producing reports from a data file of accumulated monthly trial balance figures and other information entered into the file as needed. It's claimed that accounting clerks can learn the system in "about three hours," since the type of report needed

can be specified through the use of four "easily-used" input forms. Among the reports it produces are operating statements, cost and variance statements, cash flow and net worth statements, capital breakdown, and budget forecast computations. Developed by United Shoe Machinery, Cullinane Corp. is marketing it for $15,000, including technical support, installation, training, modifications, and subsequent maintenance and support. AMR operates on an IBM 360/30 under DOS, with 65K bytes of core, three tapes, and two discs. It is written in COBOL. CULLINANE CORP., Boston, Mass. For information:

CIRCLE 559 ON READER CARD

typesetting

ULTRA-X is a utility package written specifically for typographic applications. The 12-program pack is limited to text formatting and editing and does not have graphic layout capabilities. It is designed to operate with crt composers, although it can be used with other equipment like linecasters and phototypesetters. Input can be from mag or paper tape, punched cards, or from an optical scanner. Operable on a minimum IBM 360/30 configured with 65K bytes of core and running under DOS, the package contains input composition and output modules plus nine other programs for updating and displaying. It will process 4000 cps through the system when doing standard (book) composition and is claimed to be 10 times faster than IBM's TEXT/360. The language uses 84 two-character codes along with numeric quantifiers to direct the composition. For instance, BB signifies "bottom boundary" and TF is used to give the type face, etc. PRINTING INDUSTRY COMPUTER ASSOC., INC., Princeton, N.J. For information:

CIRCLE 561 ON READER CARD

banking

MACH 1 is a demand deposit accounting/reserve accounting system whose major feature is speed. The 10-program system is said to process demand deposit accounts up to eight times faster than comparable products in use. It does about 89,000 accounts/hour versus an estimated 10,000 on the same configuration with other software. MACH 1's minimum requirements are a 128K IBM 360/40 with three tapes and three 2311 disc drives or with one 2314 disc drive system. It also requires file conversion. Assistance for that conversion, as well as consulting and programmer education, will be provided as part of the 20 man-days of support lumped under "installation" and included in the $35K purchase price.

MACH 1 performs a credit check, maintains a central file and an inquiry file, formats reports for remote transmission, and automatically outputs transactions for the account reconciliation plan. The major processing runs—for stop-pay, file maintenance, posting, and merging—are handled by programs written in BAL, IBM's assembly language for the 360 series. Subroutines for generating the 50 reports used are written in COBOL. Along with the typical banking reports generated by the routines are some for daily full account analysis, a monthly foreign account report, and daily statistics for demand deposit and reserve accounts. One of the 10 major programs, the trial balance transaction journal, can operate on-line with an IBM 2260. SYSTEMS MANAGEMENT CORP., Minneapolis, Minn. For information:

CIRCLE 560 ON READER CARD

information management

The news releases for TIMS, The Information Management System, ambitiously claim that it is one of the first, if not the first, on-line real-time data retrieval and file management systems. (One firm that may dispute this claim is Computer Corp. of America, Cambridge, which has an on-line system for retrieval of data and reports from large data bases. CCA's thing, however, differs in capabilities, being more applicable to market research—how many Greek restaurants are there in Northeast USA?—reporting. TIMS does not have this capability.)

TIMS is constructed from about 15 modules which allow for: access and display of information from touch-tone phone based terminals, IBM 2260's, or IBM 2740 typewriter terminals; for composing and updating files; for terminal and data file security; and for terminal traffic accounting. The standard IBM access methods are used, and therefore there is no requirement imposed for reformatting existing files. TIMS requires a 90K partition in a 128K IBM 360/40 or larger machine, and can share data with the other partitions. The programs operate under OS MFT II.

In addition to the 15-module system, which sells for about $40K, 30 applications programs are currently available at additional cost. These include demand deposit inquiry, installment loan and savings account inquiry, data collection, and name-and-address file maintenance routines. To access a data base with TIMS, the user inputs a file code (for what part of the base), the master file key (the "people and things" involved in the inquiry), and the processing code (what programs are needed). Confidential information will be denied without a proper terminal and operator code. User education, systems maintenance for a year, and complete documentation are provided for in the purchase price. TIMS was developed in conjunction with State Street Bank and Trust Co. in Boston. MOLL ASSOCIATES, Watertown, Mass. For information:

CIRCLE 562 ON READER CARD

loan tailoring

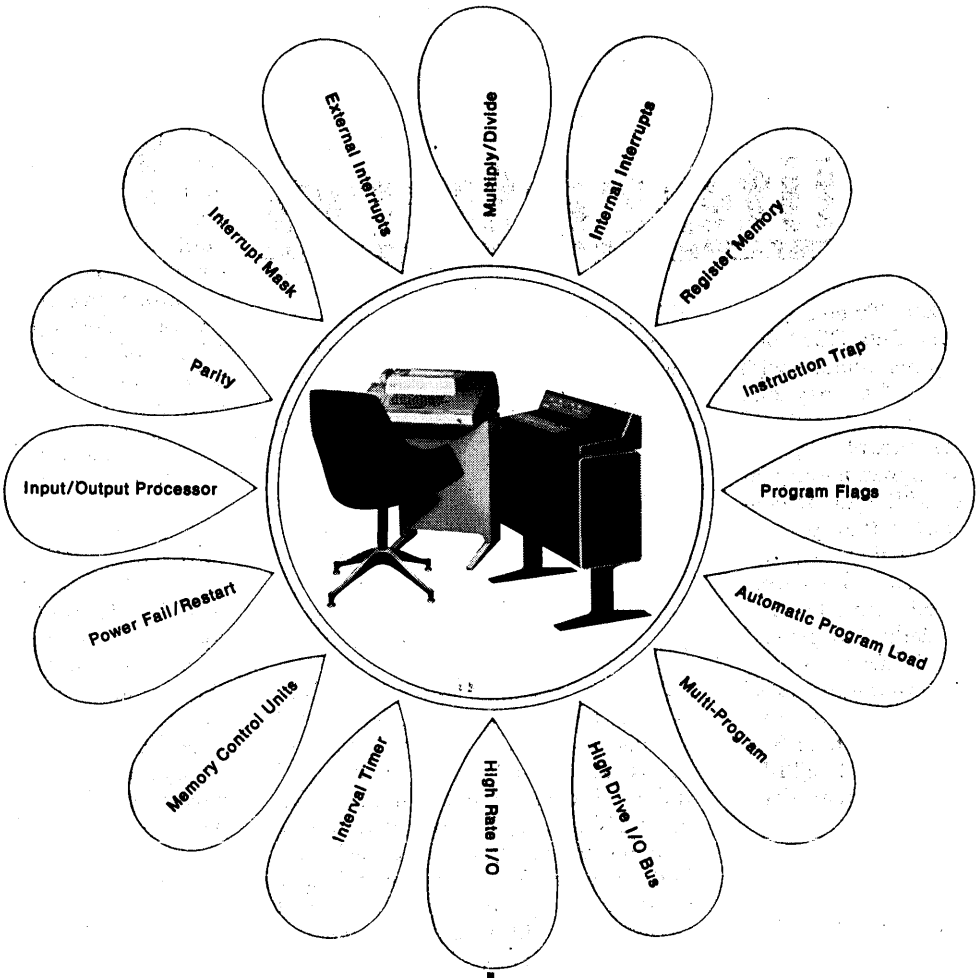
These four programs are designed to help the financial community meet the computational requirements of Regulation Z, the truth in lending regulation that became effective July 1. The programs are named TILT. (The vendor says the acronym stands for Truth in Lending Tool, but it's more fun to imagine that TILT is the message flashed across the console when a bum loan application is encountered.) The programs are for processing closed-end installation loans.

TILT A handles a single advance loan with an even repayment schedule, and rents for $50/mo. with a $400 installation charge or can be purchased for $2,500. TILT B handles loans with erratic (skipped or uneven) pay schedules and can be obtained with the A program for a total cost of $75/mo. with a total $500 installation charge and purchase price of $3,500.

TILT C is for multiple advanced loans (as for the seasonal needs of the farmer) with level payments. It is priced at $50/mo., $400 installation, and $3,000 purchase. TILT D for multiple loans with erratic schedules is obtainable with C for the same price as the A-plus-B combo. All four programs can be purchased for $5,500 or leased for $100/mo. plus $650 installation. Each program is divided into about five or six subprograms, so that the user can modify the system more easily.

Written in FORTRAN, the package is available for SDS 940's, and the vendor is planning to buy block time from t-s service bureaus for sale to end-users. The rental fee the user pays for the program will be put toward his connect time charges. TILT can be, for a fee, converted to other hardware, too. Banks or other institutions will be offered the system for their internal use and/or as distributorships for the service. DECISION ANALYTICS, INC., Pearl River, N.Y. For information:

CIRCLE 563 ON READER CARD



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The starting point is $15,600 for a 4,096 word primary memory, control processor with eight general purpose registers and an ASR 33. From there on, you can mature at whatever rate makes sense. The system also includes complete software and a full line of peripherals. Call or write for details.

TEMPO COMPUTERS, INC. 340 West Collins Avenue, Orange, California 92667 (714) 633-3660

TEMPO

new literature

OUTPUT MICROFILMER: Twelve-page brochure describes the Beta COM 600 computer output microfilmer with graphic capabilities. The magnetic tape-to-transport system is a stored program film recorder capable of printing high resolution alphanumerics at speeds greater than 12K lpm. It contains a forms projector that permits fixed images to be superimposed over computer-generated data, eliminating the need for preprinted forms. The system also contains a dedicated general purpose computer. Software is provided to convert computer-generated data into graphs, tables, charts, etc. Images can be plotted at a rate of 50K points per second. BETA INSTRUMENT CORP., Newton Upper Falls, Mass. For copy:
CIRCLE 566 ON READER CARD

OPTICAL SCANNER: Four-page brochure describes the Scanak 216, claimed to be the only truly general-purpose transaction document scanner on the market today. These advantages are cited: It is the only scanner equipped to read data recorded by the five most commonly used methods of creating transaction documents. The 216 reads four different machine codes and is, for this reason, simpler, more flexible, and has a lower reject rate than OCR scanners. Four different codes can be read simultaneously from the same document in a single pass. It operates off-line without the aid of a computer or computer programmer and thus can be operational in much less time than usually required. A recent Auerbach report on the Scanak will also be sent. CUMMINS-CHICAGO CORP., Chicago, Ill. For copy:
CIRCLE 567 ON READER CARD

FILING & RETRIEVAL SYSTEM: Four-page brochure explains the System 60 method of automated filing and information retrieval with a case history of a large university bookstore using the system for control of textbook ordering and return. Benefits of the system include the consolidation of the contents of four files on one tabulating-size card, almost instantaneous answers to questions from faculty or students, the ability to reach the right card by author, area of study, or publisher. Savings were effected by the elimination of duplicate records, reduction of search and refiling time, automatic identification of publisher return deadlines, and elimination of misfiling due to the random refiling feature of the system. ACCESS CORP., Cincinnati, Ohio. For copy:
CIRCLE 568 ON READER CARD

MULTIPLEX MODEMS: Four-page brochure describes the Model FDM-8 frequency division multiplex modem consisting of up to eight channels of full duplex communication at speeds up to 150 bps. By polling the user may have more than eight remote terminals in the same FDM system. The modular construction permits rapid channel changes and additions, for greater application flexibility. RIXON ELECTRONICS, INC., Silver Spring, Md. For copy:
CIRCLE 570 ON READER CARD

MANAGEMENT SYSTEMS SURVEY: The CODASYL Systems Committee has released a 375-page technical report titled "A Survey of Generalized Data Base Management Systems." The purpose of carrying out this survey has been to find a common basis for describing such systems and to demonstrate its usability. The survey contains a list of the features typically found in a generalized data base management system. For each of the nine systems included in the survey there is a narrative description of the system in the format and terminology of the feature list. Cost: $7.50. ACM PUBLICATION DEPT., 1133 Ave. of the Americas, New York, N.Y. 10036.

PROJECT CONTROL SYSTEM: Eight-page brochure describes S.M.A.R.T. (Systems Management and Review Technique), a modular software system that provides management with the right information to control any project. The system generates relevant data for each level of project responsibility, from the performer to the project sponsor. The modules combine to collect data from personnel and equipment involved in a project, maintain and update computer files, compute cost and progress, post this data to relevant people, calculate schedules, report on utilization of resources, and outline the condition of each activity controlled by the system. The computer processing segment of S.M.A.R.T. has been developed in COBOL for an IBM 360/30 with two 2311 disc drives, four mag tape units, card reader and printer. MOLL ASSOC., Newton, Mass. For copy:
CIRCLE 569 ON READER CARD

OPTICAL SCANNING PAPERS: Guidebook explains the types of paper which work best for optical scanning, the reasons some grades give better results than others, and the specific qualities and characteristics demanded by optical scanning systems. Specifications for optical scanning equipment offered by 16 manufacturers are given. A chart cross-references 30 machines and 17 papers with recommendations relating papers to machines for optimum performance. Samples of recommended grades are included. MEAD PAPERS, Dayton, Ohio. For copy:
CIRCLE 571 ON READER CARD

GLASS TAPE REELS: Four-page brochure describes Data Shield precision tape reels made of chemically strengthened glass. Some advantages of glass tape reels are cited: High elastic strength eliminates bent or dented flanges; tape reel rehabilitation is reduced to a simple cleaning process since there is no need for gauging and straightening of flanges; stiffness of the flanges reduces flange deflection and increases protection for tape edges; glass flanges stay smooth to minimize tape edge wear and damage; the solid flanges protect tape from dirt that can enter through flange openings on aluminum reels. CORNING GLASS WORKS, Corning, N.Y. For copy:
CIRCLE 572 ON READER CARD

I/C GUIDE: Six-page guide to digital integrated circuits is designed to speed selection and reduce engineering time spent researching operating specifications for the five major digital I/C logic families now used by computer manufacturers. The three-page center spread, suitable for wall mounting, graphs operating characteristics, including operating temperature range, power supply range, basic gate fanout,

new literature ...

typical gate dissipation, typical average propagation delay, typical flip-flop toggle frequency, and typical noise margins. Also included are basic gate configurations and positive logic functions for the different families and outline case dimensions for the 29 series of I/C's available from the company. MOTOROLA SEMICONDUCTOR PRODUCTS, Phoenix, Ariz.

HYBRID EXPANSION: Sixteen-page brochure describes the Series 16 hybrid expansion package designed for TR-48 analog computer users. The system includes software, analog linkage and a DDP-516 or H316 digital computer. The package is said to provide a hybrid capability for the TR-48 at less than half the cost of alternate methods. The system is designed for biomedical analysis, process modeling, control system analysis and design and simulation of physical phenomena. HONEYWELL COMPUTER CONTROL DIV., Framingham, Mass. For copy:

CIRCLE 574 ON READER CARD

HELP SOLVE URBAN PROBLEMS: 30-page booklet is a guideline of working ideas for business programs to help alleviate the country's urban problems. This edition is especially dedicated to small and medium sized businesses. Included are local, government, and industry sources of those who can offer more information or assistance in setting up various types of employment and training programs. AMERICAN BUSINESS PRESS, New York, N.Y. For copy:

CIRCLE 573 ON READER CARD

COMPUTER PRODUCTS CATALOG: Description and specifications of the company's complete line of magnetic tape drives, core memories and memory components for computer manufacturers and users are contained in a 20-page pocket-sized catalog. AMPEX CORP., Redwood City, Calif. For copy:

CIRCLE 581 ON READER CARD

INFORMATION PROCESSOR: Six-page brochure describes DCS/MIP (Dynamic Computer Systems Multi-purpose Information Processor), a set of

System/360 assembler language programs which provide for creation and maintenance of a data bank, retrieval of selected information from the data bank and processing of records in the data bank. The system is versatile in application and said to be simple enough to be efficiently used by non-technically oriented clerical personnel. DYNAMIC COMPUTER SYSTEMS, Houston, Tex. For copy:

CIRCLE 576 ON READER CARD

COMPUTER ROOM CARPETING: Three-page bulletin discusses the use of Brunsmet, a recently developed stainless steel textile fiber which, when properly blended with natural or man-made yarn in carpeting having a suitable backing, will render that carpet shockfree. This is said to have been substantiated by laboratory tests and studies of actual computer room installations. Accompanying the bulletin is a list of 25 carpet mills using the Brunsmet fiber in carpets suitable for the computer room. BRUNSWICK CORP., Chicago, Ill. For copy:

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PAPER TAPE PREPARATION: Six-page brochure describes on- and/or off-line paper tape preparation centers consisting of a variety of input and output devices that range from a simple keyboard-tape punch to a multifunction I/O system. Each tape preparation center is especially designed according to the needs of the particular application. INVAC CORP., Waltham, Mass. For copy:

CIRCLE 578 ON READER CARD

SYSTEMS COURSE: A 14-page sample lesson from a 50-lesson Systems & Procedures home-study course sponsored by the Assn. for Systems Management is being offered without obligation. The course is designed for personnel in systems departments who want to broaden their knowledge and for companies wanting to train their own personnel. It sells for under $400 with time payment tuition plans available. NORTH AMERICAN SCHOOL OF SYSTEMS & PROCEDURES, Newport, Calif. For copy:

CIRCLE 579 ON READER CARD

RECORDS MANAGEMENT: 24-page monograph is intended to prepare medical record librarians for converting to edp from more traditional records management systems. The booklet explains basic edp concepts by relating them to the actual job responsibilities of medical record personnel. The author uses the hypothetical case of a hospital census listing and shows how to evaluate and upgrade it by applying basic principles of systems analysis and data processing. Because of this case history approach, the book is also of interest to those not primarily concerned with medical records management. Cost: $3.25. Quantity discounts available. AMERICAN ASSN. OF MEDICAL RECORD LIBRARIANS, 211 E. Chicago Ave., Chicago, Ill. 60611.

ENGINEERING FILMS: New edition of this engineering education film catalog contains a list of motion pictures produced by and for industry, government, education groups, and professional societies. The films were chosen for their instructional value in engineering education, and films that are primarily motivational are not listed. Films are alphabetically listed and followed by information on size, running time, black and white or color, and sound or silent. A description of the film's subject matter and sources for obtaining the films are included. NATIONAL ACADEMY OF ENGINEERING, Washington, D.C. For copy:

CIRCLE 580 ON READER CARD

FILE SECURITY DEVICES: Six-page brochure describes applications and operation of the Data Lock individual computer file security devices (tape and disc), including wraparounds, canisters, and disc pack bases. DYNANAMICS, INC., Lansing, Ill. For copy:

CIRCLE 584 ON READER CARD

RETRIEVAL SYSTEM: 53-page user's manual describes TRIAL, an information retrieval system that is especially adaptable to large masses of bibliographic data where either selective bibliographies or various forms of indexes are desired. AD-684 626. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

MOS CIRCUITS: Twelve- page product guide describes the company's line of standard off-the-shelf MOS circuits, including shift registers, memories, multiplex arrays, logic circuits and

new literature . . .

transistor products. Both military and industrial/commercial product applications are listed, along with pertinent operating parameters, functions, and packaging information. AMERICAN MICRO-SYSTEMS, INC., Santa Clara, Calif. For copy:

CIRCLE 582 ON READER CARD

DISC DRIVE: Bulletin describes the CD1 random access storage device using removable disc packs. Up to 58 million bits can be recorded on each disc pack. The CD1 is said to be the only disc drive that features expandable disc pack capacity that will grow with any computer center. CALIFORNIA COMPUTER PRODUCTS, Anaheim, Calif. For copy:

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WIDEBAND SYSTEM: 35-page bulletin describes functional specifications, interfaces and applications of the DigiNet 400 for data transmission up to 50 kilobits per second. The wideband series includes digital information systems for computer data, facsimile and digitized voice in government and military complexes, private microwave networks and dedicated transmission lines. The system handles synchronous or non-synchronous binary digital data. GENERAL ELECTRIC COMMUNICATION PRODUCTS DEPT., Lynchburg, Va. For copy:

CIRCLE 585 ON READER CARD

TAPE AND ACCESSORIES: Sixteen-page catalog lists the company's line of mylar control tapes and related products for all tape controlled machines and computers. Also included is a guide to tape selection and splicing recommendations. NUMERIDEX TAPE SYSTEMS, INC., Chicago, Ill. For copy:

CIRCLE 586 ON READER CARD

T-S LANGUAGE MANUAL: Reference manual on SUPER BASIC, a time-sharing language evolved from BASIC, goes from the most fundamental concepts through such features as picture formatting, alphanumeric manipulation, advanced editing, logical variables, and complex arithmetic. Two colors are used to differentiate the output of the computer from the input of the user. Cost: $3.50. TYMSHARE, INC., 525 University Ave., Palo Alto, Calif. 94301.

books

***Materials and Cases on Computers and Law*, by Roy N. Freed, Boston Univ. Book Stores, 775 Commonwealth Ave., Boston, Mass. 1969. $13.**

At the outset, I would like to say that the author of this book is to be congratulated for his foresight and perseverance. Mr. Freed foresaw the impact the computer was going to have throughout society at a time when many of his colleagues in the legal profession looked upon it as merely a plaything of the scientific community. I might add that the lack of insight into the total significance of the computer revolution was not limited to members of the legal profession but extended into nearly every profession, including the data processing profession.

In recent years there has been a growing recognition by various members of numerous professions that the computer is affecting the fundamental structure of the society in which we live. A prime example of this increasing awareness is the data processing profession's current concern about establishing a code of ethics as a general guideline of conduct for its members. The contents of Mr. Freed's book indicates the growing awareness of the legal profession that the computer is playing an increasingly important role in the combined interactions of the individuals and corporate entities that make up society.

The book, to my personal knowledge, is the first of its kind. It will be used in a course offered to law students at Boston University in the coming year. The author indicates in the introduction that the book is in the nature of an experiment to determine if a separate course on computers and law is an effective way of acquainting law students with the numerous situations involving computers they will encounter as practicing attorneys. While the book will be used initially in a law school course, it should not be concluded that this is the total extent of its usefulness. The book is also of value to the practicing members of a number of professions.

Physically, the book is a large looseleaf volume consisting of a collection of materials from various sources. Much of the material is the work of Mr. Freed. It includes reprints from various types of legal and nonlegal publications, texts of speeches presented to legal and data processing organizations, newspaper releases and a sprinkling of court opinions. The author makes no attempt to textually distill the contents of these materials. This is left to the reader.

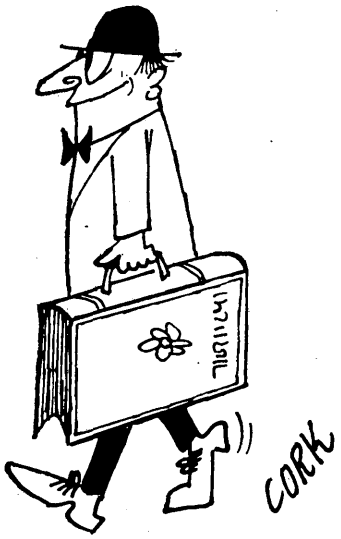
Organizationally, the book is divided into five sections which are as follows: (1) The Computer in Legal Questions, (2) The Computer in the Legal Process, (3) The Computer in the Judicial Process, (4) The Computer in the Legislative Process, and (5) The Computer in the Administrative Process. As these section headings indicate, the author has not limited the book to the discussion of legal questions. Instead, the material related to legal questions is supplemented with material dealing with the uses of computers in the legal and legislative processes.

Examples of some of the diverse legal questions considered in section (1) are as follows: Are computer records admissible under the law of evidence and if so what steps must be taken to ensure their admissibility? Are computer records which are not legible visually discoverable subject matter? What are some of the potential problems faced by a client who is planning to buy or lease a computer system? How is liability to be determined when an individual suffers a loss due to a data processing system malfunction? How can proprietary rights in computer programs be protected? Are computer programs proper subject matter for theft prosecution? What liabilities are involved in using the computer in medical practice? While this is not an exhaustive list of the legal questions considered, it does indicate the variety of questions considered in the book.

The discussion of the various uses of the computer covers a number of applications. The use of the computer in legal research is discussed. Another application discussed is the use of the computer in handling evidence in large cases. And, of course, the use of the computer in managing a law office is covered. Material on analogous uses of computers in the judicial, legislative and administrative processes is also included. While this material is general in nature, it nevertheless indicates areas in which innovations will occur in the future.

From the attorney's point of view, the book is a valuable reference source. It provides him with general discussions of various areas of substantive law in which computer technology is likely to give rise to legal issues requiring special consideration. As previously indicated, these discussions touch on considerations in such areas as the law of negligence, evidence, contracts, antitrust, patents, copyright and so on. In addition, the materials in the book covering the operation and use of computers are written at a level that does not require a technical background for comprehension. They enable the attorney to grasp the potential of the computer as a tool in the legal, judicial and legislative processes. Furthermore, these materials provide the background for attorneys that is necessary if they are going to be an effective force in making decisions relating to data processing innovations which will affect their own profession in particular and society in general.

The value of the book is not limited to law students and attorneys. The book is of such a nature that an individual in the data processing field, interested in the societal and legal impact of the computer, can comprehend a substantial amount of the information in the materials making up the book. Additionally, the sections of the book dealing with the use of computers provide the technically trained individual with an insight into some of the areas of the legal and legislative processes where innovation is occurring and, perhaps, indicate other areas where innovation is needed. This kind of information is definitely of interest



to individuals in various positions in the data processing field.

While the book, as a whole, represents a worthwhile contribution, it suffers from some faults that are relatively common in pioneering writing efforts dealing with an evolving field of knowledge. The author himself indicates that this edition of the book represents only the initial step in attempting to provide a treatise dealing with the rather large field of computers and the law. One of the apparent faults of the book is the absence of adequate bibliographies or footnotes supplying citations to supplemental materials. Such supplemental materials exist and citations to this material should be in-

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cluded for the researcher using the book as a reference source. It is also felt that the value of the book would be enhanced if a textual summary of the collected materials in each section were provided at the beginning of the section. This would be especially useful to the neophyte using the book to acquaint himself with the field of computers and law.

In conclusion, the book is a worthwhile contribution containing a substantial amount of information. It is written in such a manner and its subject matter coverage is comprehensive enough to be of interest to those in the legal, legislative and data processing fields. Notwithstanding the indicated faults, the book is definitely an asset to the reference library for individuals in any of these fields.

—NORMAN D. MCCLASKEY

book briefs

(For further information on the books listed here, please write directly to the publisher mentioned.)

***Fundamentals of COBOL Programming*, by Carl Feingold, Wm. C. Brown Co., 135 S. Locust St., Dubuque, Iowa. 1969. 201 pp. $4.95, paper.**

This book is designed so that the reader may learn all the basic components of COBOL and apply these principles to the writing of COBOL programs. The first four chapters are devoted to the introduction, the basic components, the Identification and Environment Divisions, and writing COBOL programs. The student should be able to start writing programs using the ten problems in the appendix as he procedes through the next two chapters, the Data Division and the Procedure Division. The latter part of the book explains the many features which allow the user to obtain a necessary function without a detailed program.

***Music by Computers*, H. Von Foerster and J. W. Beauchamp, ed., John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y. 1969. 139 pp. $14.95.**

Papers presented at the 1966 Fall Joint Computer Conference session on "Computers in Music" form the basis of this book. The book is divided into three sections: Systems and Programs (computer hardware and software for implementing the generation of sounds), Composition (the versatility of digital computers in exploring rules of succession and synchronism), and Aesthetics (the problem of judgment entering perception—that is, what distinguishes signal from noise). A pocket of the back cover contains four high fidelity records of all the examples mentioned in the text, allowing the testing of the presented theories.

***The SNOBOL4 Programming Language*, by R. E. Griswold, J. F. Poage and I. P. Polonsky, Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 1969. 221 pp. $6.50, paper.**

This manual is an instructional and reference guide and provides many examples of usage of SNOBOL4. The description of the language is complete and does not require familiarity with earlier versions. Some familiarity with elementary concepts of programming is presumed, however. Programs contained in this manual were run on an IBM 360/65.

***FORTRAN IV: A Programmed Instruction Approach*, by J. D. Couger and L. E. Shannon, Richard D. Irwin, Inc., Homewood, Ill. 1968. 244 pp. $7.95, paperback.**

Knowledge of high school algebra is the only mathematical prerequisite to use of this book. Format of the book is the Programmed Instruction technique. The material is presented in brief units, called frames. After reading a frame, the student checks his comprehension of the material by answering a question. The correct answer is provided adjacent to the frame. In addition, exercises are provided throughout each chapter. An index permits the use of the book as a reference as well as a textbook.

***A Guide to PL/I*, by S. V. Pollack and T. D. Sterling, Holt, Rinehart and Winston, Inc., 383 Madison Ave., New York, N.Y. 1969. 556 pp. $9.95.**

This textbook of the PL/I programming language provides the student with enough basic tools to write complete programs early in the course. Both statements of introductory concepts and an overview of the fundamental characteristics of the language are included in the first chapter, and the remaining chapters are devoted to building on the basic functions. Each of the 15 chapters contains problems at the end. The text includes a variety of illustrative programs that demonstrate the operation of particular features of PL/I and a selection of complete programs which illustrate concepts.

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people

New officers of AFIPS are **Dr. Richard I. Tanaka,** California Computer Products, president; **Keith W. Uncapher,** The Rand Corp., vp; **Richard G. Canning,** Canning Publications, secretary; and **Dr. Walter Hoffman,** Wayne State Univ., treasurer. **Thomas C. White,** ex-NYC adman, has been named Director of Information for AFIPS' new Public Information Office which has been established to make information on the development and application of computer and information processing techniques available to the general public and other groups. . . . Recently formed Cyphernetics (see April, p. 194) has added two more principals: **Edward I. Metz,** manager of special systems development, comes from Ford's commercial advanced systems; and senior applications manager in civil and structural engineering, **Charles E. Shapler,** was vp of Caltec Inc. . . . **Robert L. Thaler,** formerly vp of Security Pacific Bank, has been elected chairman of Growth Industry Computing, a Los Angeles-based firm specializing in the acquisition, documentation, and marketing of proprietary software packages to selected industries. . . . Informatics' president **Dr. Walter F. Bauer,** has been elected chairman of the board, a post unfilled since the company's founding in 1962. . . . **Charles E. Sutcliffe,** most recently with Fairchild Camera & Instrument, has been named president and chairman of the board of recently formed Four-Phase Systems, Palo Alto (see June, p. 157). . . . **Michael F. Nolan** has been named president of Information Systems Co., Los Angeles division of DPF&G. . . . **William R. Keye,** a founder and board member of Control Data Corp., has been elected executive vice president of the company. **Thomas R. Parkin,** formerly director of Aerospace Corp.'s Mathematics and Computation Center, has joined CDC as vp, software. . . . **Robert A. Westerhouse,** exec vp, has been elected president of Computer Complex, Inc., Houston-based time-sharing firm. Former president **William D. Mercer** is retiring from active management but will remain on the board of directors. . . . **W. Willard Wirtz,** former Secretary of Labor under Presidents Kennedy and Johnson, has been elected to the board of directors of EDP Technology, Inc. . . . **Norman D. McCue** has been named president and chief executive officer of McCall Information Services Co., Fullerton, Calif. Before joining MISCO, he served as vp, computer services, for the Automated Business Systems Group of Litton Industries. . . . **Frank P. Melograno** has been elected staff vp-administration and administrative assistant to Bunker-Ramo's president, **Dr. Milton E. Mohr.** Melograno had been vp-administration of the company's Defense Systems Div. . . . Computing and Software, Inc., Panorama City, Calif. (soon to move to L.A.'s Century City), has named **Robert A. Leonard** senior vp and chief executive of the company's new Data Processing Group, consisting of 10 dp centers across the country. Leonard was president of ITT's Data Services Div. C&S president **Dr. Norman E. Friedmann** is also an ex-president of ITT Data Services. . . . **Irvin P. Newbill,** most recently manager of communication terminal engineering for GE's Information Devices Dept. in Philadelphia, has been appointed president of **Electroterm Data, Inc.,** a new peripheral equipment manufacturer headquartered in Levittown, Pa. . . . **Dr. William E. Ayer,** the founder and former president of Applied Technology Inc., now a division of Itek, has joined the board of directors of Data Memory, Inc., Mt. View, Calif. . . . A couple of SDS-Xerox cross-fertilizations (there will probably be more): **Sanford Kaplan,** SDS director and former senior vp who was elected a Xerox Director upon the merger, has now been named senior vp, administration, of Xerox. **Leon J. Berg,** who has held a number of financial management positions with Xerox in the past eight years, has been appointed vp of finance for SDS and will direct all financial operations of the company. . . . Among users: At Johnson & Johnson, **Thomas J. Cassidy** has been named manager of administration for the Management Services Div.; **Clarence A. Sallee** has been promoted to dp operations manager for Northwestern National Insurance Group in the Mil-

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waukee home office; and **J. Clark Kaskie** has been appointed director of Stauffer Chemical's newly established management information department. . . . **Dickson L. Barnhart,** former national account manager at IBM, has joined Cambridge Computer Corp. as director of corporate planning. . . . **Harry T. Larson,** chairman of IEEE Computer Group's social implications committee who chaired the now-famous "URGENT—Increased Dialogue with Society" session at this year's SJCC, has been appointed to the new position of director of planning at California Computer Products. Most recently, he was with TRW Systems. . . . **Ivars Eichvalds** has been appointed vp and gm of Command Control, Inc., the Wayne, N.J., computer service firm which formed Medicron World Medical Data Bank earlier this year. Eichvalds had been chief executive officer of Management Consultants Assoc., Inc., also of Wayne. . . . **Dr. Arnold C. Ott,** founder of the Ott Chemical Co., now a diversified firm called CPC International, has joined **Cascade/Data Computer Systems,** a newly incorporated company founded last year to develop, market, and service computer systems for small business data processing. The company is headquartered in Grand Rapids, Mich. . . . **Charles V. Stableford** has been named manager, and **Herbert O. Asbury,** assistant manager, of the software applications operation in the recently formed TRW Software & Information Systems Div. . . . Computer Input Services, Inc., Upper Darby, Pa., subsidiary of Modern Data Techniques, has named **John J. McElwee III** vp and chief administrative officer. . . . **Charles Sheffield,** formerly corporate director of scientific computing for Computer Usage Co., has joined World Systems, Bethesda, Md., as vp for science and engineering. . . . Cybermatics Inc., Ft. Lee, N.J., software firm, has announced the appointment of **George G. Dempster** as vp. Formerly marketing manager for IBM's SBC, New York, Dempster will plan and coordinate Cybermatics' internal growth and implement an "active" acquisition program. . . . Computer Usage Co.'s president **Charles Benton, Jr.,** has resigned due to personal illness. **James E. Starnes,** formerly vp of operations, has been elected president and chief operating officer of the company and has been named to the board of directors. **Dr. Cuthbert C. Hurd,** chairman of the board, has been named chief executive officer and will maintain his office at CUC's Greenwich, Conn., headquarters. ■

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CIRCLE 18 ON READER CARD

world report

LEASCO PLANS TO ACQUIRE PUBLISHER

Leasco's financial whiz-kid Saul Steinberg has been joined by one of the UK's most successful entrepreneurs, Robert Maxwell, through a $60 million takeover of the Pergamon Press, a publishing house specializing in educational, scientific and technical material.

Maxwell owns 35% of Pergamon, which he started in '51, and has advised shareholders to accept a takeover from Leasco. Still to be ratified by the British Treasury, the deal will put Maxwell as deputy-chairman to the parent company's rapidly expanding world trade operations.

Several aspects of this get-together make it one of the most fascinating marriages of the Anglo-American merger rash. First, Steinberg has shown a certain resilience in his determination to get a big stake of the burgeoning European software and information systems business. For a year Leasco has been busily mopping up small specialist software houses through Europe to get footholds in operations research, civil engineering, and management sciences. But the company suffered a severe rebuff four months ago when a bid for the Paris-based Metra International consultancy group was turned down by the French government.

The acquisition of Pergamon takes Steinberg into the slightly different fields of programmed instruction and technical information retrieval that Maxwell has been developing on the back of his publishing enterprise.

Curiously enough, Robert Maxwell has earned something of a reputation as a takeover king himself. Not long ago he was hoping to buy Document Inc. According to reports, the bid for this information storage and retrieval group was thwarted because the American government would have frowned on the idea of a company handling classified contracts going into foreign control. But perhaps more interesting are Maxwell's other professional and business connexions, not the least of which is a cosy relationship with ICL in the information retrieval field. Robert Maxwell has the distinction of being a millionaire Labour Member of Parliament. He was born Jan Ludwig Hoch in Czechoslovakia and escaped to England via France at the beginning of World War II to join the British army. He was commissioned in the field and emerged from the war highly decorated. Maxwell was probably one of the first people to recognise that the fifties and sixties would see the start of the information explosion. His early fortune was based on scientific and technical publishing of highly specialist material sold at high prices to university, college and other libraries—particularly in the United States.

Maxwell has links with other big publishers, such as the British Printing Corporation, with which he jointly owns International Learning Systems. From other reserve capital he has also offered to take over The Sun newspaper, one of Britain's national dailies with a circulation of 2.5 million. There are close similarities between the meteoric

(Continued on page 199)

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rise of Steinberg and Maxwell. And it will be interesting to see how long the two can work together in harmony. Steinberg is already talking about pumping money in Pergamon to build it into a model computer publishing and information systems group.

ICL SORTS OUT PRODUCT LINE

The dominant UK computer company, ICL, is halfway through its first full financial year since various organisations were merged to form an internationally viable corporation. Mid-year financial statements are looking healthy. But more important, the product planners are beginning to see where an incompatible range of machinery inherited 15 months ago can shape up into a sensible machine range.

The main conflict came in the middle of the range of computers where the bread and butter line of the ICT 1900 family and English Electric Computer's System 4 overlapped. On the maxim that "there's nothing like the shadow of the guillotine to sharpen the wit," ICL has been presented with a very competitive reason for maintaining System 4 at the big end of the product line to satisfy the scientific-cum-timesharing needs of Europe's universities and research institutes.

In practice, this will mean concentrating on two new processors—models 72 and 85. The rationale for developing this end of System 4 comes from a study made last year by P. Bryant of the Atlas Computer Laboratory, Chilton, and M.H.J. Bayliss, now with Control Data, to compare Fortran work on the main scientific group of machines installed in Europe. These were Atlas, CDC 6600, IBM 360/75, ICL 1907, Univac 1108 and System 4. Using a suite of four programs believed representative of scientific computing, Bryant and Bayliss came up with cost-performance figures for Fortran compiling which left the larger 1900's gasping for air. Though strict hardware improvements with integrated circuits and faster stores have given the 1900's a better throughput than most machines on the general dp market, the date of the machine's architecture is beginning to show through at the big end of the market.

BITS AND PIECES

The military systems division of IBM France has produced a new airborne computer, which appeared for the first time at the Paris Air Show. The IP08C is one of quite a long line of special processors developed for the French department of defence. And engineers at the Essonnes plant of IBM are packaging a version for a ruggedized industrial system. Memory capacity is from 4K of 18-bit words to 64K...The Swedish firm Arenco Electronics intends putting its new terminal for savings bank off- and on-line working onto the American market...Canada, Australia, United States and the UK have agreed on the second stage of Mallard: joint tactical computer-cum-satellite communications for the armed forces of the four nations. The second phase will involve two years' work on modelling and simulation...The Canadian Department of Transport has added computer control of sea-lanes to the growing world applications of traffic management. A DDP 516 controlling 250 miles of the St. Lawrence is believed to be the first system for marine work of this type.

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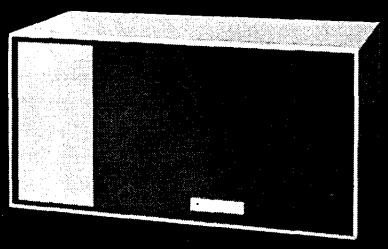

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IBM ONLY DELAYING GSA NEGOTIATIONS

IBM, contrary to rumors, has not refused to negotiate with GSA regarding the FY '70 FSS schedule, says an unimpeachable source. Rather, IBM has declined to discuss the government's request for separate prices on leasing and maintenance (but not software) until after the company's unbundling policy has been finalized. IBM remains unwilling to offer discounts on volume purchases, but this isn't a factor in FSS negotiations; it arises subsequently, after the government asks for bids on multi-computer procurement.

WU WANTS TO RAISE THE PRICE

Higher Telex charges have been proposed by Western Union, to become effective the 10th of this month; they would cost users about $3.6 million/year. User objections are likely, and a delay is possible.

FCC ASKS BELL TO CLEAR UP AMBIGUITIES

FCC has asked for removal of "unduly complicated and ambiguous" provisions in Ma Bell's private line tariff. Redefinition of " 'data access arrangement' " to show "availability" of automatic calling-receiving units was specifically requested. Such a redefinition "would give foreign attachment users leverage for complaining to FCC if AT&T doesn't make these automatic units available," explains a knowledgeable source. "FCC could then put the screws on Ma Bell." He anticipates that if "data access arrangement" is redefined in the private line tariff, it will be similarly changed in the switched systems tariff.

FCC also asked AT&T for evidence, in writing, that its recently proposed broadband service (May, p. 131) is not unfair to big-city, big-volume users, doesn't impose unnecessarily stringent sharing regulations on broadband users, and really requires a 12-month minimum service period together with a 12-month prior notice of service cancellation.

CAPITOL BRIEFS

Dr. Milton Rose, head of NSF's office of computing activities, left the first of this month to become head of the math, statistics and computer science department at Colorado State U. He was succeeded by deputy Glenn Ingram...FCC last month denied the Air Transport Association petition to reopen the Telpak sharing case; now, ATA will file exceptions to the Common Carrier Bureau's recommended decision (June, p. 133). If the bureau prevails, non-sharers could reap big rate cuts...EDP Technology, frustrated in its attempt to buy Cornell Aeronautical Lab for $25 million, has filed suit to prevent a sale to anyone else...A second meeting probably will be convened by IRS to discuss tax treatment of software with users and developers. The date hasn't been decided. Meanwhile, IRS regional offices aren't supposed to argue with taxpayers who prefer to capitalize these expenses...A new unit for measuring computer performance was proposed recently to the National Academy of Sciences. It's called the "kilogrosch" and honors Dr. H. R. J. Grosch, director of the center for computer technology at NBS. An alternate spelling—"killergrosch"—has been suggested by certain industry sources as being more realistic.

The marketing approach is most ingenious: the teacher doesn't have to learn anything and the school doesn't have to put up any money or use their computer facilities. The idea is to treat the service just as a supplemental text—and this requires only a single teacher's approval. If the teacher is sold, he tells the school bookstore to order the text—which is a manual on the system for the student. The student then pays—present price is a modest $5.70—and the rest of the service is thrown in without extra charge. The teacher gets a catalog of test questions, from which he can build a suitable test for the material covered in class. The scholars mark their test forms and CSI handles the computer processing.

If the plan goes over, CSI will start in on course testing for math, sociology, anthropology, American history, and health programs.

It looks like a boon for weary teachers—but how it can all be done at $5.70 a head is a mystery.

BELL LABS BACKS OUT OF MULTICS

The Multics project—a three-way cooperative effort to further the art of large-scale time-sharing by GE, MIT, and Bell Labs—has lost the support of Bell. The two GE-645's are being sent back and a 635 is to be installed.

The decision was apparently based on internal political and financial troubles and doesn't imply technical problems. In fact, MIT is planning broad general use of their 645 this fall and a few Bell people may be using it by remote access. But the word is that Bell Labs will generally be de-emphasizing large-scale computer research now and that dropping their share of Multics is one result of this policy.

ACT OFFERS HELP FOR PROGRAMMERS

Advanced Computer Techniques has announced the first commercially available general-purpose natural language macro generator. It's capable of translating any natural language statements into any desired target language. Called HELP (Highly Extendible Languages Processor), it can be used to translate short-hand Fortran, Cobol, etc. into the form required for compilation. Or it allows the writing of Job Control Language and program statements in the same syntactic form. In effect the programmer can create his own JCL. He may add, delete, replace or redefine Cobol statments, for instance. Or it permits the use of natural languages (English, algebra, etc.) to create new languages, applications packages and compilers. Now available for IBM 360 OS configurations, HELP will be sold or leased by ACT as a stand-alone package; they'll also provide custom-tailored HELP packages and applications to their clients.

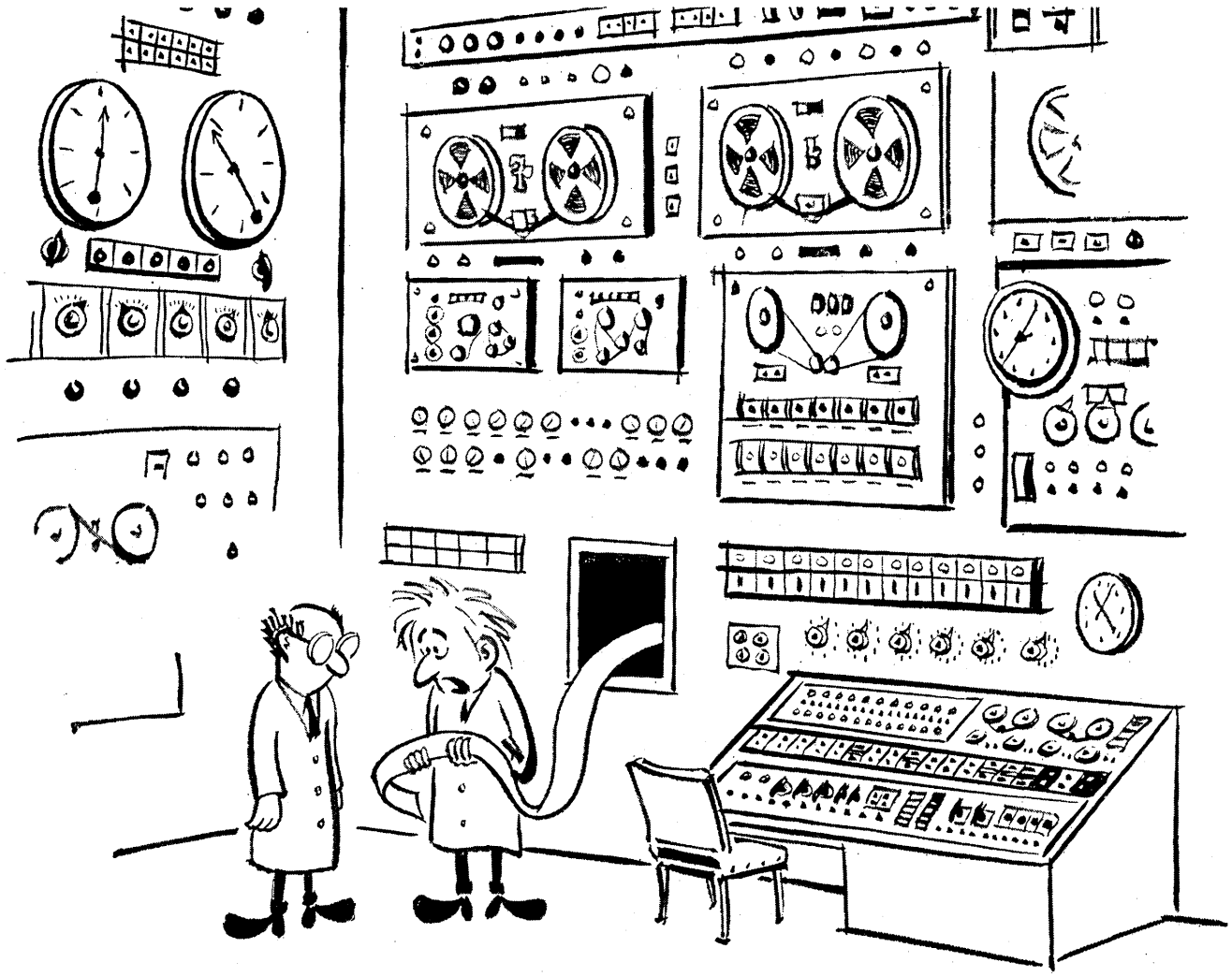
BOSTON BOYS EYE 1130 DISC MARKET

Lured away from the ivory tower 18 months ago, a bevy of bright, young ex-MITers are ready to market a new IBM 1130 disc controller.

The 28-man company, Intercomp, Inc. (Cambridge, Mass.), is headed up by temp. pres. Dr. John Donovan, an MIT prof. Other key people include vp Joseph Alsop, 25 (son of Stewart), pres. of an insurance firm and director of two banks.

Frederick Watress, MIT treasurer, is on the board of directors. Michael Mark, 22, also from MIT, designed the controller. Marketing is under "old hand" Greg Smith, 32, ex-IBM salesman and

(Continued on page 205)



IT SAYS, 'I REFUSE TO ANSWER ANY MORE OF YOUR QUESTIONS UNTIL YOU ORGANIZE WITH A NATIONAL PROGRAM DOCUMENTATION KIT... KIT... KIT... KIT... KIT...'

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.
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- Documentation folder with copper reinforced indexes. Removable so program documents can be kept confidential.
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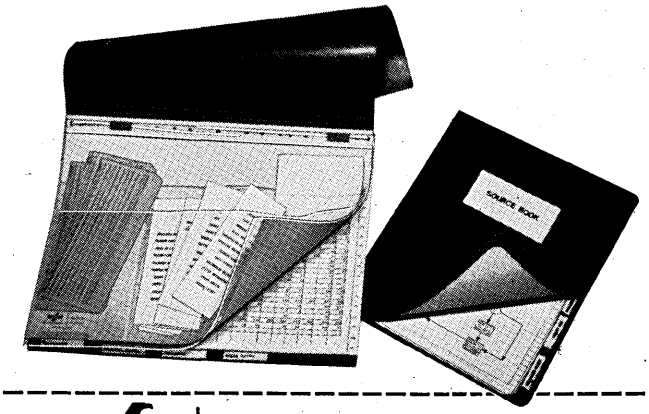
- 65 pre-printed insertable titles plus blank inserts for special needs.

*Mylar is the DuPont name for its brand of Polyester film.



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director of the Univ. of Colorado computer center. Other MITers involved: Prof Robert Graham, Stuard Madnick.

The controller will handle up to 10 2311-compatible disc drives, doesn't require any software conversion. Cost for one single-disc drive controller is $41,760 vs. IBM's $65,880 for a controller and five 2310 drives which equal the 2311's capacity; but the access time of the 2311 is 1/20 that of the 2310. Price for the controller alone: $23K. The market, a reported 4,000 1130 installations, another 4,000 on order.

Double-I also offers a clinical lab system including the 1130, software, interfaces; has sold two to hospitals.

BAY AREA BUNCH AIMS AT TC-500

Four Friden refugees have banded together to form a new firm to manufacture on-line, business-oriented satellite computers/communications processors.

The company, Qantel Corp., Hayward, Cal., is headed by Stanley Mantell, formerly vp of operations at Friden. Other key personnel: Dan Neilson, vp product development; Steve Burack, vp engineering; Bob Kohenda, vp finance. Bill McNamara, vp marketing, came to Qantel from Computer Machinery Corp. Ex RCA-er Jim Schell is director of engineering.

Qantel wants to fill what it feels is a gap between smart—and overexpensive—terminals and large and even more expensive computers...by offering on-line basic business applications plus data accumulating and forwarding.

The philosophy of their Qantel II is basically that of the Burroughs TC-500, but more versatile, powerful and, hopefully, much less expensive. The system will use core instead of disc, feature Qantel's own binary and decimal computer, with microprogramming out of MOS. It will offer interconnections to any modem, connect up to at least eight I/O devices. A protoype is due by fall.

ONE LAST HURDLE FOR ATARCSI?

The airlines have agreed to let ATAR Computer Systems, Inc. provide on-line interairline service to travel agents if CAB approves, but Telemax has told the board the agreement would give ATARCSI a monopoly and "would also enhance IBM's already dominant position." ATARCSI, in a statement to be filed with CAB this month, reportedly will argue that the multiple-supplier approach demands more cooperation from the airlines than they are likely to give; also, using the airlines' own computers to process travel agents' reservation requests, as advocated by Telemax, is impractical because some airlines aren't sufficiently automated.

A basic issue in this battle is whether different makes of computer can be accessed directly through common interfaces serving different groups; the outcome will help determine whether shared data bases in other industires (e.g. banking) are made accessible on a monopolistic or competitive basis.

CSC PLAYS LOW-BALL IN ATTEMPT TO CATCH INFORMATICS' MARK IV

After thinking it over awhile, CSC has decided not to up the price of its revised COGENT to $36K (May, '69, p. 128), will stick to $25K or $1200/month for a 30-day cancellable lease which includes installation, training and maintenance. A handsome 75% of the lease price applies to purchase.

(Continued on page 207)

New System 18/30...

computerized automation in easy, economical steps.

A computerized automation system must first perform today's tasks economically and predictably. The new GA 18/30 industrial computer system is the only automation system to do just that.

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The heart of our new System 18/30 is the 1804 processor, which is fully software compatible at the binary code level with the IBM 1800 and 1130 computers and will work with or extend existing IBM 1800 installations. The 1804 executes over 400,000 instructions per second, has a core memory with a 960-nanosecond cycle time, has a 16-word MSI scratch pad memory with a 35-nanosecond cycle time, hardware double precision arithmetic with multiply and divide, memory storage protect and parity bits, and a 16-bit word and Input/Output rates over 1,600,000 characters per second.

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. GA terminals, communication pre/post processors, process I/O, and data processing I/O, and computer to computer connectors provide the system building blocks required to take on large scale automation on a step by step basis with each step on a predictable cost and results basis.

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The DOS version of the new COGENT is out, being installed, claims enhanced diagnostic capabilities. An OS version is due out July 15. CSC vp Ed Kearns says the decision was made after watching the principal competition (Informatics, folks) "increase his price to the $36K range." (Mark IV-1 costs $30K, Mark IV-2 $35K.) He says the Enemy's product is BAL-oriented and interpretive (Informatics says, "Mark IV is programmed in assembly language...but is not interpretive"); COGENT is a COBOL precompiler and a file maintenance system...that and the price advantage, he feels, will enable CSC to capture "a significant share of the market." (Note: There are over 200 Mark IV's installed.)

RUMORS AND RAW RANDOM DATA

RCA may get around to announcing the Spectra/70 model 61 this fall, a time-sharing version of the 60. One troublemaker commented that this machine would be "the first 360/67 that works"...Rumors persist that CDC is getting closer to assaulting the business dp market, where they've had little luck with the present products, with a family of machines separate from the existing line...CDC is also said to be offering a 6200 to prospects, a detuned 6400, following Univac's approach with the 1106... University Computing's annual report confirmed the rumor that they were designing their own "next generation" machine, meaning an eventual replacement for the 1108's, to be built by "one of the major computer manufacturers." But the last we heard the best bet as manufacturer was Texas Instruments... Cyphernetics, Ann Arbor, Mich. firm (Apr., '69, p. 194), which began operation of its dual PDP-10 t-s network July 1, has developed a new on-line editing/ typesetting service called CypherText. A dozen elementary commands control paragraphing, hyphenating, footnoting, margin-setting, etc. One special command allows definition of special instructions. It's said to drive any typesetting device...BEMA has decided to move its GHQ to Washington "by July '71"...Bob Taylor, ARPA's director of information processing, will leave "sometime this summer" to take a university or industry research management job...Maj. Gen. F. E. Morris, Jr., commander of the AF advanced logistics systems center, reportedly will succeed Maj. Gen. Wendell Carter, who retires August 1 as Deputy Assistant Secretary of Defense for Information—a key DOD dp policy-making job... New OCR firm, Scan Optics Inc., E. Hartford, Conn. will enter the field later this year with modular system, growing from single-font to multi-font capability. Hand-written numerics will be included. That's all their prospectus (for public stock offering) says. Traveler's Insurance has dumped $500K into the firm...We hear that Harvey Goodman has quit the Computer Lessor's Assn.; he's miffed because they wouldn't help him financially in his lawsuit agin IBM...Redcor has closed a $5-million order for computer/terminal systems from Penta Computer Assoc., NYC...Reports are that Management Assistance Inc. has contracts for $9-million worth of Memorex disc drives and Concord tape units. About 1200 of the latter are installed. Trying to become a marketeer of a full line of peripherals, MAI is now negotiating with a crt terminal maker.

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letters . . .

(Continued from p. 29)

prospect of gibbering hordes of rutting "Morlocks" managing to overwhelm and enslave "Eloi" is a little hard to accept. Particularly when one thinks of "Eloi" such as the Mensa-folk.

The self-assurance needed to even try for Mensa membership (restricted to tested IQ's in the top 2%) is no small thing. Indeed, as a result the test appears to select as well for untamed, striving personalities of such natural fighting instincts as would render them truly formidable if ever arrayed against some common threat. Overall, this tiny elite holds such a glut of talent, and its sex drive is so evident, that I think Dr. Hardin can rest easy. Those "Morlocks" just aren't going to make it.

J. R. KLUGH
Santa Monica, California

Sir:

My sense of humor seems to be deteriorating rather than improving with age for I have just completed reading an entire article and I am still unsure of the author's intention.

The article I refer to is "An Evolutionist Looks at Computers" from the May issue. Although the format of the article appeared serious enough at the start I began to feel that the author intended it as a satirical piece when he stated that "middle-aged slaves will be much healthier animals than their middle-aged masters," when it is my opinion that middle-aged slaves were usually dead as a result of physical exhaustion.

I was almost positive that the way in which the author justified his statement that "An unused structure necessarily degenerates; a partially used structure partially degenerates" was a not so gentle spoof of the hand-waving "it can be shown that" and "it's so complex that you wouldn't understand anyway" that so often serves as proof. This was followed by such perfectly ridiculous statements as "Nobody adds anymore," and "Human thinking functions, disused, have been set on the road toward degeneration." (When, in fact, more of the population can add, as well as read and write, today than ever before in man's history; when there is no indication that any part of the human thinking function is disused; and when, to my mind, there is no proof that disuse would result in mankind losing this ability.) At this point I was almost totally convinced that the article was intended as satire.

But as I read past such statements as "a rift is being created in the species," " . . . no Morlocks will be needed at all—but it looks like we are going to have them," " . . . by chance or by design the Morlocks might be inveigled into breeding less rapidly than the Eloi," "There is little sign of the solidarity among the Eloi that would have to exist if a solution were to be found," and " . . . do we not need an explicit glorification of the transcendental values of thinking?", I suddenly became aware that I really didn't find this amusing at all and one of two conditions must hold: 1) my sense of humor had not been sharpened enough to appreciate Dr. Hardin's particular brand of satire, or 2) the article is not actually intended to be humorous.

Now if the first situation is true I must learn to live with my obvious deficiency. What really bothers me is that the second condition might hold —that Dr. Hardin really means what he says. If this is the case, I think all of your readers should be concerned.

Although I was somewhat disturbed by the completely unscientific and illogical slant of the whole article, I would probably have done nothing more than ignore it had the author been content to use unsupported opinions as facts (that the human thinking function is falling into disuse, that the capability to think is both genetically dependent and a factor in the natural selection process), then apply to them an unproved "law" to arrive at the totally absurd "deduction" that the human thinking process is doomed to extinction. Had the article ended there it might have had some harmful effect but this effect probably would have been limited to the bleeding ulcers and falling hair that it would have brought about in the few gullible readers who could accept such 'reasoning.' But the author wasn't content with that. He had to drag out the skeleton that has probably served to create more hatred, fear, suffering, and sorrow than any other single cause; that of class distinction.

Now, I do not object to the idea that mankind is divided into two classes. In fact, I am sure this *is* the case. However, I don't believe the two classes are intellectuals and nonintellectuals, Black and White, good and evil, or even Dr. Hardin's more euphemistic Eloi and Morlock. Rather, I contend the two classes of man are those who feel that there is, or ever will be, two *natural* classes and those who do not. I prefer to include myself in this latter category and would hope and pray that the large majority of

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rational people would do the same. I don't deny that classes do exist in our society, have existed in other societies, and will continue to exist in future societies. But it is my belief that such stratification does not result from a natural process such as genetic evolution but, rather, that it is invented and nurtured by individuals who wish to serve their own selfish purposes. Luckily, most attempts at such classification fail or are relatively harmless to man. To cite an example used in the article, no one is really affected to a large degree if special consideration is paid to those who possess exceptional athletic ability. At other times, the class distinction can be disastrous; as was demonstrated so well in Nazi Germany.

I can't really believe that any rational person will accept the assumption that there is a *natural* intellectual class in our society today. Had Dr. Hardin read his own article carefully he would have sufficient information to disprove this thesis. For example, he obviously considers himself an Eloi and yet his father, lacking a high school education, must have been a Morlock. And if "children of the Eloi in large numbers are leaving the parental society and joining the Morlocks," isn't it reasonable to assume that some Morlock children are sneaking in the Eloi's back door?

In summary, I would hope that my first expression was correct, that the article was really satire and that I just have too much Morlock blood in my veins to appreciate such delicate humor.

JACK THOMPSON
Indiana, Pennsylvania

Sir:

In "An Evolutionist Looks at Computers," Dr. Garrett Hardin laments that computers and other automatic machine tools are putting out of work our "Morlocks," that is, our unskilled and low-skilled laborers.

I think he is putting the blame in the wrong place. Rather, it is because our Morlocks are being put out of work that the development and use of automation is necessary. Our benevolent Government, in its great wisdom, has decreed that any man who is unable or unwilling to produce at a certain level shall not be allowed to hold a job. That required level of production is the level at which it becomes worthwhile for the employer to pay the worker the legal minimum wage and to pay the Government the taxes associated with that wage.

If one looks at charts of the mandatory minimum wage and the level of unemployment plotted against time, he sees very clearly that a rise in the former is followed very definitely by a rise in the latter.

As the workers are forced off the job, the employers must use automatic machine tools in order to keep up production.

Actually, the standard of living of a society is dependent not on how many people are working or how many dollars they are receiving, but on how much is being produced of desirable goods and services. The labor is not the goal but the means of achieving the goal.

C. C. DEVALON, JR.
Torrance, California

Sir:

Re "An Evolutionist Looks at Computers," the author implies that the loss of ability to, for instance, add in one's head represents a total net loss in biological function. I suspect that this is no more a net loss than was the "loss" of ability to swing from tree to tree by our tails. The transition from swinging to walking involved, perhaps, a period of painful readjustment, but we seem to have made it. In fact, just as prehistoric apes, once having descended from the trees, were able to develop more useful functions (i.e., an opposing thumb), so will we go on to devote our minds to more useful things than adding columns of figures.

DANIEL DURYEA
Cambridge, Massachusetts

incomplete checkup

Sir:

I read with interest the survey articles regarding data processing in hospitals in the May issue. I would like to make two points:

1. That in order for a survey to be meaningful it should attempt to be as inclusive as possible. The article does not make mention of the fact that the Loyola University Medical Center has the most complete on-line, real-time hospital information system operating anywhere in the country. It uses IBM's MISP programs with tailor-made but generally written H.I.S. application programs. As Director of Medical Center Information Systems for Loyola, I have had the full responsibility for the design and implementation of this system.

2. The "Editor's Readout" calls for an exchange of information based on practical experience and asks for a national conference on hospital computer planning.

In March 1968, I founded the Hospital Information Systems Sharing Group at the Loyola University Medical Center, which consists of nineteen members.

The membership represents those people and institutions who are performing significant work in the area of hospital information systems. It is a true sharing group whose sole purpose is for the exchange of information. This group has met ten times in various locations throughout the country since its inception. More information regarding the group can be obtained from me.

I found your survey articles interesting but lacking in completeness. They do not take into account the recent advancements in applications and installations represented by the membership of the group that have and will continue to take place at a very rapid rate.

RICHARD B. FREIBRUN
Loyola University Medical Center
Maywood, Illinois

sorry about that

Sir:

Decency and justice demand this apology from me, directed to Dr. Knuth, whom I inaccurately criticized in a letter to you (April '69).

I now learn, from his reply in the May issue, that the article on "Evolution of Numbering Systems" published in February was *not*, as it appeared to be, a definitive treatment of the subject, but merely an excerpt from his chapter on "Positional Number Systems."

I shall look forward to reading his 9.1 section on Roman numerals, an idle fad of mine.

I hope, by publishing this letter, you will make my apology as public as my criticism.

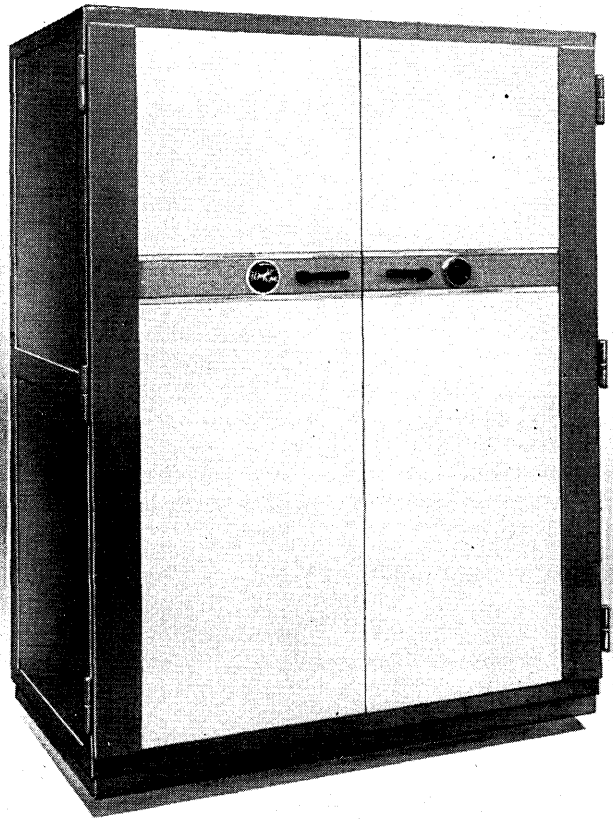
P. M. BEATTS
Los Altos, California

DATAMATION welcomes correspondence about the computer industry and its effects on society, as well as comments on the contents of this publication. Letters should be typed, double-spaced, and brief. Only those reaching the editors by the 1st can be considered for the next month's issue. We reserve the right to edit or select excerpts from letters submitted to us.

Wright LINE

EVERYTHING FOR DATA PROCESSING

...except the computer



NEW SAFER STORAGE FOR VITAL EDP RECORDS

Even if you are now in a "fire proof" building, storing tapes off-site or using a conventional vault, you probably don't have the complete protection you need.

At 150°F or 85% relative humidity, information stored on tape or disks is subject to read out loss. The cost of losing records could put many companies out of business, but you can guard against losses by properly protecting EDP records.

Wright Line Data Bank Safes are the only storage equipment to carry the Underwriters' Laboratories 150°-4 hr. label for safest protection of vital EDP media. They are available in four sizes and with a variety of internal configurations for the storage of tapes, and disk packs.

For complete details circle readers service no. 101

GOLD STAR FILES The most beautiful and versatile card files available. Line includes three wide files and counter-top model with plastic-laminate surface.
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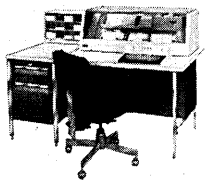
TAPE CLEANER combines pulsed vacuum vibration and powerful vacuum to completely clean 2400 foot reel of tape in less than four minutes.
For details circle Readers Service No. 108



COUSTI-COVER reduces keypunch noise level by as much as 75%. Hinged transparent acrylic cover allows easy access to keypunch.
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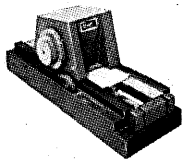

PORTABLE CARD PUNCHES for punching cards and plastic cards. Printing punch has tab stops and prints and punches simultaneously.
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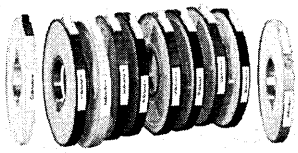
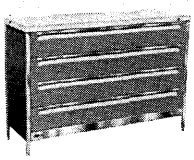


TAPE-SEAL® SYSTEM The safest, easiest handling, most economical method of storing tape. Line includes cabinets. trucks and accessories.
For details circle Readers Service No. 106



DISK PACKS AND DISK PACK STORAGE 1316, 2316, and 2315 Disk Packs with Data Coat Surface and a complete line of storage units to give you maximum safety and protection.
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THE ICP QUARTERLY ISN'T FOR EVERY TOM, DICK AND LYDIA

After a hard day on the set, aging starlet Lydia Libido likes to relax by leafing through the latest issue of the ICP Quarterly Catalog. Lydia, whose latest releases include *Poolroom Ballerina* and *Vampire Sing-Out,* heard that the ICP Quarterly has the world's largest listing of software for sale or lease. The world's largest anything, she figures, must be important. Besides, the word "software" turns her on. Money, of course, is no object to Miss Libido; $60 for a year's subscription is just a fraction of the cost of a face lift. Besides, Lydia hopes to make a bundle by having the Quarterly adapted for the screen. Why Lydia Libido subscribes is her business. But most people take our Quarterly because they've found that buying software saves a lot of time, talent and money. If that interests you, drop us a heart.

☐ I don't know what you're talking about, but send me a Lydia poster. I enclose $1.50.

International Computer Programs, Inc.
Dept. C
2511 East 46th Street
Indianapolis, Indiana 46205

☐ Please send the latest ICP QUARTERLY for review and a free Lydia Poster. If after 15 days I do not wish to subscribe, I'll return the copy with no obligation, but keep Lydia.

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Position_____

Firm_____

Firm Address_____

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State_____

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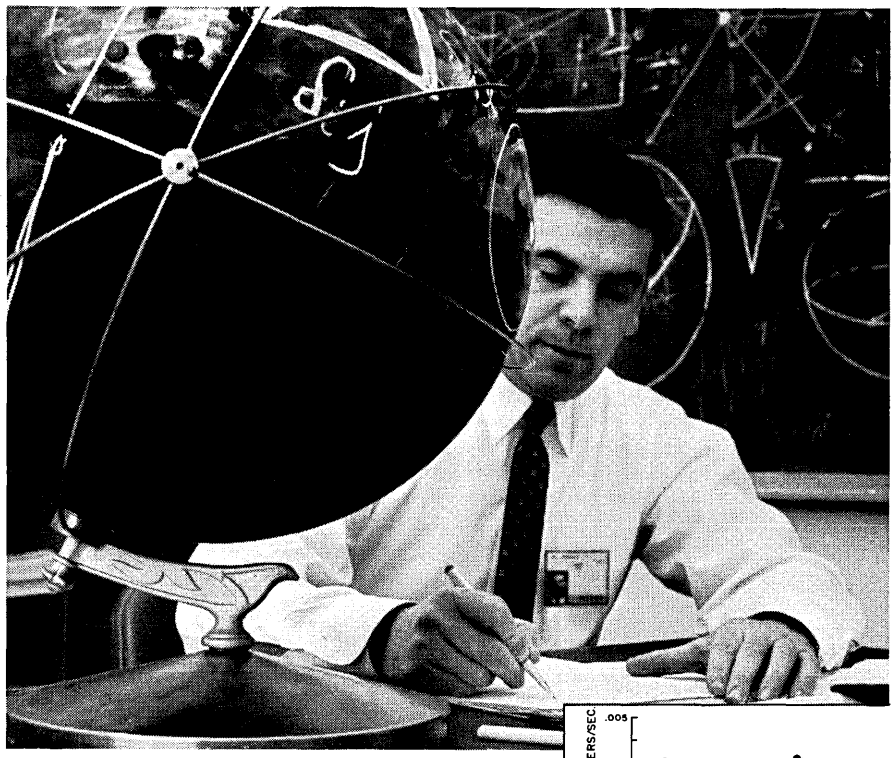
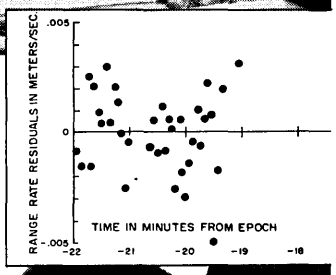
recruitment advertisers' index

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:





We have projects from ARB to ZRT.

Enough, in real words, for a lot more good people than we have right now. In everything from military command and control to urban planning, from medical information to air traffic control. Important jobs!

So we're looking. But we're looking only for top people. People who want to work in the large and complex systems business. People capable of taking over important jobs, and seeing them through.

If you're thinking of looking, look into MITRE. You couldn't have chosen a better time.

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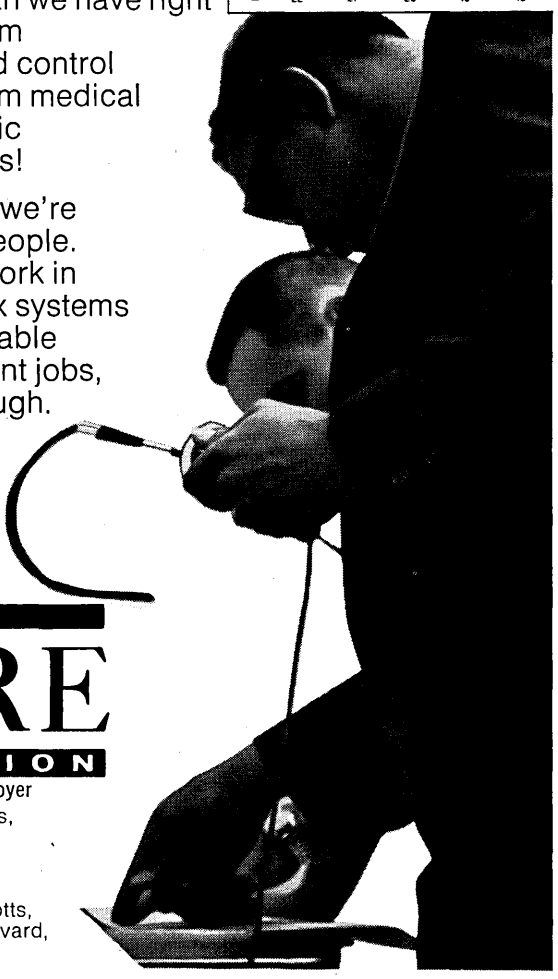
Address: Mr. Richard Seamans, The MITRE Corporation, 3607 Middlesex Turnpike, Bedford, Mass. 01730

In Washington: Mr. Robert Knotts, 1820AU Dolley Madison Boulevard, McLean, Virginia 22101



CIRCLE 340 ON READER CARD

"Let's get one thing straight... you can get ahead faster at LINK"

And that's a fact.

At Link, we make it a point to recognize individuality, creative freedom, and active project participation.

Since we're a dynamic, expanding firm backed by the full resources of a huge company, you can't get lost in the crowd here. The effects of your work are visible, significant and appreciated.

With us, you can become actively involved in a broad range of exciting new projects. They include advanced computer related electronics; advanced microfilm technology; spacecraft and aircraft simulators; participation in U.S. manned space programs; land, sea, and subsea ordnance; and sophisticated traffic control systems.

And the rewards couldn't be better. Because at Link, you can go as far and as fast as your talents take you. And then some. What's more, you'll also have the great advantage of living and working in Sunnyvale—at the heart of the San Francisco Peninsula, near Stanford and Cal, the bay and the ocean, the wine country and the redwood forest.

So if you want a place in the sun at Link, check one of the following disciplines:

Scientific Programmers
Test Engineers
Sales Engineers
Circuit Design Engineers
Logic Design Engineers
Digital and Analog Technicians
Program Managers
Proposal Engineers

If you are interested in a Link career, please send resume including salary history and present requirements, in complete confidence, to Mr. R. Nadzam, Employment Manager, Singer-General Precision, Inc. Dept. DA, 1077 E. Arques Avenue, Sunnyvale, California 94086.

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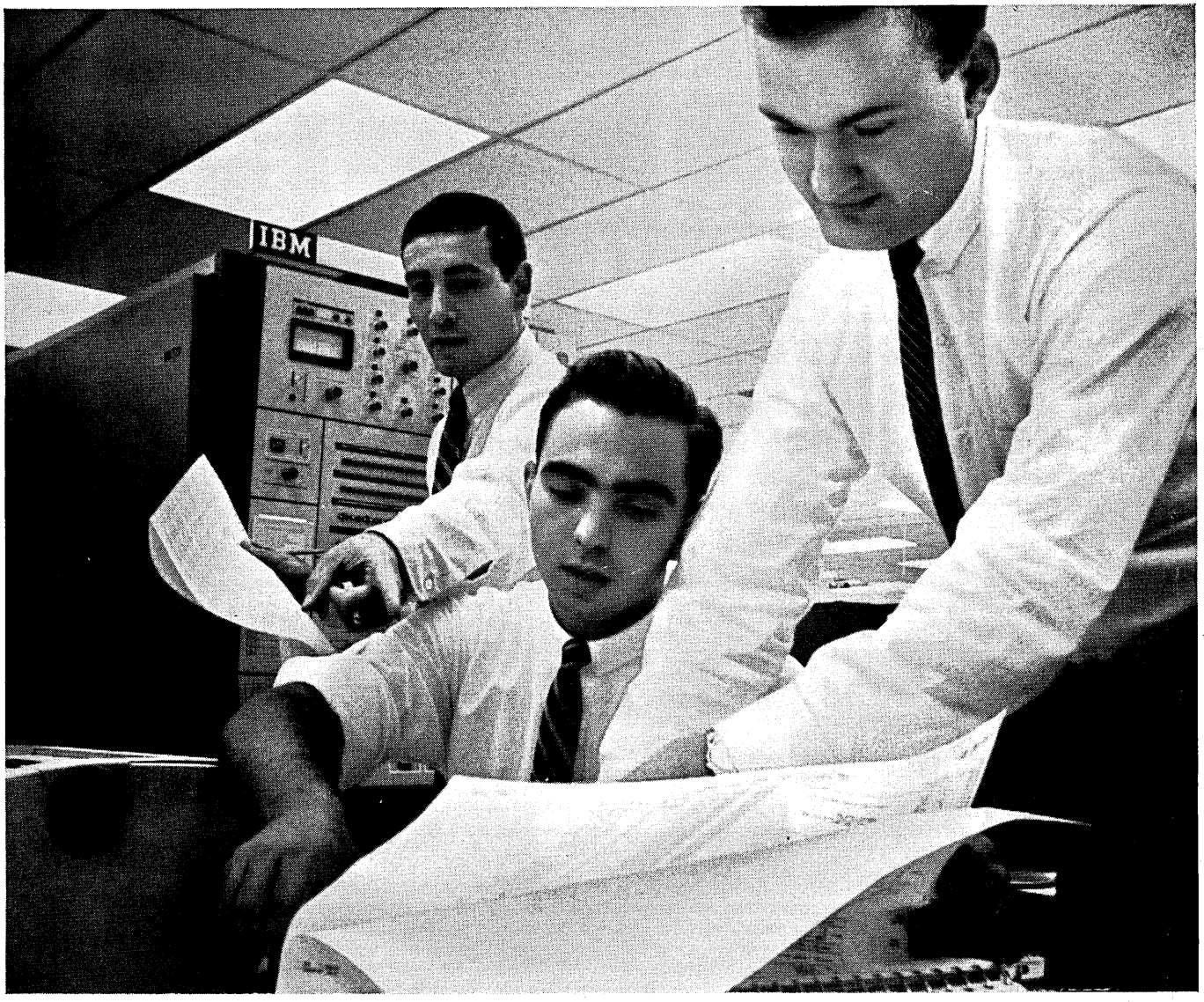
Scientific Engineering Programmers:
Help IBM expand new technologies in semiconductors.



At IBM's Components Division in East Fishkill, N.Y., we develop and manufacture semiconductor devices for our computers.

We're looking for Scientific Engineering Programmers to help us design and develop quality control and manufacturing systems to test improved semiconductor devices.

What you'd do

If you qualify, you'd join a project team, or take on an individual assignment, within our advanced semiconductor group. You'd interface with a number of engineering disciplines and give them basic system support.

You'd concentrate in such areas as process control of test equipment, semiconductor processes, analysis of process-oriented engineering data, research or manufacturing records.

And among the tools you'd use are our sophisticated 1800, 1130 and System/360 computers.

You should have a Bachelor's degree in Engineering or Math with at least one year's programming experience.

Call or write

If you're interested, call Dan Pearlman at (914) 897-6405 collect. Or send a brief letter or resume to him at IBM Corporation, Dept. CG1010, Components Division, Route 52, Hopewell Junction, N.Y. 12533.

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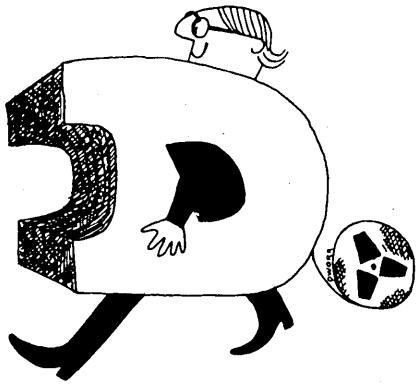


Step into ITT's New Data Dimension ...and exert yourself.

We're not going to fool you. Entering ITT's new Data Dimension is more like a stride than a step. Which means your mind may be more often in gear than you've been used to. But, that's what the Data Dimension demands ... and what happens when you're helping implement a multi-million dollar ITT program to establish a nationwide network of data processing service centers.

Still staying honest, we'll admit the Data Dimension isn't exactly a cerebral holiday. It's surveying whole new industries—adapting and/or creating hardware systems for them. Like plunging into a spate of applications problems and creating new compilers and executive systems. Or thinking in terms of now, sophisticated peripherals like CRT terminals, X-Y plotters, TTY systems, data concentrators and the like. Coming up for a breath, you might find yourself spewing out new wrinkles for current languages.

But, if it's tough, the Data Dimension is also rewarding. You'll be able to work with nothing but System/360 computers. Move ahead professionally in the most advanced time-sharing atmosphere around. Get personal satisfaction from an excellent salary and a matching benefits program.

ITT's new Data Dimension isn't just another transitional move in EDP. It's a leap-frog, career express stop that bypasses "Stifling Gulch". Right now we need many different skills including:

SALES REPRESENTATIVES

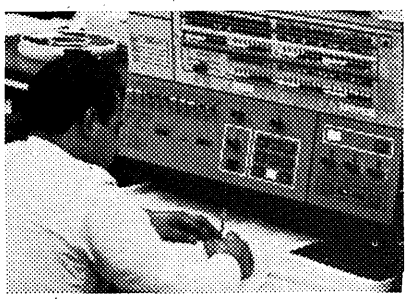
College degree preferred with 2-3 years' experience in marketing commercial software applications packages, programming services or time-sharing services.

Openings in New York—Northern New Jersey, Washington, Detroit, Chicago, Houston, Boston, St. Louis, San Francisco, Los Angeles and San Diego.

SYSTEMS PROGRAMMERS

For large-scale, real-time information systems using teleprocessing techniques and CRT's. 2-3 years' IBM System 360/BAL programming experience on information retrieval systems. (Will consider COBOL if other experience is pertinent.) To extend software to interface with the IBM 360 System. Must have 1-2 years' machine language experience with Honeywell DDP-516.

Openings in Paramus, New Jersey, Houston and Los Angeles.



PROGRAMMERS/ ANALYSTS

Openings at all levels to develop applications programs in accounting, MIS, inventory control, sales forecasting, production control and finance. Requirements are a degree in business, economics, finance or operations research with one or more years experience related to your specialty since your degree. Languages include COBOL, BAL, JCL.

Openings in Paramus, New Jersey, Albany, St. Louis and Los Angeles.

SYSTEMS REPRESENTATIVES

Sales support for time-sharing systems, consumer finance and credit information systems. Must know IBM Systems 360/BAL, COBOL, and/or FORTRAN IV programming. OS, DOS, MFT/MVT, etc., highly desirable.

Openings in Paramus, New Jersey, Chicago, Detroit, St. Louis, Houston, Boston and Los Angeles.

PROGRAMMERS (Naval Tactical Data Systems)

Openings at Virginia Beach for candidates with a BS and minimum 6 months programming experience involving real-time command/control system on such equipment as IBM 360/65, 67, RCA Spectra 70, GE 600, CDC 3000, 6000, Univac 490, 1206, 1830, 1230, 1218.

Please forward your resume, in confidence, to Mr. E. S. Galvin, ITT Data Services, Dept. 326-MG, Route 17 & Garden State Parkway, Paramus, New Jersey 07652.

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Salaries range from $8,200 to $25,000.
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Salary range: $8,000-$30,000. All expenses paid by client companies (fees, interviewing and relocation).

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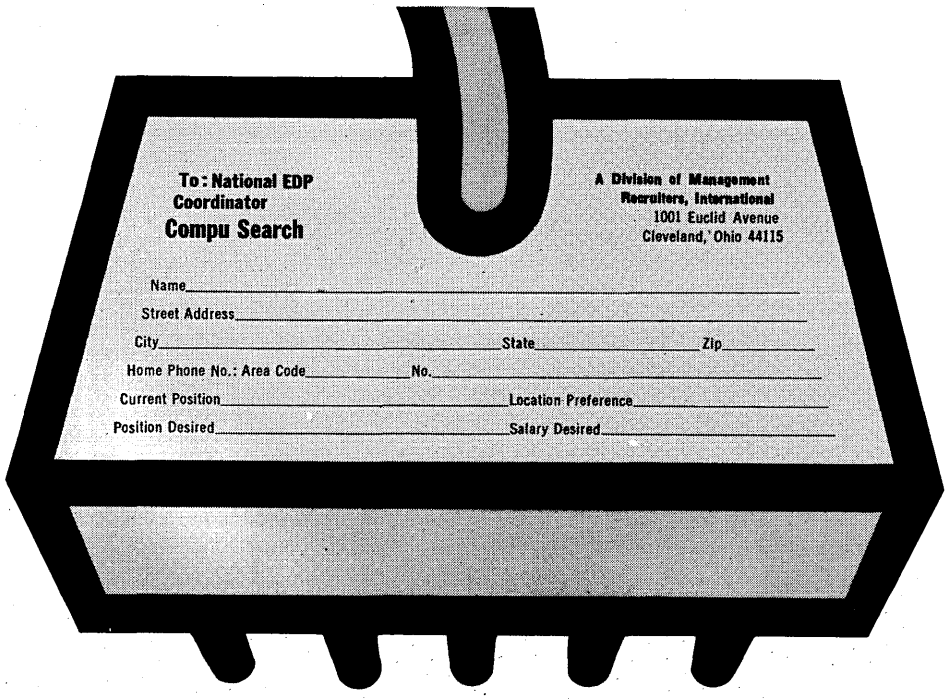

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Compu Search is a nationally coordinated network of over 50 offices devoted exclusively to your career advancement in the Data Processing Industry. We know our installations like a printout and have an abundance of positions at all levels of data processing. Salaries range from $7,000 to $40,000 per year, and naturally our client companies assume all fees.

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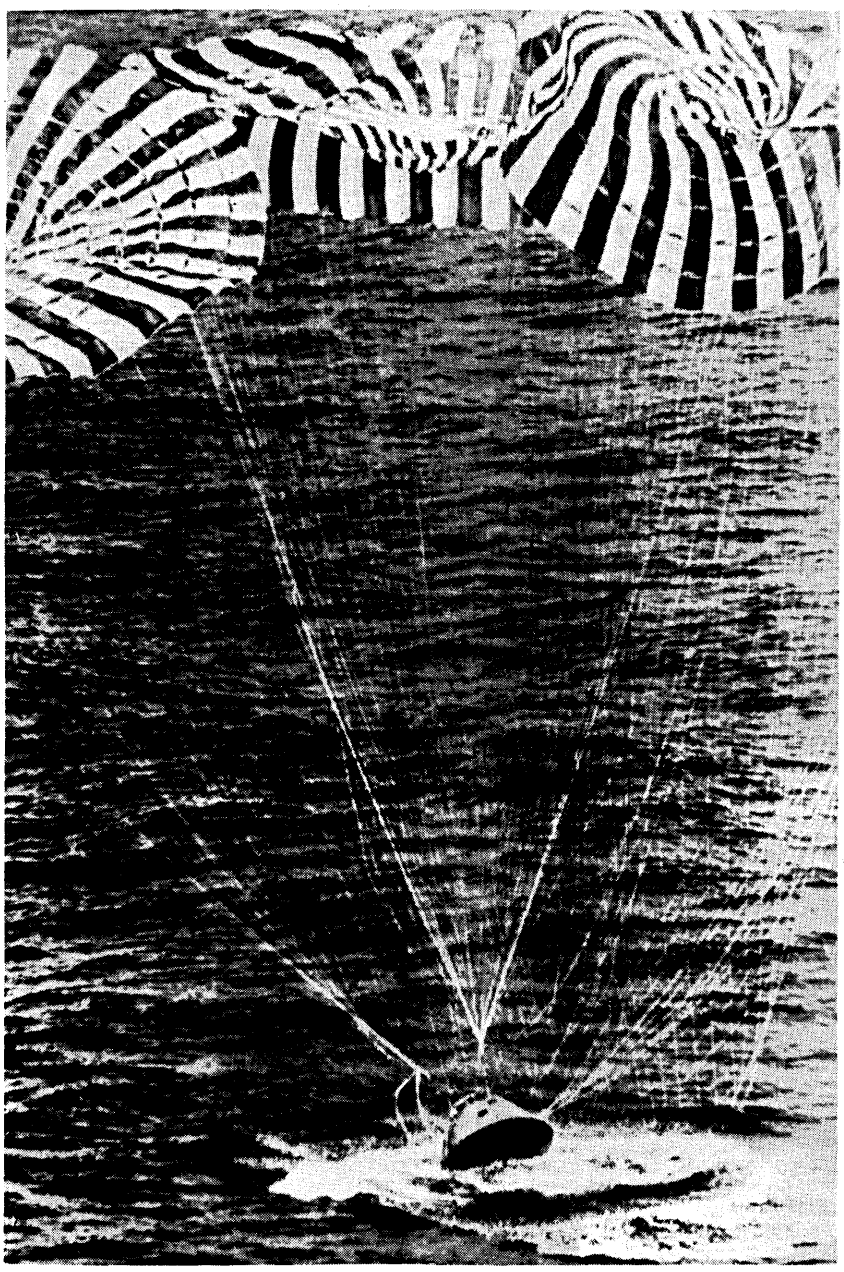

If you think the last shot was a real bell ringer... the big ones are still to come!

We're now looking far beyond the lunar landing.

And that's the interesting part about working on America's space program, the challenge is always there. Right now NASA has big plans. As they see it, "- - - In the coming years we will see an expansion of our knowledge of not only the planets Mars and Venus but also Mercury, Jupiter and the other outer planets."

We can make you a part of that future if you join the Lockheed Team at the NASA Manned Space Center in Houston. You'll work on the future in a pleasant present.

You'll be developing programming systems and advanced techniques that integrate digital, analog or hybrid computers into the overall functions of scientific computation, data acquisition, transmission and processing. You might perform analysis and programming on IBM, UNIVAC or CDC equipment, using COBOL and FORTRAN IV and V. Or you might analyze equipment configurations and data processing requirements for instrumentation engineering of telemetry communications systems. Or you might develop electrical and numerical models of scientific and engineering problems for solution on high speed computers.

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We'll encourage you to continue your education. At company sponsored courses. At any of the colleges and universities in the Houston area. And we have regular management training programs in which we enroll key management and potential management people.

And, living in the Houston area is great for the family. Your children will have the advantage of attending exceptional schools with the children of our space pioneers.

A thriving community with attractive homes, sailing, golf and other recreation has grown up right around the Manned Spacecraft Center. And theatres, museums, concerts and fine shopping are just a few minutes away from your work in the metropolitan center of Houston.

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A Division of Lockheed Aircraft Corporation
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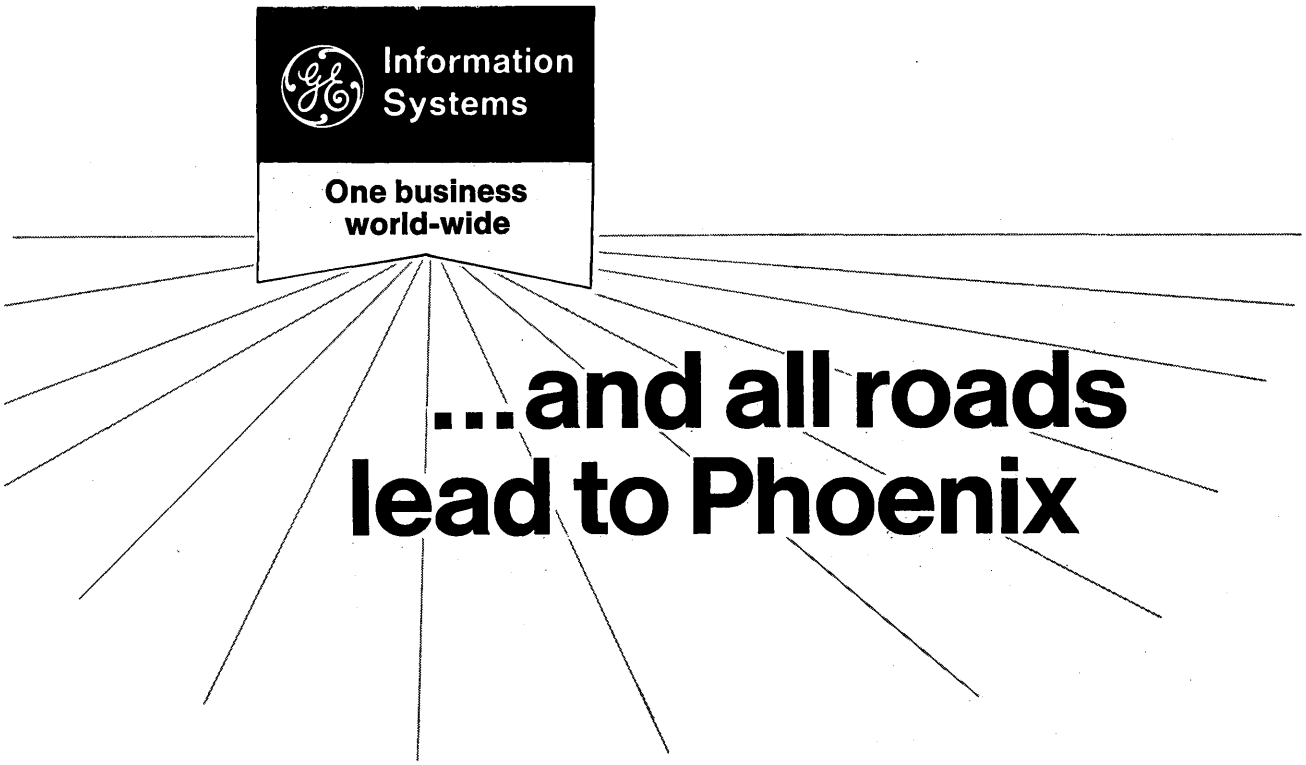
CIRCLE 331 ON READER CARD



■ Since 1956 General Electric Information Systems (valued at one billion dollars) have been delivered to and are being used by more than 7000 customers in over 50 countries.

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A word about location: few areas in the country can match the Southwest for year-round living and few areas in the Southwest can match Phoenix with its excellent public schools, Arizona State University in suburban Tempe, 4 months of skiing 150 miles to the north, 8 months of swimming in your own backyard, 12 months of boating, fishing and golf practically anywhere.

Basic candidate prerequisites: appropriate training plus 2-10 years applicable experience.

Get on line regarding these opportunities by sending a detailed resume including salary history to: Mr. George Callender, General Electric Co., Information Systems Equipment Division, Sect. 40-G, 13430 N. Black Canyon Highway, Phoenix, Arizona 85029.

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Simulation and Math Modeling
Software Systems Development
Software Applications

MANUFACTURING

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Test Equipment Design
Quality Control Engineering
Process Engineering
Static Memories
Multilayer Boards
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Sales Planning
EDP Sales
Applications
Industrial
Manufacturing
Banking
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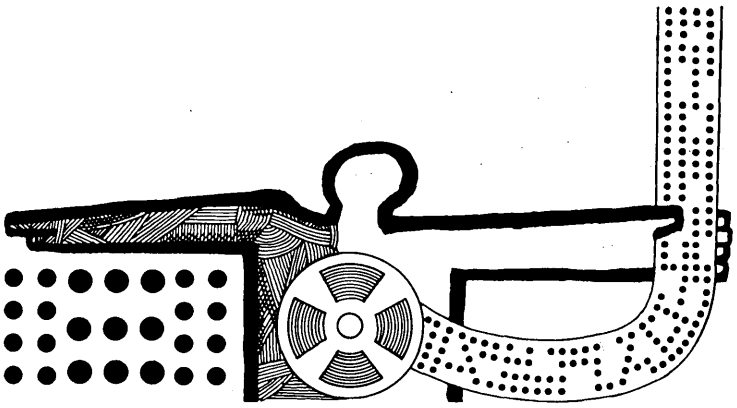


PROGRAMMERS SYSTEMS AND BUSINESS

Systems programming is in three areas of application: 1) Develop on-line systems for hospital data management. Must have IBM 360/DOS and assembly language background; 2) Perform test data programming on advanced aerospace projects. Must have CDC 6000 experience; 3) Coordinate between programming and manufacturing organizations. Must have A.P.T. systems experience. BS in math or engineering is required for all above positions. Business programming: Develop COBOL programs for hospital business offices. Must have degree and two years' experience.

For further information please write H. W. Bissell, Professional Placement Manager, P.O. Box 504, Sunnyvale, California 94088. An equal opportunity employer.

LOCKHEED
MISSILES & SPACE COMPANY
A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION

CIRCLE 319 ON READER CARD

SENIOR ANALYSTS

and

PROGRAMMERS

EUROPE

We have separated the functions of Analysis and Programming and we are developing a methodology which will lead to improved techniques.

We are looking for both Analysts and Programmers with a minimum of three years' experience, who would like to work on short or long term projects in the mutual fund, banking, and insurance fields, and who would be interested in learning about and developing such techniques as:

ANALYSIS

The preparation of programming specifications in symbolic form; element analysis and definitions; set analysis; level analysis; display analysis; the theory and use of tables; and notation.

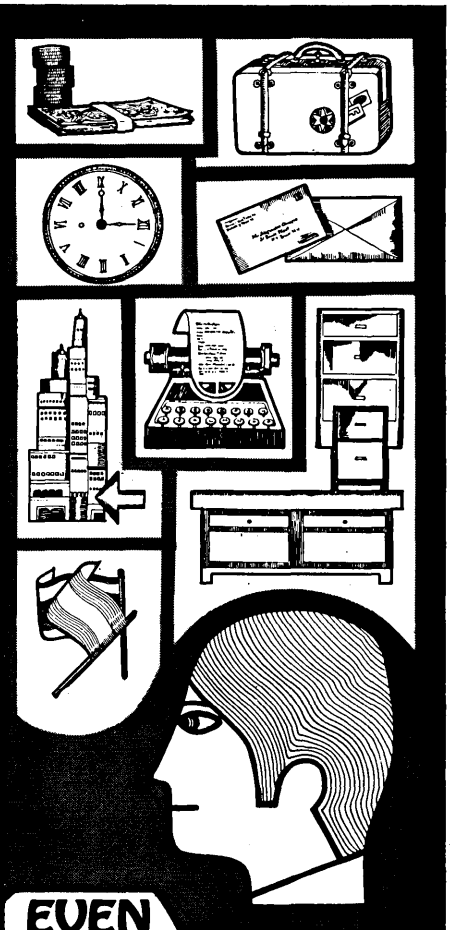
PROGRAMMING

The definition of routines; the definition of records; theory of types; the theory of finite state automata; recursive routines; and definition of programming projects on DOS/360 and UNIVAC 9300.

Salaries for the above positions will be attractive; and, in addition, the Company has interesting benefits.

Interviews will be held shortly and persons wishing to apply should immediately send their resumes to:

Box D, 1330, 125 W. 41 St., N. Y. 10036



EVEN PROGRAMMERS HAVE DREAMS

Parker-Finch can help you make your dreams a reality. We can tell you everything you want to know: Who needs you now. What they'll pay. The hours, the vacation, the extra benefits they offer. Where they're located in the metropolitan New York-New Jersey area. The equipment they have on hand and on order. The languages they're looking for. The programs they're writing and getting ready to write. It all adds up to a fresh approach to *your* future!

It's easy to get started. Just complete this coupon, send your resume or call.

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City & State_____ Zip_____
Telephone home_____ office_____
Present Employer_____
Position_____ Salary: $_____
Description of Responsibilities:_____

Machines and Languages you are familiar with:_____

Job Preference:_____
Geographic Preference:_____
Special Interests:_____
Education (highest degree achieved)_____

PARKER-FINCH **Associates, Inc.,**
51 East 42nd Street
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10017 (212) 661-1830

CIRCLE 337 ON READER CARD

The new big Software jobs are in control systems — at Foxboro!

If you really want responsibility, involvement, and "hands-on" programming experience, join the team of professionals at Foxboro who are setting the pace in new process control systems.

Foxboro has a total systems capability and responsibility for designing, building and installing digital and analog control systems for customers throughout the world. Our world-wide installations control processes that produce PVC (polyvinyl chloride), gasoline, liquefied natural gases, cement, paper, food and a wide range of other products. They utilize single, dual and triple computer configurations.

The complexity, size and diversity of existing projects and experimental programs now underway at Foxboro's suburban Boston headquarters are greater than at any other time in our 60 year history. And the opportunities for professional and personal rewards are greater too.

APPLICATIONS PROGRAMMERS

Several new positions exist requiring varying levels of experience. Creative application programmers are sought who are capable of taking complete responsibility for bringing process control systems' software from their introductory stages of design through to full real time simulation testing and installation. Experience is required in one or more of the following areas: Real Time Executives and/or Real Time Input-Output, Time Sharing, Batch Control, DDC, Setpoint Control and Multilevel Programming.

SOFTWARE SYSTEMS DESIGN

Senior Programmers and Designers are sought to work in a creative environment, developing a new generation of digital technology. Development programs encompass advanced Real Time Systems, Computer-based CRT Display Systems and Man-Machine Communications. A degree is required, with a minimum of 3 years' programming experience in leading development efforts in operating systems, languages and communication, and control software development. Successful candidates will be responsible for all phases of program designing, coding, checkout and documentation.

Interested individuals should forward their resume or a detailed letter to Mr. Tom Bryant, Professional Placement Office, The Foxboro Company, Dept. D7, Neponset Avenue, Foxboro, Mass. 02035. Foxboro is an equal opportunity employer.

FOXBORO®

SYSTEMS ANALYST

Exceptional career opportunity for individual with 2 to 4 years scientific data processing background. Supervising experience beneficial. Duties and responsibilities will include:

- **Organizing and directing execution of systems analysis and design tasks.**
- **Defining data requirements for systems study.**
- **Assisting in the development of computer programs for handling research data.**

Third generation computers.

This assignment's in our modern laboratories located in Ann Arbor, Michigan. Please send complete resume in confidence to:

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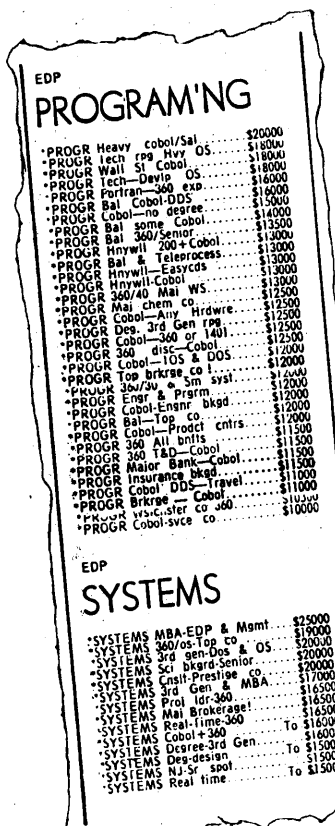

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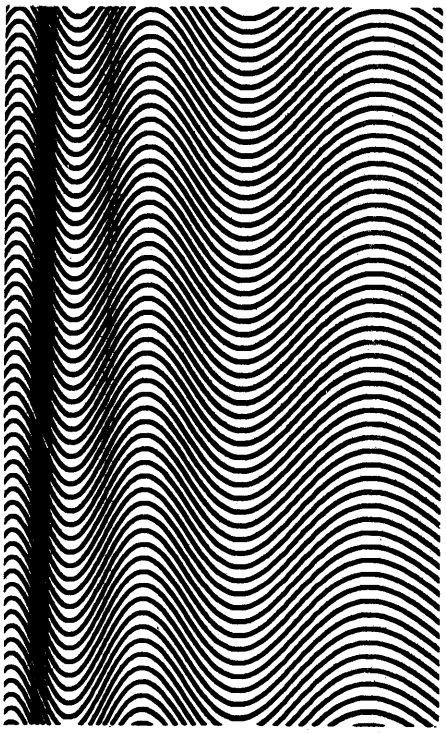

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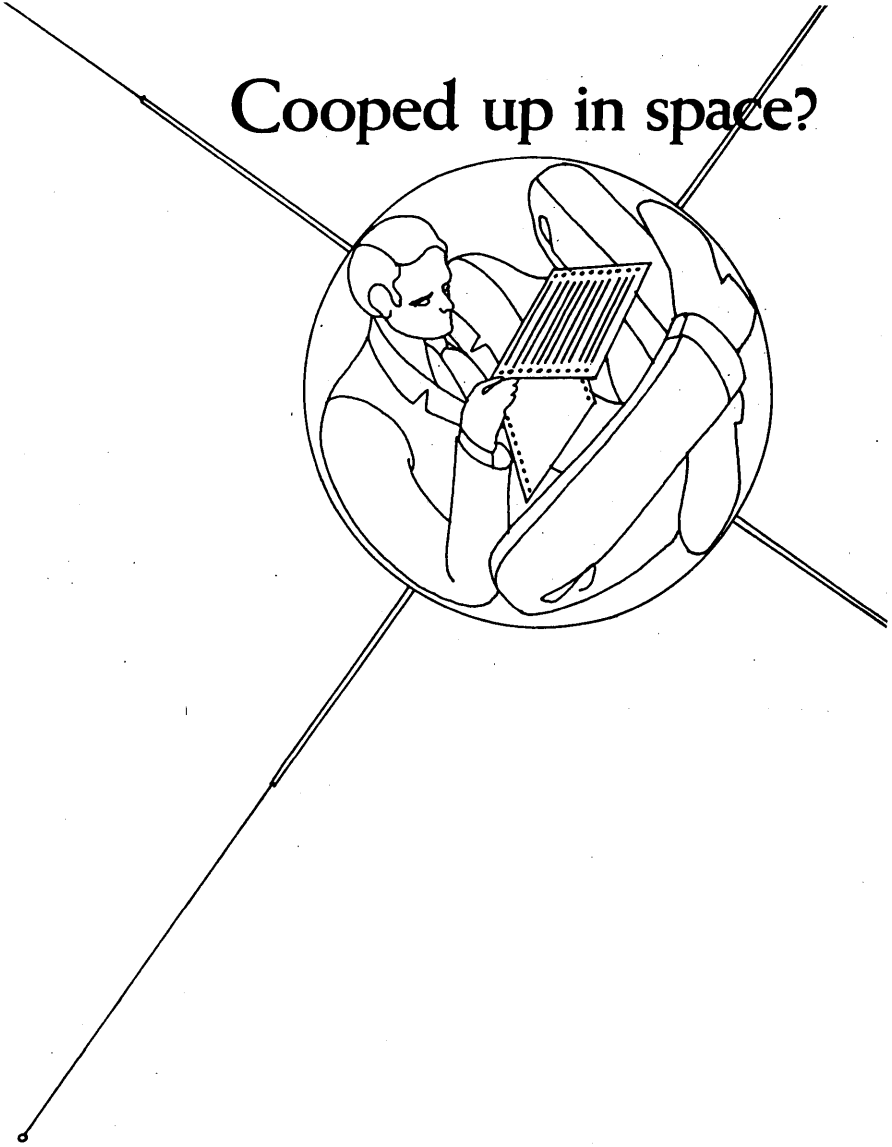

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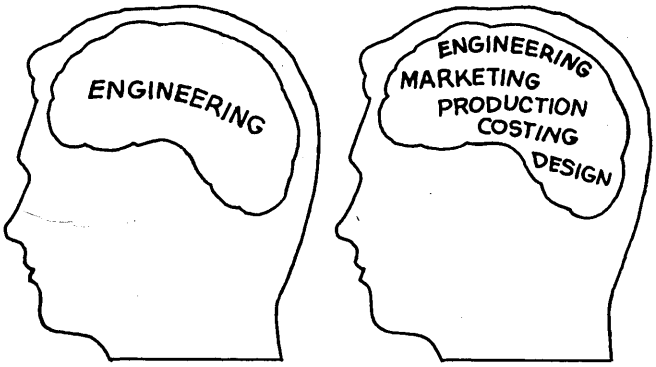

ORDINARY ENGINEERS OUR ENGINEERS

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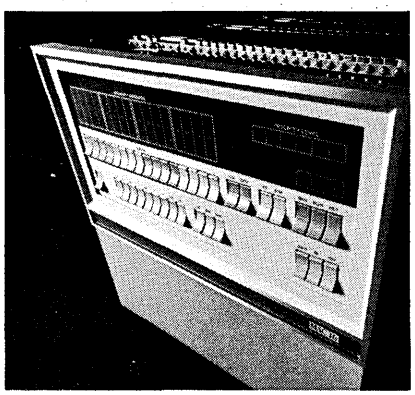

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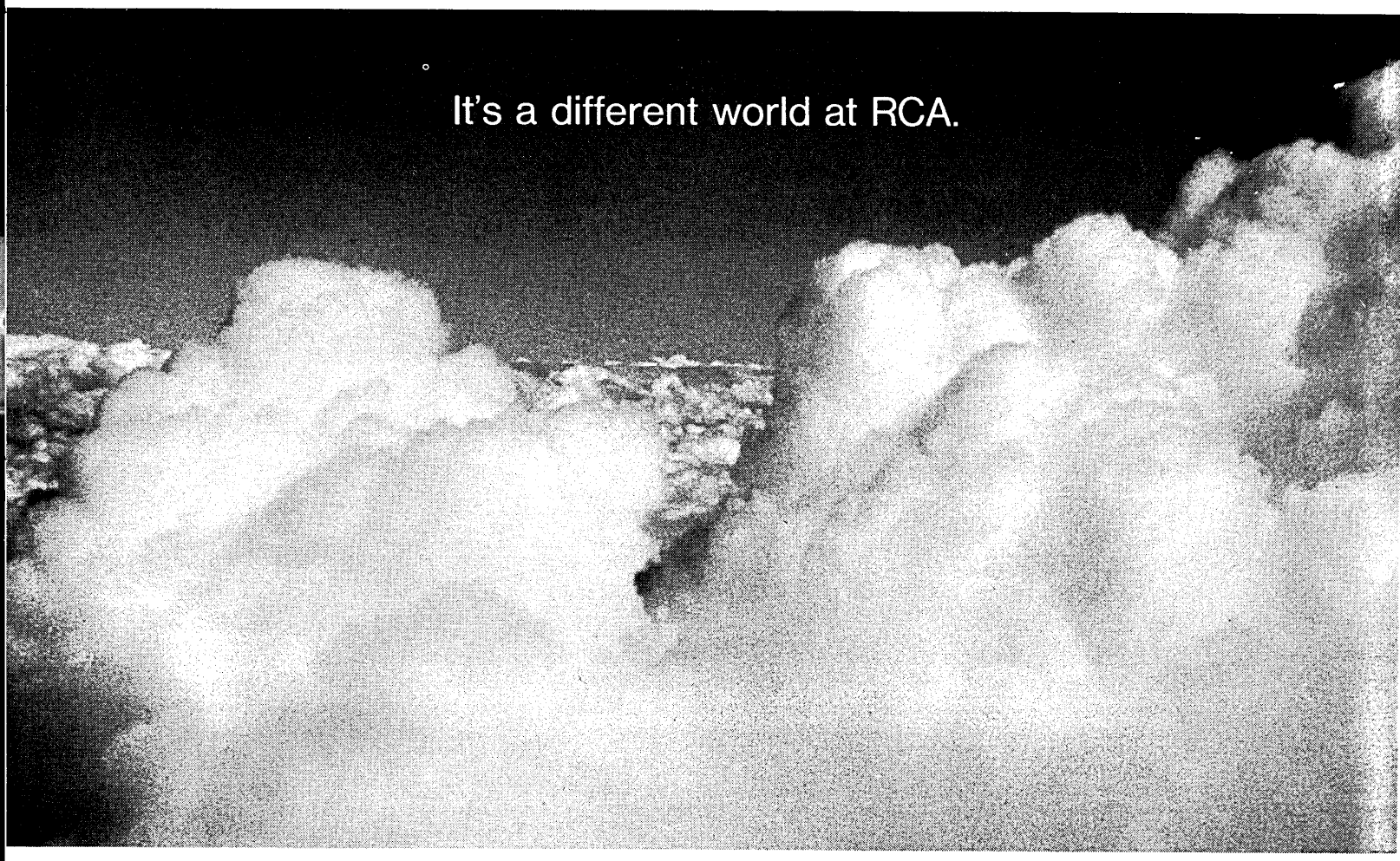

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the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

IT'S HAPPENED BEFORE

Twenty-two years ago, the United Shoe Machinery Corp. stood in much the same relation to shoe machinery users and makers as IBM now bears to computer users and computer makers. It had been the giant of the industry for 50 years. It offered every kind of machine, supply, service, materials, and advice needed to make shoes—any kind of shoes. It leased its machinery to anyone with even a ghost of a credit standing. It installed its machines, trained operators, gave free maintenance; it carried on research in shoe/foot relations, shoe use, shoe materials, manufacturing methods; it studied leather, tanning methods, and synthetic substitutes; it sold tacks, thread, wire, lasts, etc., of high quality and uniformity; and it would counsel shoemakers as to plant layouts, management, and staffing. And everybody was free to kick the shins of the giant, as a sort of industrial hobby.

USMC leased its principal machines, sold others, and offered some on either type of terms. It covered all its new research and development products with patents. It maintained branch offices in major shoe making centers, staffed with skilled maintenance men who responded instantly and free of charge to any demand for help, reasonable or unreasonable.

The shoe making industry consisted of about 900 known concerns, the largest holding about 10% of the market; the 50 largest covered about 90% of the market. They made about three pairs of shoes per year per person (a ratio which has been remarkably stable for half a century). They made them, and they sold them; any questions of technology were left to United, who conducted on behalf of the industry virtually all the R & D that was done in or for the shoe industry.

Other suppliers of materials and machinery coexisted with United. Compo, for example, brought the cement sole attaching process in from Germany about 1930 and United, in spite of Herculean efforts, never obtained leadership in this type of shoe making. Singer had always been the major supplier of dry-thread sewing machines (as opposed to waxed-thread machines) and United never got into the field, nor did it penetrate heavily into the specialized field of shoe upper manufacturing where the dry-thread machines are principally used.

In short, United swung at almost every pitch, and swung well at most. But at every point it found some small specialist competing ably, happily,

and usually profitably. Nevertheless, it was United which set the general tone of the industry, the standards of quality, and did much of the long-range research work.

In 1947, the Justice Department brought an antitrust action against United under Section 2 of the Sherman Act. It was a structural suit, just as is the current one against IBM. It charged monopoly, achieved through diligence of research, excellence of design, patent protection, service, and the use of leasing terms, amongst other things. Again, there is a parallel.

As one might guess (if he did not

already know), USMC was found to have 75% or 80% of its market, and hence was guilty of having violated the Sherman Act, and a series of penalties were prescribed:

United was instructed to cease monopolizing the machinery market.

All machines had to be offered for sale terms.

Machines might be leased, but on terms no more favorable than the sale terms.

Extant patents were to be offered for license at a nominal fee.

No shoe materials could be sold which were not manufactured by USMC or a 50%-owned subsidiary.

Service was to be charged for.

Extant machinery on lease was to be offered for sale at discount appropriate to its age.

(Parenthetically, that last penalty seemed to be tossed in casually; it does seem reasonable, considering the others. While the requirement to sell all machines should have put the little competitors on an even footing, this last penalty had just the opposite effect. It drove many of them to the brink of bankruptcy. Neither they nor United could sell new machines in competition with 900 factories full of installed machines, all debugged and maintained in apple pie order, which could be bought for as little as 10% of the new price for the same model.)

So what happened?

Sales terms were duly set, both for old and new machines. Few new machines were sold for awhile.

Some machines were kept on lease if they were on "unit charge" terms (as opposed to "time charge" terms). The shoemaker kept his owned machines busy on the bulk of his shoes, and did the surplus on the leased machines, which on low work loads ceased to be profitable investments for USMC.

There was virtually no demand for licenses for United's huge stable of patents.

When maintenance calls commanded a service fee, shoemakers placed a lot less calls. Versatile service men went to work in the shoe factories, and most of the branch offices shut down for want of work and men. As a result, the level of machine efficiency has dropped in all but the bigger shoe factories.

There were some secondary effects which are even more important than the primary effects:

Competition was not greatly enhanced. The largest competitor, Compo Shoe Machinery, barely survived the next decade.

Concentration in the shoe making industry increased. The big got bigger and the weak died off or were absorbed. The "monopoly" is shifting to a new site.

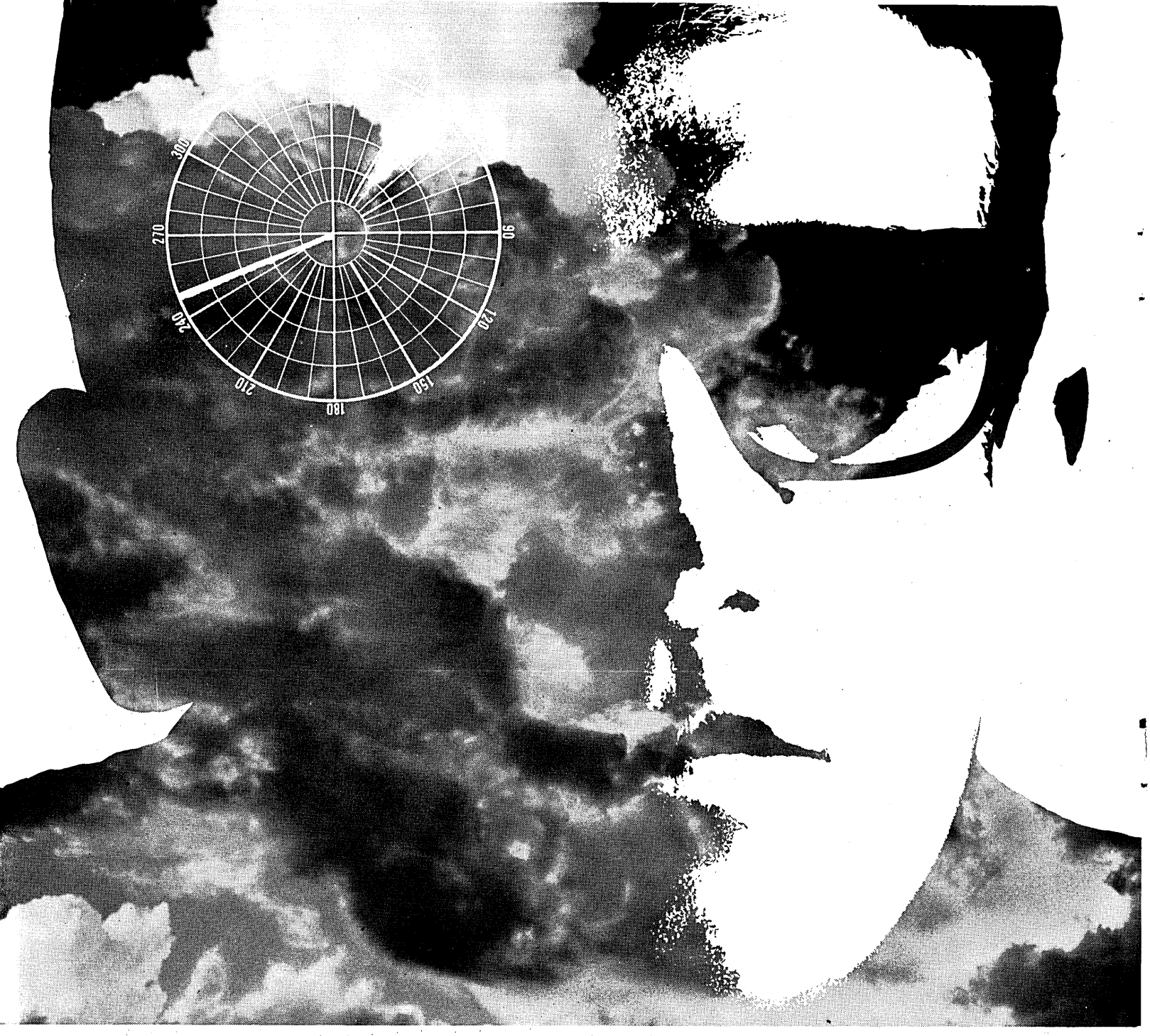
United could no longer dedicate a large percentage of its sales revenue to research for the good of the industry. R & D budgets were cut, refocused on new and more competitive systems.

The Shoe Manufacturers' Association talked about picking up the task of conducting research for the industry. Mostly, they just talked about it.

United has turned to other fields, and has successfully entered several businesses unrelated to the shoe industry.

After all these years, the Supreme Court has just recently reviewed the case, and decided that the penalties didn't break up the monopoly—50% is still too big a share of the market, so United (now USM Corp.) is splitting its shoe machinery subsidiary into two companies.

As an effort to restructure the shoe industry, this suit was highly success-



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ful. But if it was an effort to benefit those whose complaints may have stimulated it and who certainly abetted it, it was a flop. The small shoe machinery makers lack the industry-wide guidance and stabilizing effect of USM's research program. The shoemakers are either becoming incipient monopolists or are being squeezed by those who are. The shoe industry is without the leadership, and beneficial research of the fallen giant. And as for the public—well, have you bought any shoes lately?

The structure is surely different. But it's not much better, and progress was set back about a decade by the trauma of the restructuring.

Now it appears we are about to see this play re-enacted; can we be so bold as to hope that this time the structure of a major industry will not be demolished without the substitution of an equivalent or better structure?

As Santayana once said, "Those who have forgotten the past are condemned to repeat it."

—JOSEPH HARRINGTON, JR.

ANTI-TRUST AND FEDERAL CONTROL

Recent anti-trust suits have caused considerable preoccupation about their effect on the major vendor, and the resulting impact upon the industry in general. While this is certainly of interest to us all, it should not obscure the more important underlying change our industry is facing. Just as with the auto industry, our industry, our country and our leading vendor will be better off in the future if the market is more equably distributed, though not everyone will currently admit this.

But this is not the major change facing us all, right now. Observe that, with the almost total dominance of the

profession by one company in the past, we also had almost complete supervision of the ethical, philosophic and development areas of our industry by this one source. They not only sold most of the equipment, they were also the prime source of regulation and control over the profession and the users of such equipment. During the past decade, while the company has retained a major share of the market income, they have lost most all their dominance over these regulations and professional standards. As you know, our federal government abhors a jurisdictional vacuum, and we should therefore expect Washington to initiate action to regulate our industry. This would have happened in any event. The recent anti-trust action is both a symptom of this trend and a further impetus to such increased regulation. Look, therefore, for government control to be the result of these court actions, more than divesture by the one company.

I submit that we are not in a position to debate if such federal control is good or bad—it is going to happen anyway, and it will affect both vendors and users. What we had better consider is what form and degree of regulation will best serve our industry and the general public. Such supervision could be as loose as that currently applied to the auto industry, or as comprehensive as the control of the airplane and airline industry. Whatever form we may feel it should take, we probably have no more than five years to present our opinions and advocate our point of view before such controls are in being.

The primary experience for such regulation will probably come from those federal agencies currently working on controls and standards—the military services and GSA. These agencies have already established a substantial basis for further action through their activities in COBOL, vendor performance standards and main-frame/peripheral contracts. As the government proceeds into further regulation, these agencies will have the opportunity to exert considerable influence on the nature of the action taken. We should

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therefore work, as a profession, as closely as possible with these agencies so they have an appreciation of the needs and resources of the nongovernment areas of data processing. The other area of influence available to us is the force of our professional societies. Unfortunately, none of them appear to be aware of this coming change. We had best get our international offices moving toward debate of the best form of regulation. They should then lobby in Washington for the consensus of the industry as to what form controls should take.

Recognize this, and realize it now—federal regulation is coming, it is going to be speeded up by the anti-trust actions and we cannot avoid or delay it. As an industry and a profession, data processing has just a few short years to develop and advocate the best form such regulation should take. So let's get to work! —KENT D. KITTS

CONSEQUENCES OF SEPARATE PRICING FOR HARDWARE AND SOFTWARE

To date, vocalism on the subject of separate pricing for hardware and software by computer manufacturers has been at either of two extremes; on the one hand it has been hailed as the life-giving slap on the back of the software baby; on the other it has been regarded as the killing pillow in the face of the user. But through the wailing and gnashing of teeth comes an all too obvious (and quite sensible) panoramic of an adolescent industry taking another step in the process of coming of age.

The question is no longer if separate pricing will come to be—it's simply when. True, the industry is dominated by a giant, but even a giant is sensitive to economics. And with government and business structure being what it is in the U.S. today, possibly that giant is more sensitive than the dwarfs.

Separate pricing by the manufacturers will be caused either by their own internal economics or by their users' economics. IBM's economics can be subjected to pressure, it would seem, from someone as large as the federal government or someone as small as Data Processing Financial & General. Meanwhile computer-using management is increasingly realizing that the present pricing structure for their computers has become inadequate for the industry.

This should alarm no one. Other industries in their infancy have had many of the growing pains that now characterize data processing and computers.

All too often it would seem that we forget that our group is not much more than 20 years old. And while automobiles and steel, banking and shoemaking, peer over their aged spectacles of wisdom at this new group of hustling, bustling young people with young ideas, we tend to grow impatient with our own development. We panic, expecting too much and forgetting the parameters of our own problems.

How many of our hasty conclusions for instance, are based on false premises? How much of the problem lies in believing catchy phrases and hearsay? Take the common phrase, "The price of hardware covers the price of software." That software and programming assistance has been supplied to *some* users is true, but it is not true for all users. The sophisticated user, be he large or small, does not rely on the manufacturer for other than the basic essentials of systems software. Even then, many have created their own systems software or have at least heavily modified that which has been supplied by the manufacturer. It is the user who has sometimes been termed marginal who needs manufacturer support. And it is difficult to criticize the manufacturers for, in effect, making computer usage possible where, without their support, no installations would exist.

It has been said that software is easily duplicated and therefore cannot exist as "property," cannot be legally protected, and falls roughly into that category of things you can give away and yet keep. Again, there are those certain programs which can be easily replicated and used by another. But I submit that these programs are extremely few and far between. We do not yet have the standardization within the industry nor the commonality of purpose and goal to make the situation any other than what it is. Most programs require detailed conversion procedures, operating instructions, installation efforts, and then continuing maintenance. One does not get these factors by reproducing a deck of cards or copying a tape.

It is still said (albeit an increasing number of people are realizing the fallacy of making it a generalization) that manufacturers' software is free. Depending on the economics of the particular individual situation, it can be free. The stated price of the software is zero; and if computer utilization in the individual installations is less than the full shift, faster performance software will not reduce or substantially change data processing cost for that user. Whether indeed the software is or is not free depends not only on the purchase price of that software but its performance statistics within a given equipment environment, compared to the scheduled work load and requirements of the user. These are not easily evaluated factors. Few computer users have reached the point of sophistication where their costs are sufficiently isolated and identifiable so as to allow analysis.

In short, even we, the technicians, have been awed by the immensity, versatility, and power of the computer and have not paid much attention to some of the dollars and cents involved. It's a bit like finding yourself in love with a beautiful woman; where $3.75 for a dinner had been excessive before, suddenly $30 seems normal.

Now, at the same time that we must re-evaluate some of our false premises, it is also necessary to directly address ourselves to some of the real problems that we have.

It is commonly known that individual designers of software would rather program their own than accept another's work. This also should surprise no one inasmuch as it is no more than a reflection of human nature. Any engineer would probably rather design his own nuts and bolts than accept someone else's. Two things keep that engineer from doing so:

1. A set of standards has been imposed on his work and he has been told by his management to use common parts when he possibly can.

2. He has grown to realize that to the extent that he is not designing nuts and bolts, there are bigger and better things to do with his talent in his lifetime.

These same two things must come to pass in computer programming. It is my guess that the realization of broader horizons will come much more quickly than the implementation of standards, particularly if the giant is not allowed his voice. Standards are always difficult to arrive at, and when

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it is approached from a group viewpoint, with no one of the group necessarily having majority control or vested interest, then we come up with things such as the BEMA tower of Babel within the topsy-turvy USASI committees and subcommittees.

Another serious problem is that management—that ill-defined group of individuals who presumably control business activities—has remained aloof from computer technology and is not as aware as they should be of what impact computers could have on their business operation. While this in many cases is a generalization, more likely than not it is true. And the problem rests with the data processing community, not with business managers. We ourselves have done a lousy job of selling our profession, technology, abilities and potential to the people who control. Here too, however, there are signs of the industry coming of age. It must be aided and abetted by more data processing people taking the time to learn the requirements of managing and management.

Another characteristic, and possibly the one most difficult to affect or change, is that the software market at this point in time is unstructured. Many of the elements of a full, sound and thriving market are coming into being. All too often, however, it is a matter of someone sticking their toe in the water rather than plunging in head first.

There are natural market forces that are having their influence on the total situation. Software designers are in short supply—and good ones are going where the money and opportunities are. Non-manufacturers' software has been proven to be better than the manufacturers' in many cases. While we cannot conclude that *all* non-manufacturer software is better, at least we have proven that *some* of it can be better. And then, in addition, computer using management is admitting to some of the economics of data processing; they are becoming involved if for no other reason than that, by this time, it is second-generation management.

The textbook solution to the whole problem would probably be fewer although somewhat bigger, installations as a consequence of consolidations and the economics of scale; this would lead to more facilities management companies which would be affected somewhat by the increased usage of time-sharing (with nonprogrammers using the computer).

Odds are that some of these, to some extent, will occur. But don't look for them to take place in noticeable fashion. The computer, after all, has become a necessary part of doing business, and business managements' fascination with it as well as technicians' abilities to use it will not quickly nor easily wane.

Separate pricing will be a shot in the arm to software firms. Those that will succeed in getting bigger and better will be those that have a recognition of the market and the sales and marketing technicians who know how to take advantage of what they recognize.

This will lead to better products, more intelligently priced and promoted and with sufficient support to make them operational.

As a consequence of this, better definitions and clarifications of software in the realm of accounting and tax regulations as well as the legal concepts of software will emerge as more and more case precedents are established.

It won't happen overnight; it won't turn the market upside down. We may be somewhat unsophisticated, but not that much. —L. A. WELKE

NEEDED: BETTER COMPETITORS AND CUSTOMERS

In your editorial on the IBM anti-trust case, you hit the critical point when you described the industry as immature. I believe IBM's dominance is due not just to IBM's effort, but also to the performance of competitors and the behavior of customers.

First, I should say that I am not nor have I been an employee of IBM and although I have worked in computer centers since 1953, it is only in the last two months that I have been associated with a computer center that was predominantly IBM.

IBM achieved its pre-eminent status through its own efforts and as a result of lack of effort or the ineffectiveness of its competitors. Some of the smaller companies in the business seem to be all-out competitors, and I have respect

the forum...

and sympathy for them. They suffer as any small competitor in any competitive business. However, the companies that are big enough to compete on even terms with IBM haven't. Since IBM's competition includes giants of electronics such as GE and RCA, it seems apparent that if they thought IBM had too much of the computing business, they did not devote their entire corporate resources in an attempt to catch up.

Also, back in the competitive pack is Univac, who for a brief period had all the computer business (it wasn't that long ago when computers were called "IBM Univacs"). Univac was soon overtaken and just as quickly left far behind; they had the lead and couldn't keep it.

How immature would the computer industry be today if we had to depend on the leadership of these competitors? Would we be still waiting for the announcement of a firm delivery schedule for third-generation computers or just reading an announcement from one of the competitors of appointment of another professional manager to head up and reorganize their computer business?

Perhaps the most immature partner in the industry is the consumer. I have long suspected that the majority of feasibility studies and surveys conducted by computer center managers consist of determining what their friends and colleagues have ordered. "Well defined requirements" are then derived by adding to a friend's configuration factor X. (X must be large enough to be noticeable but not so great as to preclude backup.) An alternate is to determine the absolute maximum dollars that will be approved and gin up a configuration to meet that limit. Never mind if it is lopsided and will produce only a fraction of what is expected. The people who approve large appropriations won't know that and supplemental emergency appropriations for more core or tape drives can be obtained just prior to acceptance.

This immature industry cannot afford to have any of its participants diminished. If only one partner has achieved some maturity, I certainly do not want him reduced to the level of the rest. What is needed is an improvement in competition and customers—a maturing that will see customers understanding their own needs and ordering from the source that will best meet those needs—and producers delivering on schedule equipment that performs to spec on delivery, and performs reliably at spec level for years.

—JOHN K. SWEARINGEN

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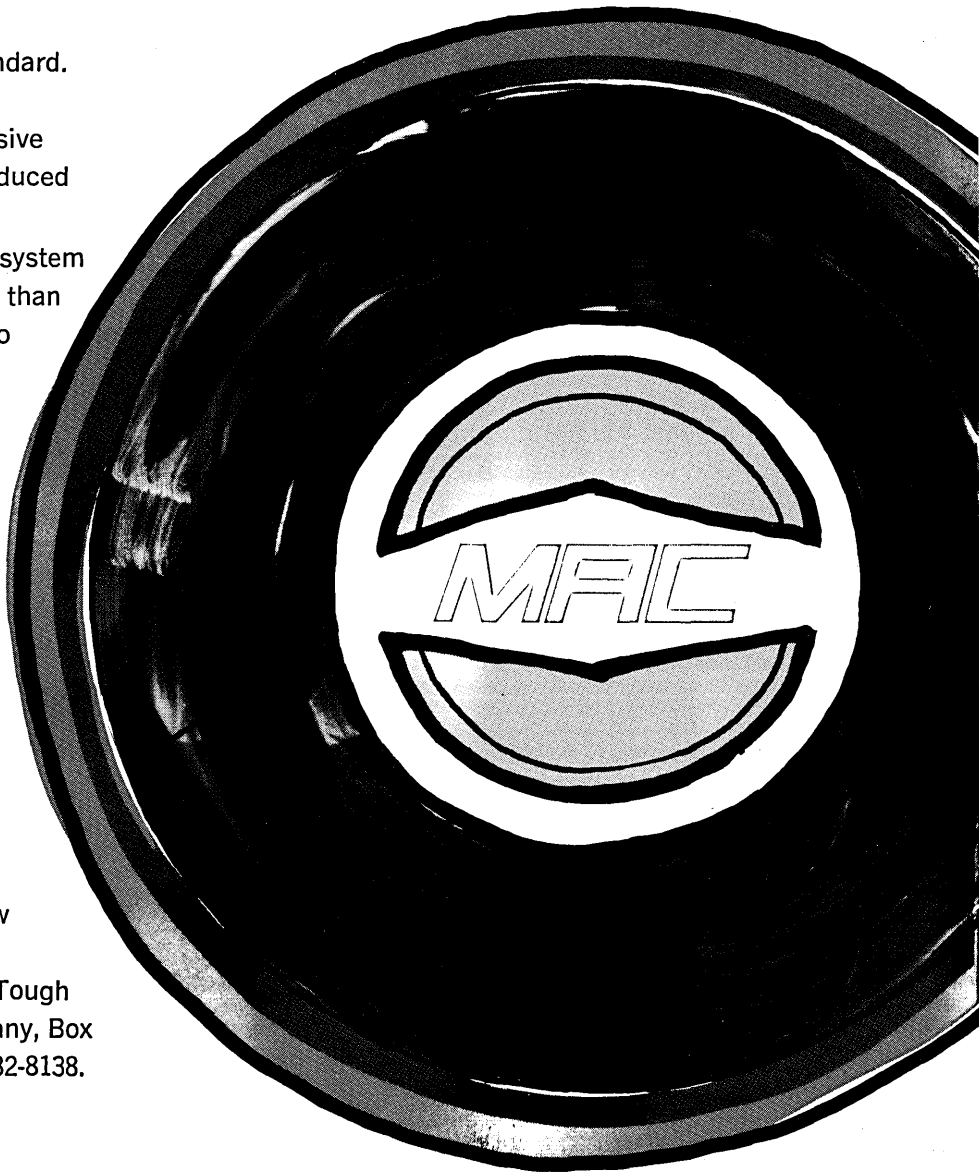

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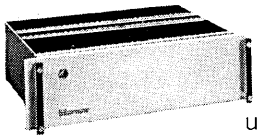

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