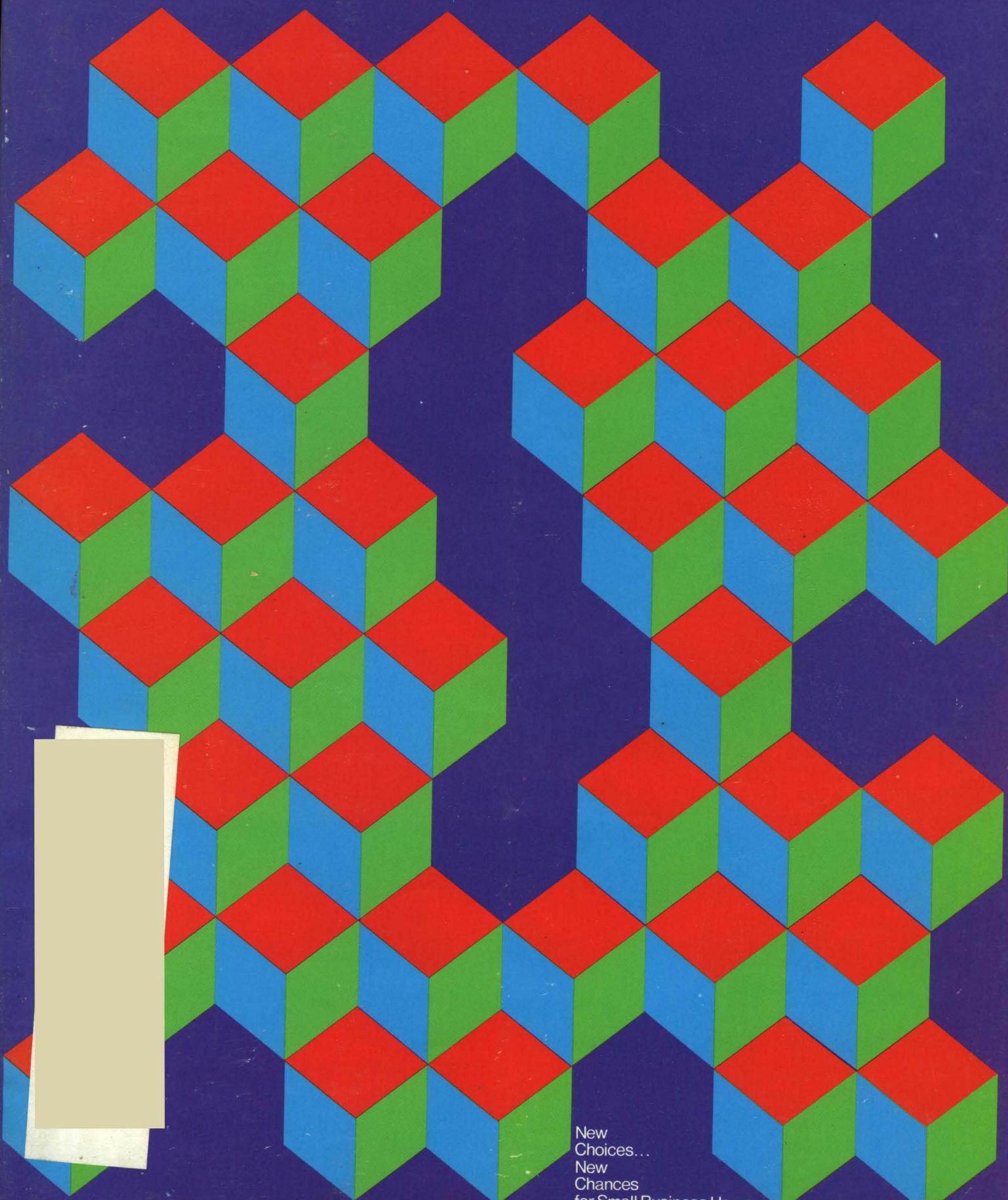


DATA MATION '72

June



New
Choices...
New
Chances
for Small Business Users

Your free data communications analyst.

If you call the Man from TRAN, you're going to get a highly qualified adviser with seasoned expertise in configuring data communications networks.

At TRAN, we specialize in practical network approaches to satisfy your terminal end-users' requirements. Your local Man from TRAN is willing to analyze your network situation and to diagnose cost-saving alternatives for free. No obligation.

Sure, he's got something to sell you — low cost, highly flexible data communications equipment for networks with maximum usability today and unlimited expansion and reconfiguration tomorrow.

If that's the kind of network you're planning, the Man from TRAN's your man. Call him right now — direct or collect.

The logo for TRAN, consisting of the letters 't', 'r', 'a', and 'n' in a stylized, lowercase, bold font. The letters are white and set against a dark background.

computer transmission corporation

1508 Cotner Avenue, Los Angeles, California 90025 • (213) 477-5020

eastern regional sales office 685 Fifth Avenue, Suite 305, New York, New York 10022 (212) 593-3175

central regional sales office 800 Enterprise Drive, Suite 115, Oak Brook, Illinois 60521 (312) 325-1591

CIRCLE 51 ON READER CARD

TALLY DATASCRIBE...

to dramatically increase data transmission throughput without changing modems.



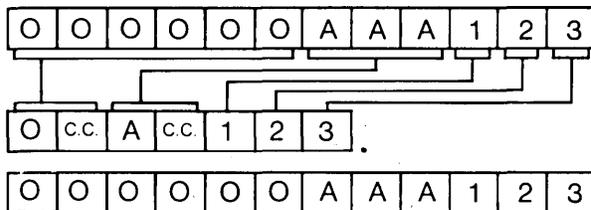
Tally data transmission is unequivocally faster. Tally Datascribe gives you magnetic tape-to-tape data transmission throughput speeds to 1200 characters per second over the dial-up phone network. You'll witness significant savings with no changes in transmission procedure.

Tally Datascribe couples an innovative

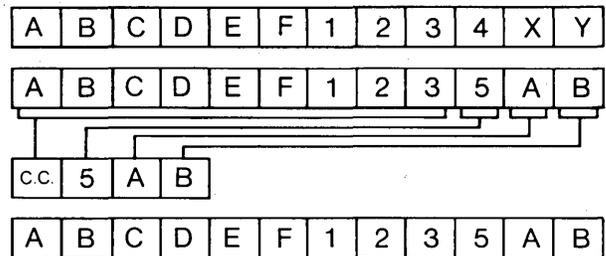
hardware technique with reverse channel and a double buffer to give you actual throughput of 170 characters per second from a 1200 Baud modem. This compares to something less than 120 characters per second using other techniques. Your data rate triples using 3600 Baud modems.

The real time-saving story continues! Tally's unique hardware data compression feature automatically delivers phenomenal throughput benefits. Essentially, Tally data compression eliminates the transmission of redundant information over phone lines. And there's no software in the deal.

With serial data compression, groups of consecutive identical characters are not physically transmitted . . . but are reconstructed to their original image at the receiver. This feature is especially useful at the input terminal when a computer is not available for editing.



Parallel data compression provides hardware duplication of redundant data appearing in consecutive records. Data transmission times are dramatically diminished. Ask Tally for further information.



In actual benchmark tests, Tally sent over 210 80-character records per minute compared to 70 80-character records per minute by standard methods (the competition).

By using a 3600 Baud modem, you can triple those rates. In fact, a 3600 Baud modem interfaced to a Datascribe delivers a minimum throughput of 500 characters per second on up to 1200 characters per second, according to the amount of data compression. For accurate data, Datascribe offers four kinds of error checking features during transmission.

It makes good sense to transmit with Tally. Typical users get throughput speeds 2½ times faster than the expected speed from their modem. Prove it to yourself. Contact your local Tally man and ask him to perform a benchmark test on your data. *It's an eye opening experience.*

Tally Corporation. 8301 South 180th Street, Kent, Washington 98031. Phone (206) 251-5500. In New York, (212) 490-2430; Chicago, (312) 298-6710; Atlanta, (404) 633-1991; Los Angeles, (714) 542-1196; San Francisco, (415) 989-5375.

TALLY

DATA TERMINALS • PRINTERS • DISC MEMORIES • CARD READER TERMINALS • PAPER TAPE PERIPHERALS



360 CORE YOU CAN TRUST

MODELS 22+, 30+, 40+, 50+, 65+

Who has Fabri-Tek produced core memories for over the past 15 years?

Hundreds of companies, including:

CDC	Canadian Westinghouse
XDS	Ferranti (Canada)
Honeywell	GE (Canada)
DEC	Elliot (England)
GE	Olivetti (Italy)
Burroughs	ICL (England)
Varian	Honeywell-Bull (France)
NCR	AEG-Telefunken (Germany)
Litton	English Electric (England)
CFTH (France)	CLL (France)

And yes — even IBM!

Now you can capitalize on this expertise, as this growing list of 360 customers and users are doing:

Booth Computer Corporation • Dearborn Computer Leasing • Diebold Computer Leasing • Leasco • Greyhound Computer of Canada Limited • National Computer Rentals • Rockwood Computer Corporation • Grumman Systems Corporation • Intertek, Inc. • Gant Shirtmakers • Chicago, Milwaukee, St. Paul and Pacific Railroad • Eagle Discount Supermarkets • United Farm Agency • Medtronic, Inc. • Accounting Corporation of America • Rome Research, Inc. • Weldon, Inc. • Certified Grocers Co-Op • Kentucky Farm Bureau Mutual Insurance Company • Graco Inc. • E.B.S. Data Processing Inc. • Bell Telephone of Penn. • Hudson Bay Company • Rockland State Hospital • J & L Steel • Trans Union Systems Corporation • University of Rhode Island • Computoservice, Inc. • Faultless Starch Company • Waldbaums, Inc. • MAI Equipment Corporation • G.S.A. • U.S. Department of State.

Nationwide Service: Over 900 service representatives from Sorbus, Inc. provide you with 24-hour field maintenance in over 90 cities in the U.S.A. Canadian service available through MAI Canada Ltd. in 12 Canadian cities.

We back our products, and you can be sure we're going to be here to service your 360 memories — and provide spare parts — for as long as you need. And furnish your next generation memories as well.

Let us show you how a real leader can perform: Fabri-Tek, Inc., 5901 South County Road 18, Minneapolis, Minnesota 55436. Phone 612-935-8811. TWX 910-576-2913.

Our complete, high-performance line:

- MOD 22+** expands main memory of 360/22 to 64K bytes.
- MOD 30+** expands main memory of 360/30's to 128 K bytes.
- MOD 40+** expands main memory of 360/40's to 512 K bytes.
- MOD 50+** expands main memory of 360/50's to 1024 K bytes.
- MOD 65+** expands main memory of 360/65 to 2 megabytes.

SALES OFFICES

Long Beach, Calif. (LA area)	213/420-2493	Auburndale, Mass. (Boston)	617/969-5077
Sunnyvale, Calif. (SF area)	408/739-4780	Cherry Hill, N.J. (Pa. & So. N.J.)	609/667-7722
Phoenix, Ariz.	602/266-4448	Parsippany, N.J. (Metro N.Y.)	201/263-2330
Melborne, Fl. (Miami area)	305/724-0900	Columbus, O.	614/262-7966
Westport, Conn.	203/226-6949	Oklahoma City, Okla.	405/843-6444
Atlanta, Ga.	404/457-0821	Dallas, Tex.	214/748-2764
Chicago, Ill.	312/437-4116	Houston, Tex.	713/772-7050
Minneapolis, Minn.	612/935-8811	Roslyn, Va. (Wash. D.C. area)	703/525-6435

SALES REPRESENTATIVES

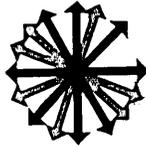
Seattle, Washington	Computer Supplies	206/623-2413
Portland, Oregon	Computer Supplies	503/222-2006
Kansas City, Missouri	Computer Systems/Graphics	816/474-4690
Clayton, Missouri	Computer Systems/Graphics	314/862-0787
Minneapolis, Minnesota	Data Serv Equipment	612/546-4422

CANADIAN REPRESENTATIVES

Toronto	Greyhound Computer of Canada	416/366-1513
Montreal	Greyhound Computer of Canada	514/866-3475
Ottawa	Greyhound Computer of Canada	613/225-4690
Alberta & British Columbia	Computer Supplies	206/623-2413

**Leader in memory technology
for over a decade.**

FABRI-TEK INC.
MEMORY PRODUCTS DIVISION



JUNE, 1972

volume 18 number 6

This issue 110,805 copies

departments

<i>Look Ahead</i>	7
<i>Calendar</i>	15
<i>Letters to the Editor</i>	19
<i>Editor's Readout</i>	39
<i>News in Perspective</i>	78
<i>Hardware</i>	104
<i>Software & Services</i>	118
<i>Literature</i>	124
<i>People</i>	131
<i>Books</i>	137
<i>Index to Advertisers</i>	139
<i>The Forum</i>	140

40 How to Succeed in Small Business DP

A DATAMATION interview. The choices include time-sharing and batch services, new in-house business computers, specialized services . . . which way should the first-time user go?

47 Small Business DP: User Experiences

EDITH MYERS. Saving time is the most important reason small businesses use dp. Whether the computer is in-house or at a service bureau depends partly on need and cost and partly on attitude.

51 Small Business Computers

MICHAEL WILLIAM CASHMAN. If the small businessman doesn't want to turn over the edp job to someone else, here are the choices he has right now in a fast-changing market.

65 EDP People . . . Review and Preview

ROBERT B. FOREST. Understanding management's attitude towards you and your job can make the difference between success and failure as future changes shape your career choices.

75 Effective vs. Efficient Computing

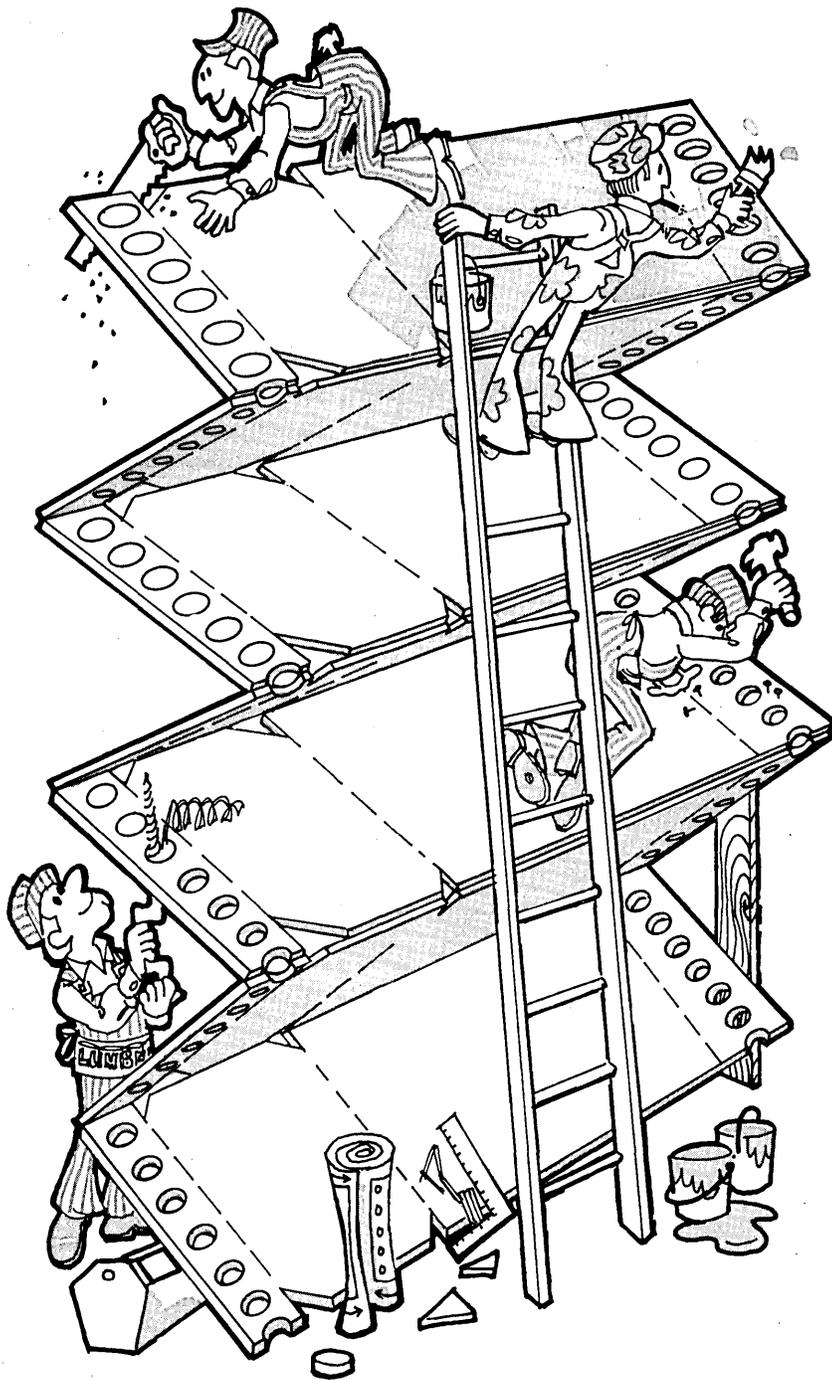
A conference report.

78 News in Perspective

Computer science research at Rand Corp. is seriously weakened as federal funding continues to tighten. One group, headed by AFIPS president Keith Uncapher, has found a new home at Univ. of Southern Calif. . . . IBM's Information Management System undergoes close scrutiny . . . All the bad news looks good at the annual meetings of the computer mainframers . . . Amex has quite a few hurdles to clear with its new AMCODE system . . . EDS takes on Ma Bell.

About the Cover

On first looking into it, the edp picture for the small businessman just doesn't seem to stand still . . . but with concentration the image adjusts to his needs. Design is by our art director.



Now you can get
**continuous System/3 cards with
 print-out stubs up to 9" wide.**

Our processable System/3 cards are continuous and long grain. With no medial strip. They offer you a stub area that opens up a whole new world of uses for your computer's print-out capabilities. Lots of options including card and stub consecutively numbered if you like. Interested? Just write or call Ray Senour, our Can-Do expert, and ask him to send you Sample Kit #32.



Forms inc. The Can-Do People
 An American-Standard Company
 P.O. Box F • Willow Grove, Pa. 19090
 Phone 215/659-4000

CIRCLE 38 ON READER CARD

DATAMATION

EDITORIAL STAFF

Editor	Robert B. Forest
Senior Associate Editors	William J. Rolph Tom McCusker
Associate Editors	Richard A. McLaughlin Edith D. Myers
Copy Editor	Janet Eycler
Assistant Editor	Michael William Cashman
Editorial Assistants	Alma O'Steen Mary Ellen McCoy
International Editor	Angeline Pantages
Western Editor	Edward K. Yasaki
New England Editor	W. David Gardner
Washington Editor	Phil Hirsch
Southwestern Editor	Robert F. Alexander
European Editor	Pearce Wright
Australian Editor	Frederick A. Bland
Contributing Editors	Howard Bromberg, Philip H. Dorn, Louis B. Marienthal, F. G. Withington, Paul Armer, Michael A. Duggan, Robert L. Patrick
Editorial Adviser	Robert L. Patrick
Technical Consultant	Lowell Amdahl

EDITORIAL OFFICES

Headquarters: 94 S. Los Robles Ave., Pasadena, CA 91101. Phone (213) 681-8486. Eastern: 35 Mason St., Greenwich, CT 06830, (203) 661-5400. 19 Marlborough St., Boston, MA 02116, (617) 267-9414. 9805 Singleton Dr., Bethesda, MD 20034, (301) 530-7271. Southwestern: 2711 Cedar Springs, Dallas, TX 75201, (214) 744-0161. Western: 61 Renato Ct., Redwood City, CA 94061, (415) 364-3171. Foreign: 65, Hill Road, Chelmsford, Essex, England. 322, Park Regis, Park St., Sydney, NSW 2000, Australia.

GRAPHIC DESIGN & PRODUCTION

Art & Production Director	Cleve Marie Boutell
Production Manager	Marilee Pitman

CIRCULATION

35 Mason Street, Greenwich, CT 06830
 Circulation Director Suzanne A. Ryan
 Circulation Manager Mae Van Rennes
 Marketing Research Director Douglas De Carlo
 Publisher James M. Morris

Circulation audited
 by Business Publications
 Audit



Member, American
 Business Press, Inc.



tp DATAMATION is published monthly on or about the first day of every month by Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice, Jr., President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 94 So. Los Robles Avenue, Pasadena, CA 91101. Published at Chicago, Ill.

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of \$18 annually in the U.S. and Canada. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of £12.50 annually. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, OH and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, CT 06830. Copyright 1972, Technical Publishing Company. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc.

DATAMATION

360/CORE FROM CAMBRIDGE MEMORIES IS WINNING ALL THE BIG ONES.

Our compact 360/CORE replacement or expansion memory for System/360 computers offers you more and saves you more than any other system. That's why our compact 360/CORE is winning big government contracts, lessors' contracts, and with individual users as well.

IT'S COMPATIBLE-PLUS.

360/CORE is fully 360-compatible - plus it's upward and downward compatible and model to model compatible, all in the same box. That means fast on-site installation, fewer spare parts and minimum servicing and interruptions.

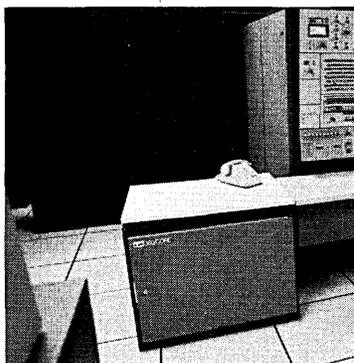
RECENT 360/CORE WINNERS

*U.S. Army BASOPS 37 Models 30s (16-128K)
U.S. Navy 8 Models 30, 40, 50
Leasing Companies:
Randolph Multiple Models 30, 40, 50
DPF Multiple Models 30, 40, 50
Diebold Multiple Models 30, 40, 50
EDP Resources Multiple Models 30, 40, 50
And a growing list of individual 360 users.

*Largest add-on core award in history

IT'S ULTRA-COMPACT.

360/CORE is available in a desk high unit, as well as in a 5-ft. high "tall boy." In one desk high cabinet we store 128K bytes plus "bump" (auxiliary) storage. And our desk-high is available for all models - 22, 30, 40 and 50. That means we take less floor space, provide your operators with precious counter space, and increase the efficiency of your computer room operations.



360/CORE

from



CAMBRIDGE MEMORIES, INC.
285 Newtonville Ave.,
Newton, Massachusetts 02160 Telex: 92-2405

Boston (617-969-0050)
Chicago (312-425-4544)

Hartford (203-247-4500)
Dallas (214-233-0452)

New York (212-895-5518)
Minneapolis (612-890-6810)

Philadelphia (609-227-2203)
San Francisco (415-692-4806)

D.C. Metropolitan Area
(301-657-9105)

IT'S COVERED.

360/CORE uses the latest advanced core technology. That means more core in less space, plus maximum reliability. Then we back that with the best, most qualified field maintenance available. Fast. Knowledgeable. Expert coverage. In addition to our own 360/CORE specialists, we also have contracted with both Comma Corp. and Honeywell to give the best and broadest national maintenance coverage available.

THE COMPACT 360/CORE LINE

Expand or replace memory on your System/360 whether it's owned, rented or leased:

CMI Model	IBM Model	Expansion to:
CC22	360/22	64K bytes
CC30	360/30	128K bytes
CC40	360/40	448K bytes
CC50	360/50	1024K bytes

IT'S FROM CMI.

360/CORE is a product of Cambridge Memories, Inc., a company young enough to care, but old enough to have over 5,000 memory systems in operation. Our products include add-on memories for minicomputers (we were first), MOS semiconductor memories (again, CMI was first) and a full line of advanced memory systems in wide use by OEM manufacturers. We have a fully staffed R & D department that has developed some of the newest, most advanced technologies available, including a domain tip technology we call DOT. This promises low-cost, high-speed, all-electronic mass memory for future computers.

360/CORE is the winner in the 360-compatible core market. Contact our nearest sales office and let us tell you why. Or jot a note to Dick Baker, director of end-user marketing.

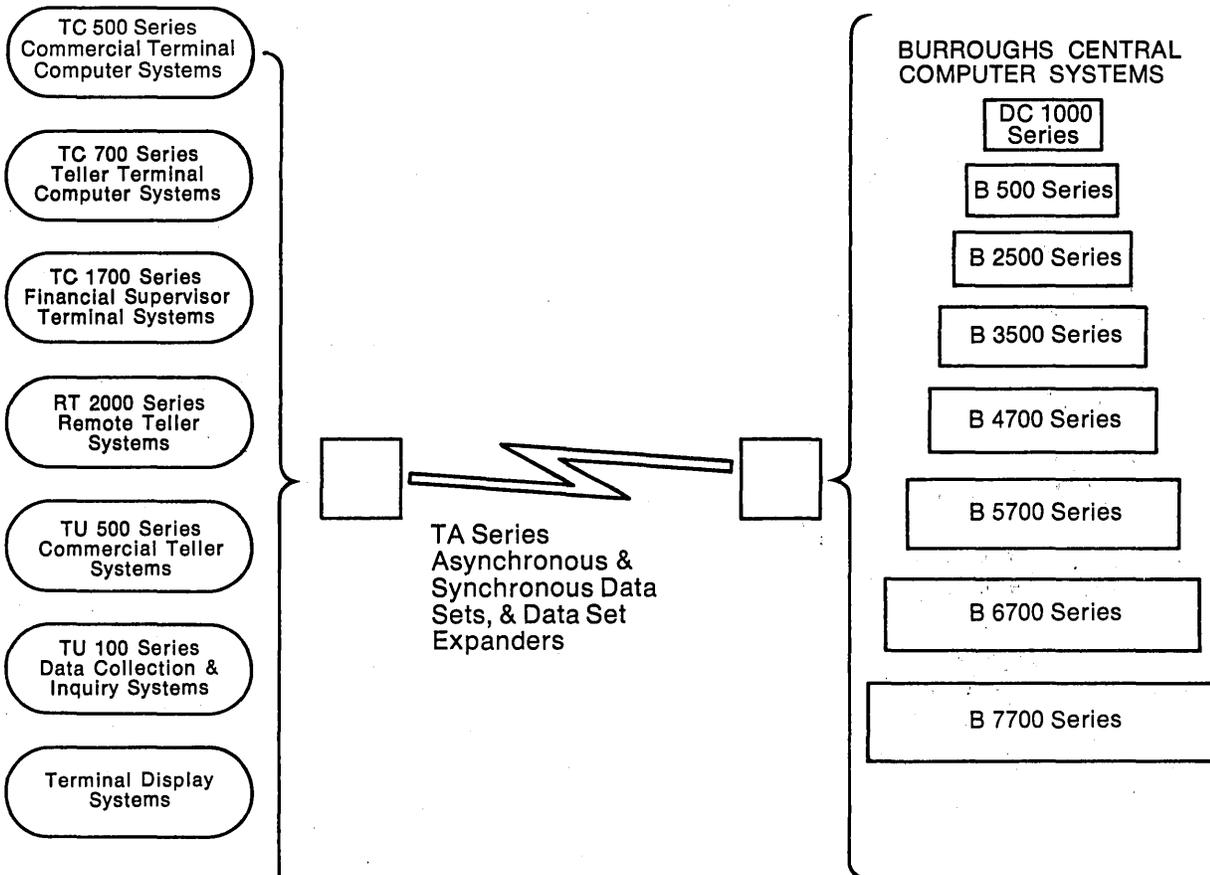
- today's leader in advanced technology for data storage -

UNICORE • EXPANDACORE • MOS BUFFERS • 360/CORE • DOT DOMAIN TIP TECHNOLOGY

BURROUGHS RESPONDS TO YOUR TOTAL DATA COMMUNICATIONS NEEDS...

WITH A WIDE RANGE OF:

- Compatible Terminal Systems
- Versatile Communication Control Devices
- Powerful Central Computer Systems



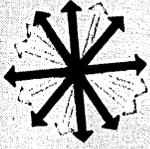
AND, Burroughs provides economy and simplicity in data communications through:

- A STANDARD line discipline for compatible communications with remote terminals.
- Only ONE communication line needed to support a variety of terminal types.
- ONE standard line adapter at the data center communicating with a variety of terminal types.

For the full story on Burroughs hardware, business management systems and on-site maintenance for your complete communication network, contact our local office, or write us at Detroit, Michigan 48232.

Burroughs





Look Ahead

360s STILL PROMINENT IN USER PLANS

This spring, used 360/65s were being offered for as low as 40% of the original IBM price--many on short-term (1-3 year) leases. These fire-sale 65s, coupled with auxiliary memories from the independents, are providing interesting alternatives to prospects and users of IBM's 370/155s.

In Fontana, Calif., Kaiser Steel, faced with a need for 300K of extra core on its 512K model 50, seemed a natural for a 155. But after benchmarking a 1-megabyte 155 and a 512K mod 65 with 1.5 megabytes of auxiliary core and finding no difference in throughput, it selected the latter configuration. The savings, according to Kaiser's Bob Bogart: \$20K a month.

Other 155 installations consider similar moves: Allied Chemical, Morristown, N.J., replaced a mod 50 with a 155 last September. But now, in need of more memory on its second 50, the company is considering leasing a 65 for half the price it would have paid a year ago. It also would add auxiliary core, as well as 3330-like disc drives which some independents now offer on the 360 machine. Bob Thompson, of Avco's Lycoming Div., Stamford, Conn., says the savings can be substantial. He contemplates replacing a 1-megabyte 155 in January with a 512K 65 and one megabyte of auxiliary memory at \$12K a month less, taking into account the IBM extra-shift charges. At that time Lycoming would add 3330 replacements from independents. These same considerations prompted B. F. Goodrich to turn in a 155 for a 360/65...and General Motors actively is studying a similar move on several machines.

Meantime, two of those sticking with 155s are installing main memory add-ons from independents. Outboard Marine Corp., Waukegan, Ill., upgraded its 768K mod 155 to 1 megabyte by sending back 256K to IBM and adding 512K of Ampex memory. By replacing 256K of IBM's memory, operations supervisor Tom Turwell says his company is saving \$1,732 a month--almost enough to pay for the total upgrade. Hamilton Standard Div. of United Aircraft Corp., Windsor Locks, Conn., which added Data Recall memory to its 155, estimates it will save \$500K over the life of a 54-month lease with Computer Investors Group which markets DR add-ons.

3330 RANGE EXTENDER--360/25s AND UP

While some independent manufacturers of 3330-type disc drives will offer them for use with 360/65s (Feb., p.7) a six-month-old Santa Ana, Calif., firm is readying a controller for summer introduction that it says will make it possible to use 3330s on all IBM models, 360/25 and up. The company, International Peripherals & Computer Corp., says a prototype of the IPC 6030 will be ready in July with first deliveries in late August or early September.

IBM AND ADD-ONS: BACK TO COURT?

There is confusion over published reports that IBM won't maintain overseas 360/30 cpu's with any independent memory extensions of 96K and up installed after July 1. The company, in fact, will maintain cpu's, if independents come up with a way to "switch off" the alterations made to the cpu when the cpu is being maintained. Its argument is that such extensions so alter the cpu's as to require additional CE training and/or special equipment for

Look Ahead

maintenance. But there's word IBM has found at least one independent-made 96K memory design in the U.S. that is "practical to maintain."

IBM is merely applying the same screws to competition overseas that it tried and failed to apply in the U.S. At writing, Intel Corp., the independent that took IBM to court over the issue and won, was considering doing it again to make the out-of-court settlement also apply overseas.

Despite the IBM tactic of discouraging independent memory use, the world should note and remember that add-ons to its 40s, 50s, 65s, and 22s are deemed "practical."

ROUGH GOING IN THE COMMON MARKET

Hint of what trading may be like next year in the enlarged Common Market: France has turned down a request by Pitney-Bowes for a license to sell its new point-of-sale data collection systems, SPICE and PEPPER, in that country. P-B understands the rebuff is because all of its stock is American-owned. The company has had no such rebuffs in the U.K. where it manufactures them, and it expected the same trading recognition Europeans have with each other. Some observers feel France's action could be a sort of muscle flexing to show the power of that marketing group, which next year will have a combined GNP exceeding \$650 billion.

VENDORS BATTLE STATE COMPUTER PROPOSAL

Understandably, the biggest obstacle to the state of California's four-year attempt to centralize its multimillion dollar edp operations has been the refusal by agencies to give up control. This against a backdrop of warring political factions. Now, the vendors have joined battle--apparently for cause.

Representatives of Univac, Honeywell, and Burroughs were in Sacramento last month seeking to knock a consolidation proposal by the state's Dept. of Finance. Among other things, it would cut Univac's (nee RCA) share of computers used by the state from a present 50% to about 17%, while IBM's share would soar from 50% to 80%. The Finance Dept.'s proposal is approved by the California Information Systems Implementation Committee which a year ago was told to come up with a plan before July 1 to help the state make better use of its computers. Opponents eagerly and frequently use the committee's acronym, CISIC, better known phonetically as Seasick.

CENSURE AND CENSORSHIP AT SJCC

The computer profession's very own "Pentagon Papers" controversy centers around a book published in April and entitled "Government Regulation of the Computer Industry," co-authored by Bruce Gilchrist, executive director of Afips, and the Afips attorney Milton R. Wessel. It contends the government knows too little of the industry. So, an outside commission should make "a broad economic study of all segments of the computer industry to provide the background for more appropriate and effective government action."

How does that kind of recommendation sit with the profession? Not too well, as displayed at the Spring Joint Computer Conference in Atlantic City last month when general conference chairman John E. Bertram stepped in. Bertram, IBM's director of engineering, programming and technology, ordered promotional material removed from registration kits. (The material was placed in the kits because the book is published by Afips Press, conference sponsor.

(continued on page 135)

DATA GENERAL ENTERS THE MINIPERIPHERAL WAR.

Data General, the world's number 2 minicomputer company, is in the peripheral business.

We've just introduced a new line of compact, fixed-head discs — the Novadiscs.

They're the ruggedest, most reliable mini discs on the market.

When we designed the Novadiscs, we recognized that the critical requirement — beyond price, speed, size, and capacity — was reliability.

Most minicomputer discs simply can't stand up to the kind of hard use that minicomputer mainframes take.

So we made sure the Novadiscs have the guts to go anywhere our computers go — including the tough on-line industrial applications in which modern minicomputers work.

Plug a Novadisc into a Nova-line computer, and you get a dramatically extended mainframe, with up to 800,000 16-bit words of high-speed memory in a single tough, compact package.

We built reliability right into the guts of the Novadiscs.

Instead of trying to fly the read-write heads on a fragile 30- or 40-gram air bearing, we designed an air bearing that exerts 2 pounds of force on the head, and can stand up to 4 pounds. So the heads aren't disturbed by the bumps and jolts that make other discs crash.

When they're not flying, the heads are secured, outside the disc pack cylinder. So you don't risk a crash every time you move the unit across the room — or across the country.

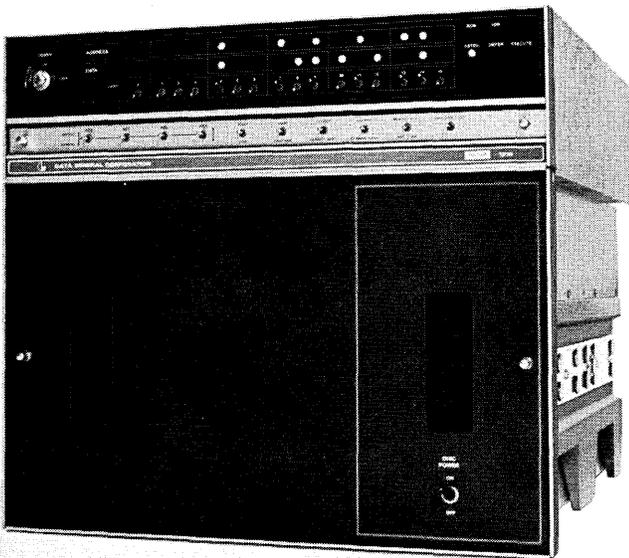
The Novadisc recording medium is an industry-standard, 10-surface disc pack. The motor, drive spindle, drive belt, and air filters are the same ones used on big, mass-produced disc drives.

Some of those parts are over-engineered for our requirements. They're also a lot less expensive and more reliable than anything else on the market.

Of course, the Novadiscs have all the other right specs, too.

Price. A Novadisc with storage capacity of 128K 16-bit words costs \$5,200,

ROUND 1: A NEW DISC WITH GUTS.



256K is \$6,750, 512K is \$9,250, and the 768K Novadisc costs \$12,560. Quantity discounts are available.

Size. Including power supply, the Novadiscs are only 12¼ inches high in a 19-inch rack.

Speed. Average latency time is 8.4 milliseconds, and data transfer rate is 2 million bits per second.

Software. Novadiscs are compatible with our device-independent Disc Operating System, which handles user I/O and provides interrupt-driven buffered service for peripherals.

DOS in turn supports a relocatable assembler, editor, linking loader, Extended ALGOL, Extended FORTRAN, and Extended Timesharing BASIC.

Peripherals. You can add mag tape, other DOS-compatible discs, A/D and D/A, communications equipment, CRT's, plotters, printers, card readers, paper tape equipment.

In the last three years, we've shipped over 2,500 Nova-line minicomputers and systems.

We've made a reputation for making some pretty pushy claims — and for living up to them.

Now we're in the peripheral business. And just as pushy as ever.

 **DATA GENERAL**

Southboro, Massachusetts 01772, Tel. (617) 485-9100

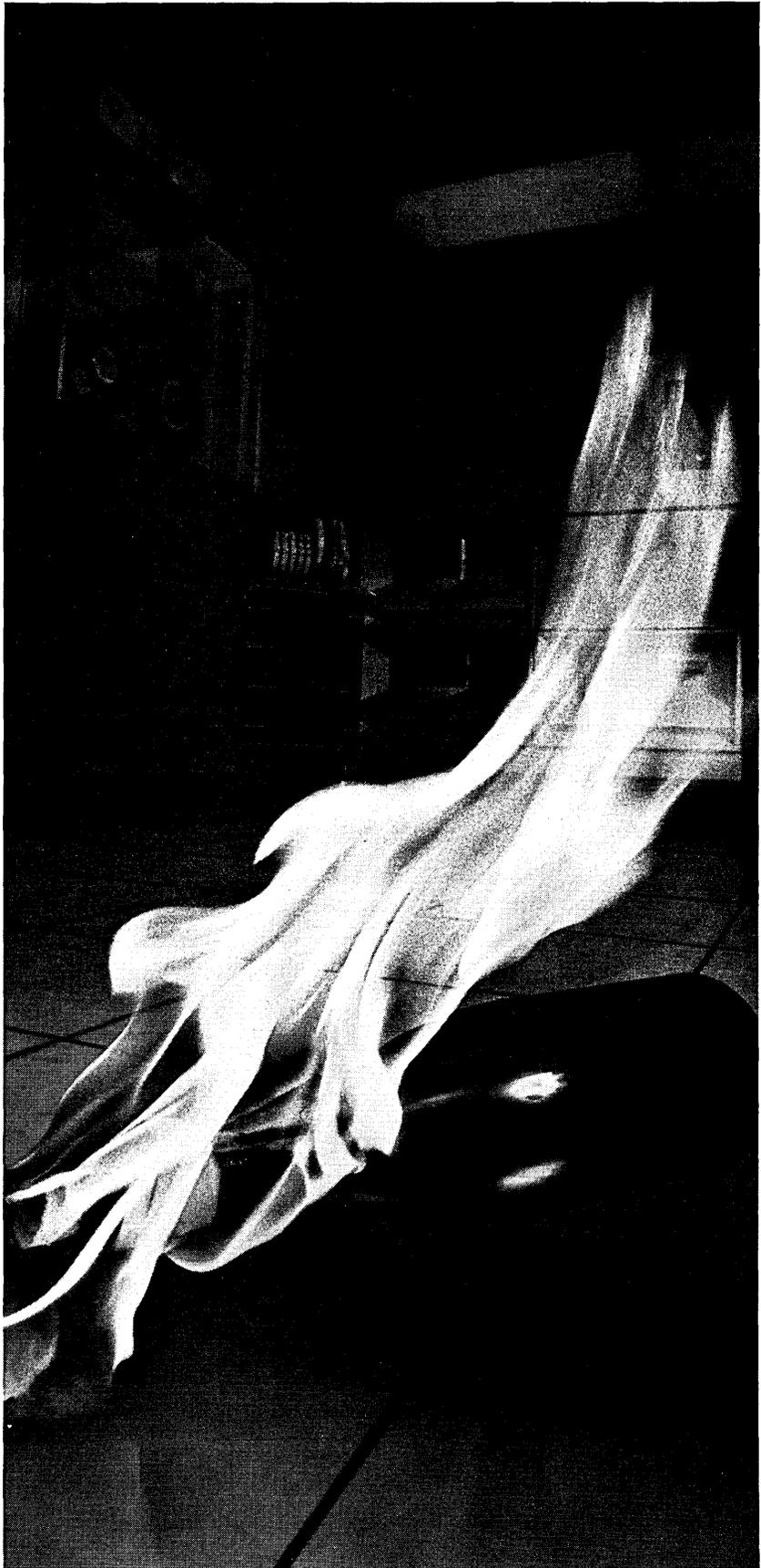
We've tried every trick at setting off computer room fires.

We know what fire, smoke and water can do to your irreplaceable tapes and records.

Even if they don't totally destroy them, they can shut you down for weeks, if not months.

So, to probe the causes, effects and characteristics of fires damaging computer rooms and peripheral service areas, we literally stop at nothing in the Fenwal Fire/Explosion Test Site. Here, Fenwal engineers actually make a career of arson, studying how to design the fastest, most effective systems for stopping fires dry in high value areas. Using Halon 1301, a clean, safe-for-people, dry suppressant, our system can snuff out a fire in seconds, leaving the entire area ready for immediate reuse. We're years ahead of everyone in the field of fast fire suppression. In fact, we're the only ones capable of stopping explosions after they start. If you want the best in Fire Protection Systems*, call us. We'll be pleased to arrange a showing of our color film "The Fireaters," featuring our systems in action. For a free copy of the Harvard Business Review Report on Safeguarding Computers, write Fenwal Incorporated, Ashland, Mass. 01721. Phone (617) 881-2000. Division of Walter Kidde & Co. Inc.

*FM approved—UL Listed



FENWAL

*In fire and explosion suppression systems,
Fenwal has more experience than any
other company in the world.*

We've Been Plotting Behind Your Back.

Maybe you haven't heard (we haven't beat our drum much) but Zeta has been the quality leader in small plotters since 1969.

Now we've got a big drum — the Zeta 3600! 36 inches wide, it's bigger, faster and more economical than competitive units. It offers speeds up to 1800 increments per second on or off line, and 810 increments per second remote.

The 3600 series joins a proud family. The Zeta 230 series — ideal for time share users — gives sharply increased plotting speeds and does it over *standard voice-grade telephone lines*. The Zeta 100 series, with speeds up to 450 increments per second, delivers low-cost high-performance plotting for general use.

The plot's really simple. Just write. You'll get the full story on today's most advanced off-the-shelf plotting systems.



Zeta Research

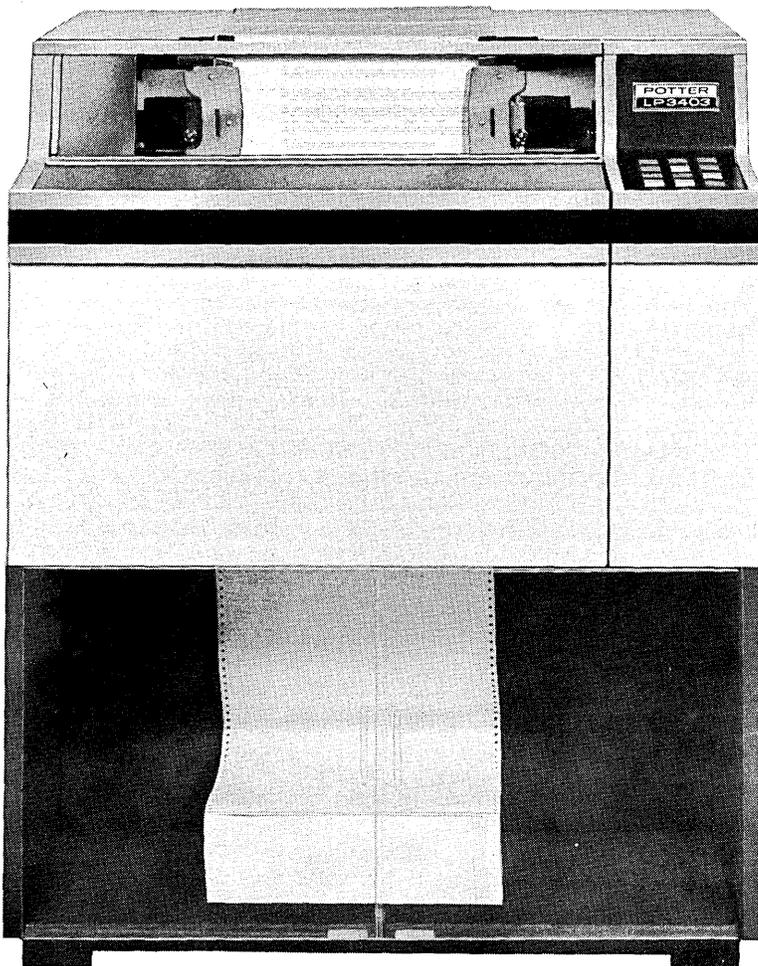
1043 Stuart Street
Lafayette, CA 94549
(415) 284-5200



“Let me prove to you that our Potter 1500 lpm printer gives the highest quality printout you’ve ever seen!”

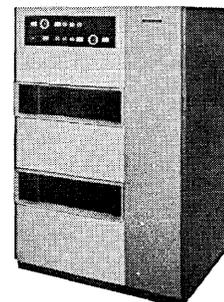
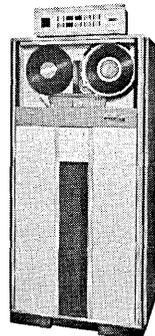


JOHN T. POTTER, President



Now, we can give you high speed printout with a clarity that's hard to match! At its present maximum speed of 1500 lines per minute, the LP 3403 produces characters that are as sharp and clear as machine set type. Here's a printer that's more than just a replacement for the 1403. The Potter Printer gives you substantially better print quality, higher speeds for more output, greater reliability for less maintenance and lower leasing costs. In addition, the controller, which operates up to three printers, is built into the printer to save floor space. Hard to believe? Let me send you the details and a printout sample. Write today or call your local Potter Representative. Potter Instrument Company, Inc., 532 Broad Hollow Road, Melville, N. Y. 11746. Phone 516 694 9000.

We can also supply you with 360/370 compatible magnetic tape systems and disk storage systems. No matter which IBM tape or disk models you are currently using, Potter can provide you with equivalent equipment to give better performance at lower cost.

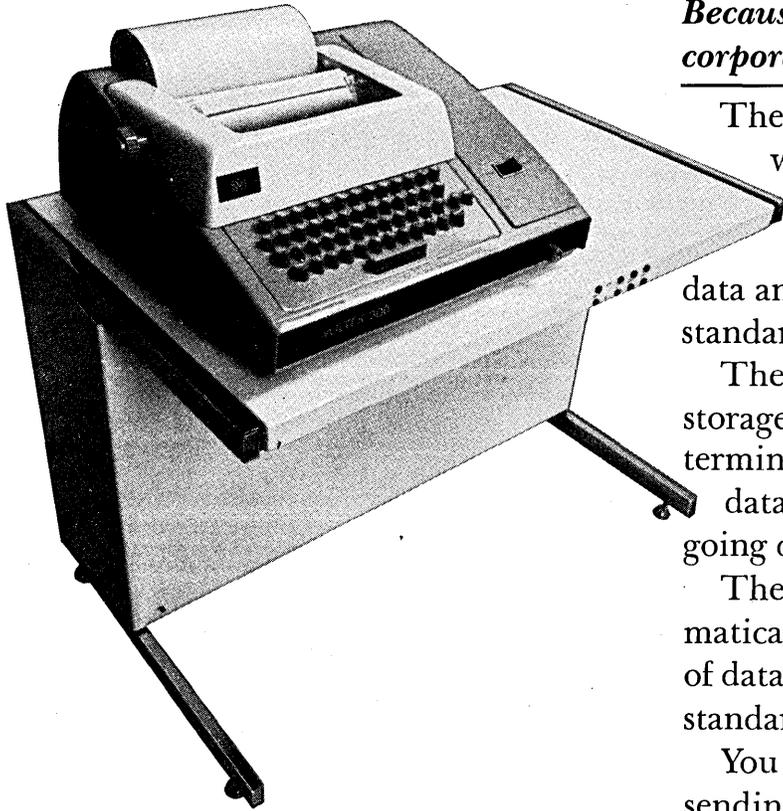


POTTER. A lot more than less expensive.

Calendar

EVENT/SPONSOR	DATE	LOCATION	CONTACT	COST
JUNE				
ACM 10th Annual Computer Personnel Research Conference	15-16	Toronto	c/o OISE Conf. Secretary 252 Bloor St., West Toronto 5, Ont. (416) 923-6641	\$45, members \$55, others
ADAPSO 35th Management Conference & 3rd Software Conference	22-23	Boston	ADAPSO 551 Fifth Ave. New York, NY 10017	\$80, members \$150, others
Data Processing Mgt. Assn. International Data Processing Conference & Business Exposition	27-30	New York City	DPMA 505 Busse Hwy. Park Ridge, IL 60068	\$90, members \$115, others
JULY				
Assn. of College & University Telecommunications Administrators 1st Annual Conference	17-20	Chicago	ACUTA Secretary 108 Cook Hall Illinois State Univ. Normal, IL 16761	Not available
Mexican Society of Electronic Computation 2nd Int'l. Computer Exposition for Latin America	24-28	Mexico City	Exhibition Management Inc. 40 W. Ridgewood Ave. Ridgewood, NJ 07450	Not yet available Exhibits free
AUGUST				
ACM '72	14-16	Boston	Elden M. Levine 36 Parramatta Rd. Beverly, MA 01915	\$40, members \$65, others
SEPT.				
International Federation for Documentation 36th Conference & International Congress	1-13	Budapest, Hungary	Office of Documentation Nat'l. Acad. of Sciences 2101 Constitution Ave. Washington, DC 20418	\$30
Society for Management Information Systems Annual Conference	7-8	Montreal	SMIS One First National Plaza Chicago, IL 60670	\$200, members \$230, others \$75, faculty
Irish Computer Society International Conference & Compex 1972	12-14 12-16	Dublin	ICCE Congress Secretary 74 Northumberland Rd. Dublin 4, Ireland	Not available
IEEE Computer Society Conference: COMPCON 72	12-14	San Francisco	Rowland C. Fellows IBM Corp. Monterey & Cottle Rds. San Jose, CA 95114	\$40, members \$50, others
Nat'l. Retail Merchants Assn. Annual Information Systems & Telecommunications Conference	24-28	Miami	NRMA 100 W. 31st St. New York, NY 10001	\$125, members \$175, others
ACM/IEEE 5th Annual Conference on Microprogramming	25-26	Urbana	L. A. Hollaar, Registrar Dept. of Computer Science Univ. of Illinois Urbana, IL 61801	\$75, members \$85, others \$55, students

Why 20 of the largest are installing the



Because the Wiltek terminal cuts corporate data transmission costs in half.

The Wiltek terminal slashes teletypewriter network costs by combining high speed performance—up to 2400 bps—with the ability to batch data and transmit it *automatically* over standard dial-up facilities.

There are two unique first-in, first-out storage buffers built right into the Wiltek terminal. One temporarily stores incoming data, the other temporarily stores outgoing data. Each holds 50,000 characters.

The buffers enable the terminal to automatically send and receive large amounts of data during a single call over the standard telephone network.

You pay only for time actually used in sending data rather than for costly leased lines.

Data moves fast, so phone calls are brief. Data transmission costs go down *more than 50%*.

U.S. corporations new Wiltek terminal

Because the Wiltek terminal increases the reliability and accuracy of an entire communications network.

The Wiltek terminal transmits and receives data automatically under the control of a centrally located computer. The computer sequentially places calls to all terminals in the system.

When called, a Wiltek terminal automatically answers and sends to the computer all messages that have been entered by the local operator. The computer then sends accumulated traffic back to the terminal and automatically terminates the call.

Messages received from the terminal are sorted by the computer for routing to other terminals in the network.

Block check characters are included on all data transmitted or received. If an error is detected, the block is automatically retransmitted.

The result is fully automatic, error-free data transmission.

Because the Wiltek terminal dramatically increases operator output.

Because of the remarkable buffers built into the Wiltek terminal, the operator can enter data at low speed at the same time the terminal is sending or receiving at high speed.

There's no time wasted waiting to enter data into a "busy" terminal.

And because the buffers store and forward data automatically, the operator never has to load cassettes, handle paper tape or rewind tape reels.

In fact, the operator never even gets involved in the communications process. Operator time can be devoted exclusively to data entry.

Because even with all its time- and labor-saving features, the Wiltek terminal leases for no more than the teletypewriter terminals most companies are using now.

This—combined with line cost savings and increased operator efficiency—reduces overall system costs dramatically.

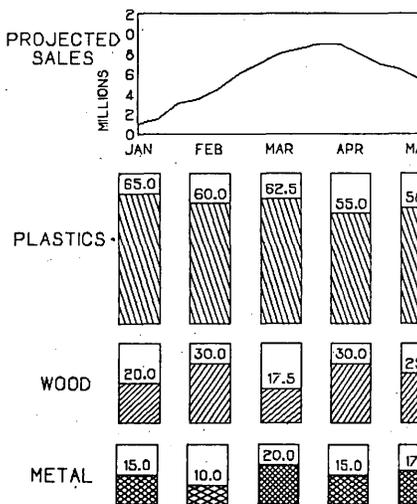
Find out more about the Wiltek terminal. Call Robert Colella, Commercial Marketing Manager, Wiltek, Inc., Wilton, Conn. 06897. Tel. (203) 762-5521. Or write for more information.

the
WILTEK
data
communications
terminal

Most printers tell it the way it is.

The Gould 4800 tells it the way you want it.

When the Gould 4800 printer/plotter delivers information from a computer, it delivers it in whatever form you want. Words, numbers, perspective drawings, charts or graphs.

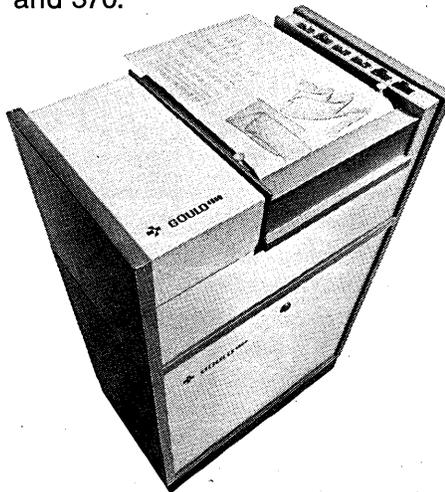


Example: On-time, easy-to-read management reports

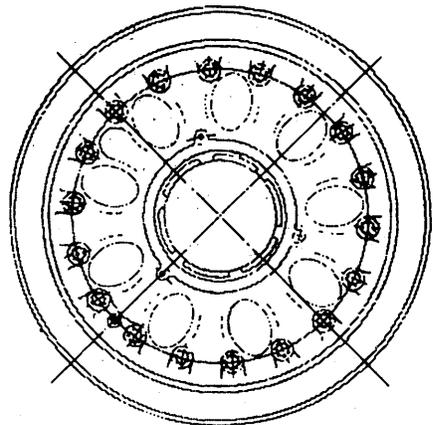
Or any combination of the above because it can handle both alphanumeric and graphics simultaneously.

And it delivers fast. Up to 4800 character lines a minute. That's 6 times faster than most line printers. 200 to 400 times faster than a digital plotter.

Because the 4800 is electrostatic, it operates quietly. Gives you fewer maintenance problems because it has few moving parts. Leases for less than most impact printers. And can be supplied with software and interfacing for most every major computer, including the 360 and 370.



So remember. If you just want words and numbers from a computer, most any printer will do.



Example: Computerized design for aircraft brake drum

But if you want information in a useable form—quickly and economically—you'll want a Gould 4800. And at Gould, service is a commitment. For more information, write Gould Inc., Data Systems Division, Marketing Headquarters, P. O. Box 7255, Denver, Colorado 80207.



Letters

One who knows

Shame on you for allowing the Tom Pittman letter on p. 152 of the April issue. As far as the 10 digits go, ASCII is a BCD code.

R. W. BEMER

Phoenix, Arizona

Mr. Bemer started on the ASCII effort in 1958 as manager of logical systems standards—for IBM, no less.

Giant lover

The otherwise good article in the March issue by Gruenberger ("Problems and Priorities," p. 47) once again emphasized the sophistic abilities and attitudes of your contributors.

Unfortunate that he could not have stopped the unbiased, well-written, interesting article one paragraph sooner! But then, of course, he has two strikes going for him—both the Univ. of Wisconsin and DATAMATION!

R. J. BRUMM

Data Processing Manager

Northeast Wisconsin

Technical Institute

Green Bay, Wisconsin

Bleary eyed

Benjamin Strong (May Letters, p. 22) misread my intent. I meant (that the work of a full-time computer man be) acceptable and responsible *as defined by himself*. Each of us has a vision of social good, but far too many of us violate that vision—our own innards, dammit—every time we punch in at the waxworks. That's wrong! Even a Hitler (ugh!) ought to be true to his dream. Fred Gruenberger said it precisely (March, p. 48): "... daily work appears to him as socially acceptable and responsible" (emphasis added). Strong is obviously a nonreader. That's what comes of operating a t-s console all day.

HERBERT R. J. GROSCH

Washington, D.C.

Friendly postulation

I had firmly resolved to say no more on the subject of division by zero unless specifically invited to do so. Some of my personal mail, however, leads me to believe that a few more words on the topic are plainly in order.

My article, "The Fallacy in the Fallacy" (Nov. 15, p. 36), attempted to make a serious point in an altogether friendly and lighthearted way. I hoped that most persons, particularly the mathematicians, would apprehend that point—and possibly even take active measures to do something about it.

I was somewhat startled to learn that a few persons (including some who should know better) still believe that

the rules of mathematics were handed down by the Deity—possibly on the reverse side of the stone tablet containing the Ten Commandments. Consequently, I was taken to task for suggesting in the Letters column (Feb., p. 119) that these rules are subject to alteration. My critics apparently believe (quite seriously) that one of the conventional postulates, which says that every number except zero has a reciprocal, is an irrevocable and self-evident truth.

I feel compelled to point out that it is just as easy to postulate that the zero ($\equiv 0/x$) *does* have a reciprocal (namely, $x/0$), but that the reciprocal of zero is the only number whose *quotient* (I recommend zero for esthetic and practical purposes) cannot be multiplied by the denominator to equal the numerator.

It is utterly futile and nonsensical to argue about which of these postulates is "true," because a German mathematician by the name of Kurt Goedel proved, some 40 years ago, that *all* such statements are "undecidable," and may therefore be used as axioms—provided, of course, that the axioms do not contradict *each other*.

What we *can* decide, and *should* decide, is which of these postulates is more convenient to our purposes. I suggest that the original postulate is quite amenable to manual calculations but that the latter is better suited to automation.

JERYL W. LAFON

Albuquerque, New Mexico

A dog's life

Permit me to congratulate DATAMATION for the splendid article by David Gardner in the March issue titled "Curtain Act at RCA."

What happened to RCA's computer business should not happen to a dog. Maybe taking down the Victor Pup from the RCA building brought on bad luck. Anyhow, your article should be read by every top executive as a lesson in management. What can we learn from this story?

1. No individual can grasp the "feel" of operation in a new job and in a new company in two years, let alone make costly decisions.

2. No top executive should push his master mind pet over loyal employees who have the know-how but do not have the inside pull.

3. No matter how smart, brilliant, hot shot, educated, or talented, no executive should be allowed to have so great an authority so as to put one section of a company out of business in two years that took 18 years to develop.

EDWARD STANKO, P.E.

Atco, New Jersey

Justasupposing

I was extremely interested in your March issue with the back-to-back articles on the demise of RCA and Bunker-Ramo's success with NASDAQ, having myself worked back-to-back with RCA and then with Bunker-Ramo on NASDAQ.

At RCA, I was senior systems analyst at Palm Beach Gardens, Florida, and observed the many managerial and communications problems which existed between the various groups (particularly between programmers and engineers). However, on NASDAQ, where I was one of the programming group leaders, we generally had harmonious relationships in designing and installing this very successful system.

In addition to myself, there were two other key personnel on the NASDAQ team who were former RCA employees—our director of programming and our group leader of recovery.

On the same vein, it became apparent to some of us, even as NASDAQ was being installed, that after NASDAQ, Bunker-Ramo's future was bleak. Many of the potential contracts that were being planned, particularly Phase II of NASDAQ and Telequote V, were not to become reality. The talent to install the systems was there, but the customers for the concepts proposed had not been sold.



So as NASDAQ approached completion, or soon after implementation, most of the NASDAQ team moved to firms or positions with more favorable potential futures.

Frequently, the lower ranks can foresee the future problems of a company before the executives can, and therefore act appropriately.

ROBERT BEATTY

Cincinnati, Ohio

Public knowledge

Your April issue contained an article by Dave Farber titled "Networks: An Introduction" (p. 36). This article vaguely refers to a MITRE Corp. paper that I co-authored ("Survey of Computer Networks," MTP-357, Sept. 1971). No mention of the paper name, nor credit to the authors (myself and Jack J. Peterson) appears despite the

If you own an IBM System /360, we need it. We'll buy it.

We need more IBM System/360s, at least \$50,000,000 worth.
We need them to satisfy the worldwide demands of our customers
during the next twelve months. If you'd like to sell your/360
for cash, we'll buy it. Right now.

Leasco Computer, Inc.
One Linden Place
Great Neck, New York 11021

Call Michael Morrell, President

516 466-9500

Leasco
THE LEADER IN LEASING

letters

fact that our survey is in the public domain. Because Mr. Farber has drawn on our work, I feel strongly that our paper should be properly credited.

SANDRA VEIT
The MITRE Corporation
McLean, Virginia

Rat pack

Computer users have been done a great favor by DATAMATION's printing of Dr. D. Farber's article on networks. In particular, Farber hints at the closed nature of ARPA (Advanced Research Projects Agency). He points out that many other universities, agencies, and organizations would like to join the network.

I want to reinforce Farber's observation and say more emphatically that I could never understand how ARPA could justify spending the taxpayers' money on a network which can be characterized as academically exclusive, even clannish. By what criteria are computer organizations (industrial or otherwise) denied participation in the network they help pay for as taxpayers and might even specifically support as users? I am glad to see Farber point out that the trend is toward a democratization of the ARPA network.

Similarly, an argument can be advanced concerning ARPA's funding of computer-oriented research. Not only has the taxpayers' money been used to support predominantly academic research (versus that of industry), but only a few universities have been selected. Furthermore, these few have been given large grants year after year. In view of the questionable results from some of the institutions, "unique capability" cannot justify continued preferential support. Proprietary approaches and unique capability might justify grants for a year or two, but hardly the 10-12 years enjoyed by a few universities. The buck should be passed!

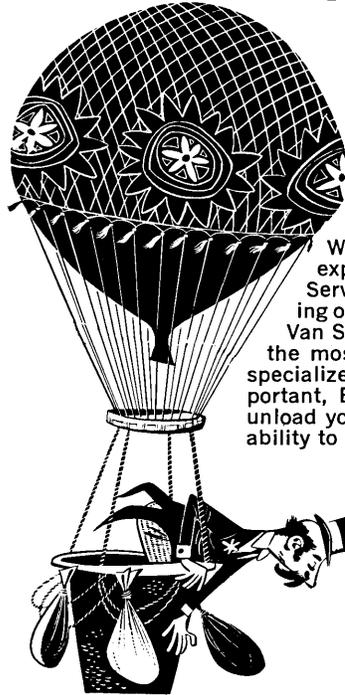
WILLIAM S. JARNAGIN
Concord, Massachusetts

For a related article, see "ARPA Network to Go Commercial," in the April News in Perspective, p. 106.

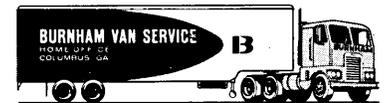
The wrong place

We at the Lawrence Livermore Laboratory have unlimited admiration for the abilities of our colleagues at the Lawrence Berkeley Laboratory. However, we are unwilling to go so far as to credit them with our own work. Please inform your readers that the Octopus network described with fair accuracy in "Networks: An Introduction" has been developed and implemented entirely at the Lawrence Livermore Lab-

computers borne tenderly



When you ship computer hardware, look for an experienced computer mover like Burnham Van Service, which helped pioneer the nationwide moving of electronics and other high value cargo. Burnham Van Service has air-ride vans with power tailgates and the most advanced tie-down systems, along with other specialized equipment for moving electronics. More important, Burnham has the know-how to load, move, and unload your computer hardware without damage, and the ability to spot your shipments at all times, day and night, from one end of the country to the other. Call the man from Burnham Van when you're ready to talk about computer shipments. Or write to us and we'll be glad to send you a copy of a new 32-page equipment manual that illustrates Burnham's specialized equipment for handling high-value cargo.

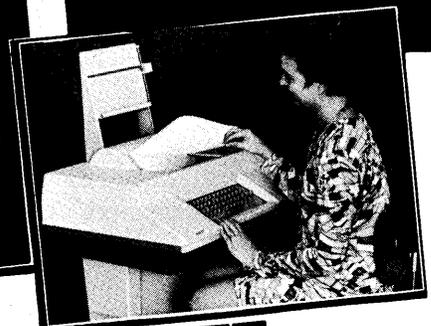
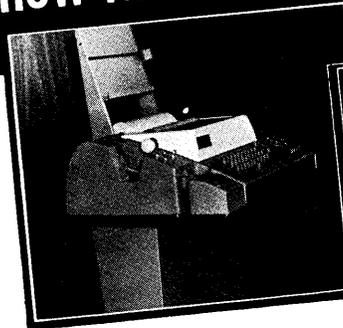


BURNHAM VAN SERVICE, INC.

1636 Second Avenue, Columbus, Georgia 31901 • Phone 404/327-7491
Denver 303/433-8619 • Chicago 312/372-4323 • New York 212/679-4111 • Cheverly, Md. 301/322-1300

CIRCLE 80 ON READER CARD

a FANTASTIC machine... now fantastically QUIET!



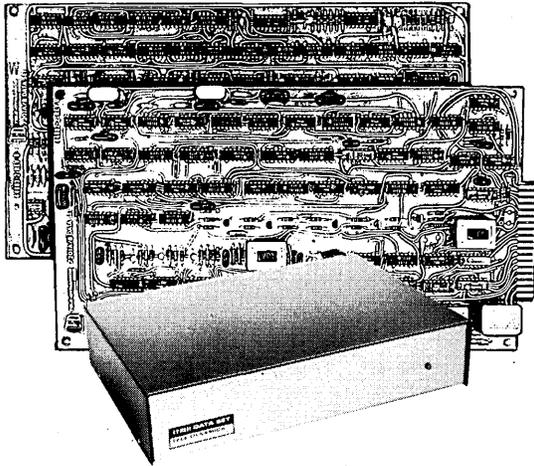
GATES ACOUSTINET...

is the difference, and the result of that difference is a new found PEACE and QUIET. ■ GATES has the solution for your noisy business machine, be it a teleprinter or other type terminal for data communication. ■ GATES also QUIETS Automatic Typewriters, one or a complete word-processing center, keypunches, accounting machines or you name it. ■ All this fantastic QUIET is available without interfering with the operator or serviceman, simply contact ... **GATES ACOUSTINET, INC.**
P. O. Box 1406-D5, Santa Rosa, CA 95403 (707) 544-2711, Telex 34-0376

THE QUIET SOLUTION FOR NOISY BUSINESS MACHINES

CIRCLE 45 ON READER CARD

Another new modem from Tele-Dynamics

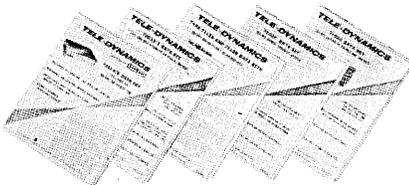


7201 A and B

Full duplex 2000 or 2400 bps automatic or manual answer. Interchangeable low-cost replacements for Bell 201A and B.

Available for delivery now. In PC card version for OEM; as a stand-alone complete with power supply, barrier strip termination, business machine connector and power cord; or in a multiple rack mounting adapter that houses up to five complete data sets. Functionally and interface compatible with Bell 201A and B data sets. Uses Type CBS or CBT DAA for automatic public telephone network operation, or CDT for manual only.

Find out about the 7201. And about the complete Tele-Dynamics line of 300 to 2400 bps modems. Send for data sheets. Or call John Jurenko at (215) 643-3900. Do it now.



TELE-DYNAMICS

DIVISION OF

AMBAC

525 Virginia Drive, Fort Washington, Pa. 19034 (215) 643-3900

CIRCLE 59 ON READER CARD

letters

oratory of the Univ. of California.
JOHN G. FLETCHER
Livermore, California

Tape dispenser

In the Dec. 1 issue (Letters, p. 15) I read Stephen F. Piron's reply to E. Alldredge's suggestion that "all essential documentation relating to a computer file (be) put into both human and machine readable form and placed at the beginning of the file." (See B. Menkus, "Retention of Data . . . for the Long Term," Sept. 15, p. 30.)

As a long-time records administrator and a former custodian of classified information, including Top Secret, I would like to advise Mr. Piron that it was not the intent of Dr. Alldredge, I'm sure, to reveal the security of the data. Classified information would either be indexed to the proper container as prescribed by security regulations or coded if necessary.

I also would like to appeal to all tape users to send their old computer tapes to Blind, Inc., 12007 S. Paramount Blvd., Downey, CA 90240. This non-profit organization reprocesses the tapes for use on audio recorders. The blind use the tapes for many purposes, such as recording textbooks. Tapes for the Blind needs tape one-inch and one-half-inch wide. They especially need one-mil tape. Through Tapes for the Blind, a blind person can buy an 1,800-foot reel of one-mil recording tape for \$1 instead of the usual \$5.

So please: 1) help the ecology, as burning of tapes pollutes the air with poisonous gases, 2) help your administrative costs by freeing your storage areas, 3) preserve your documentation by saving only the essential record of the transactions, and 4) safeguard your firm from legal involvements because of no or improper documentation.

VIETTA A. FITZGERALD
Baltimore, Maryland

Freebies

In his letter (April, p. 21), Robert Marsh puts his finger on the very real problem of shops not investing enough effort in program design. Furthermore, he identifies lucidly the results of this short-cut. My colleague, John Rhodes, was asked to write a series of articles for *Data Systems*, a British dp publication, entitled "Management by Module." If any of your readers would be interested in receiving copies of these articles, I should be happy to supply them.

NICK M. ROWE
Hoskyns Systems Research Inc.
600 Third Avenue
New York, New York 10016 □



ANNOUNCING THE ULTIMATE MINI

Our 330 nsec VARIAN 73 has extendable architecture, multiple busses and user-accessible microprogramming.

VARIAN 73 is the first of a whole new, all new family. It comes complete with every bell and whistle developed over all the years of minicomputer technology. And it has a brand new extendable architecture which includes multi-bus organization, user-accessible microprogramming, dualport asynchronous memories, 64-bit control word for maximum speed and flexibility. Plus

built-in interfacing between multiple processors and memories.

VARIAN 73 comes complete with comprehensive software and peripheral packages built up for Varian's 620 series computers. Including VORTEX. Yet VARIAN 73 is not expensive. In fact,

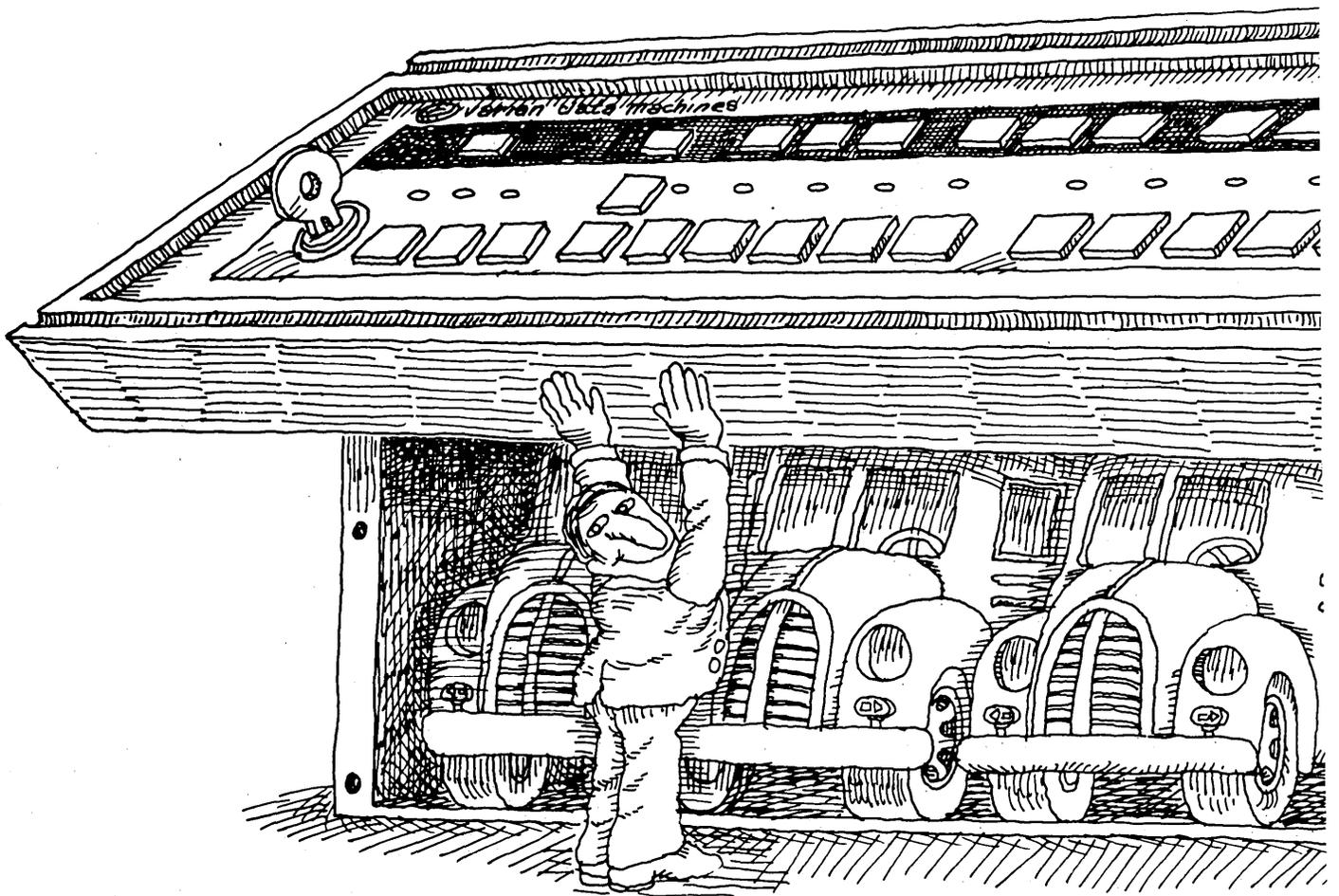
varian data machines 

it costs a lot less than systems with only a portion of its capabilities.

Call VARIAN 73 the ultimate mini... the 330 nsec mini... the mini with extendable architecture... multi-bus mini... or the mini with microprogramming you can get your hands on. But call. Or write. Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664 (714) 833-2400.

**It takes more than one bus
to get the most
out of a 330 nsec mini.**

**Introducing
the multi-bus VARIAN 73.**



Our new minicomputer has a whole new architecture. It was designed to take advantage of its 330 nsec cycle time without tripping over its own CPU. Or getting stalled in the bus line. Or any of the multitude of problems that hit the computer user as memory speeds have gone the limits.

VARIAN 73 is compact. A complete 32K system in a seven inch chassis and more in a 14 inch chassis. But fast. 165 nsec microinstructions. 330 nsec full memory cycle (660 nsec optional for less money with core). And direct I/O memory data transfers at rates up to 3 million words per second.

With a memory like this, you can forget the delays. Dualport (standard with either the super fast semiconductor memory or the slower core or any combination of the two). Dual busses

which make for faster interleaving of I/O and CPU functions. VARIAN 73 also gives a much more efficient and flexible instruction repertoire. Not only microprogrammed, but with micro-programming you can get your hands on. And a 64-bit control word dictating the flow of data through a 16 register processing section.

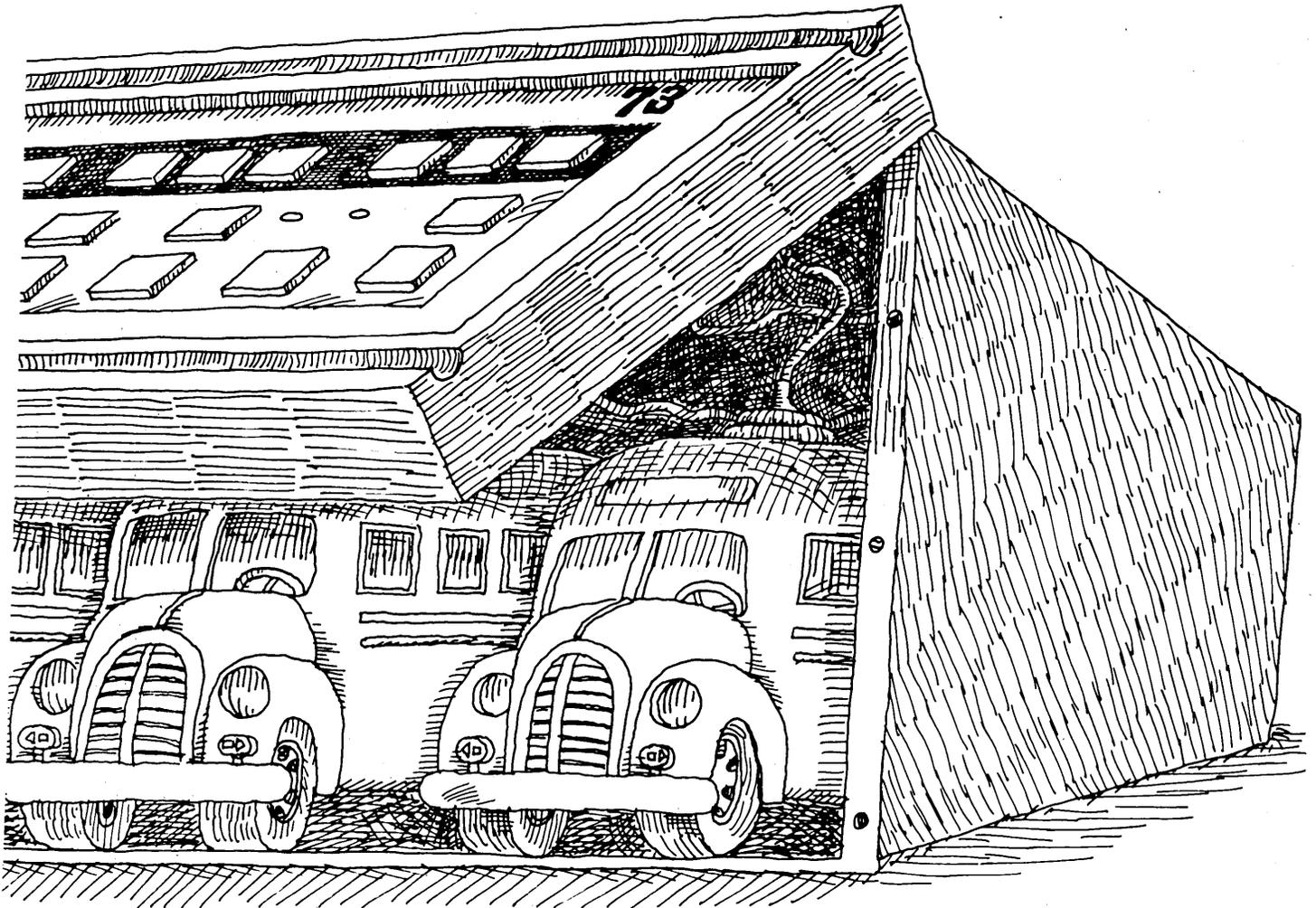
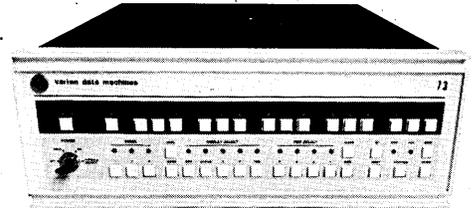
Your designer and programmer can choose from up to seven different I/O channels. And from many varied software combinations (compatible with all previous Varian 620 programs). Or use Writeable Control Store as an option.

VARIAN 73's faster, more efficient and flexible. With expandable memories and extendable architecture. And simple interfacing between multiple processors and memories. Just install them in the chassis.

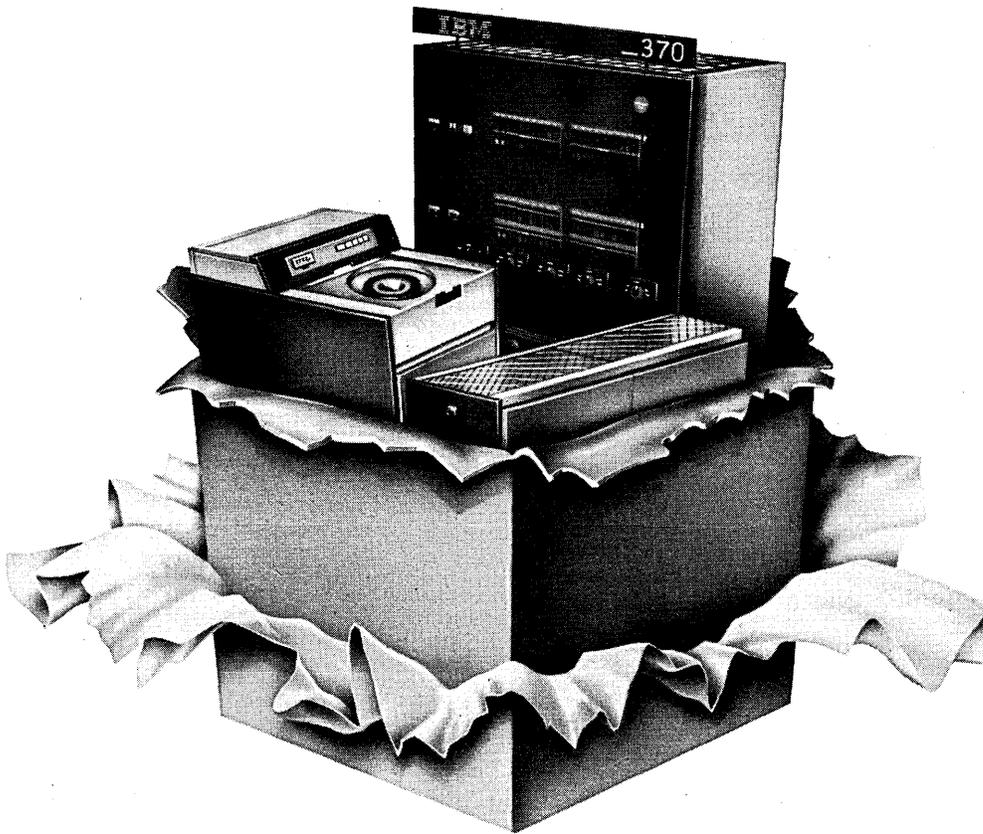
VARIAN 73 prices out well below the competition. It's hard to make comparisons since there isn't anything on the market like it. But the nearest minicomputer carries a higher price tag and leaves you stuck on the bus. Which puts them pretty far behind.

Call or write. Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664 (714) 833-2400.

varian data machines 



BREAKTHROUGH!



ITEL'S unique new Packaged Lease Program may be the most significant announcement since the introduction of the 370.

Now there's a new way to lease an IBM System/370 from ITEL on a short term basis with complete flexibility and surprisingly large savings. The ITEL Packaged Lease Program lets you lease a complete computer package consisting of System/370, ISS Disk Drives, and AMS Monolithic Memory.

Lease terms range from 3 to 8 years, and savings can be as great as 60% of IBM rental!

ITEL'S Packaged Lease Program may be the most comprehensive leasing program ever offered. Just look at the advantages of this package: All equipment is from a single source, ITEL. You can upgrade from one model of 370 to another during the terms of the lease. You get advanced

technology Disk Drives and Monolithic Memory. And you get remarkably flexible lease terms.

ITEL has the unique capabilities required to make such a lease: financial resources and expertise. (ITEL has over \$260 million in 360 and 370 leases in effect.) Monolithic Main Memory from Advanced Memory Systems, Inc. And Disk Drives from our Information Storage Systems Division, which have set the industry standards for reliability.

Get all the facts on ITEL'S Packaged Lease Program. **CALL THE PRICE/PERFORMANCE PEOPLE AT ITEL.**

ITEL
CORPORATION
One Embarcadero Center
San Francisco, California 94111
Phone: (415) 989-4220

CUT YOUR COSTS

ITEL Corporation, DPG
One Embarcadero Center
San Francisco, CA. 94111

Please provide me with more information on the Packaged Lease Program.

Name _____ Title _____

Company _____ Phone _____

Address _____

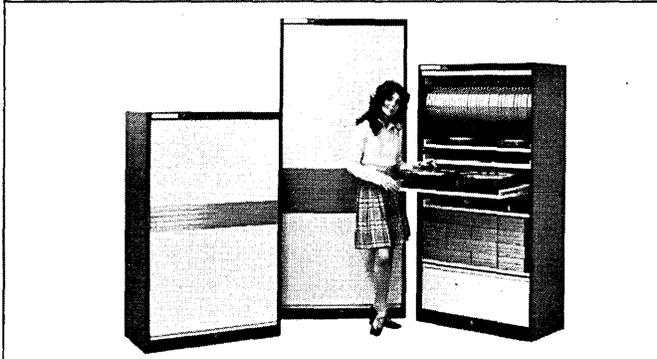
City _____ State _____ Zip _____

Present system _____

Any media storage cabinet you buy now may be obsolete before it is delivered...

before you buy, find out about the improved storage efficiency and cost advantages of new optimedia™ cabinets

Two years ago we decided that it didn't make much sense to keep designing cabinets that were locked-in to the storage of cards only or tape only or one type of disk pack. So we studied the total media storage problem from all angles and came up with what we believe is the ideal solution, optimedia™ coordinated cabinets can store all types and sizes



of data processing media. They can store them in virtually any combination you desire, and — when your storage requirements change, optimedia cabinets can adapt to the changes. They're sort of a "living" storage system that won't become obsolete or leave you with excess capacity for one medium and not enough for another.

optimedia™ coordinated cabinets have other benefits such as "Action Level" storage that lets you place all media at the most convenient retrieval height, smooth operating roll up doors that open all the way leaving the entire inside fully accessible, and up to 20% extra storage capacity when compared to other cabinets with the same outside dimensions.

So . . . hold up that purchase requisition until you can hear the full story on optimedia™ coordinated cabinets. That way you may avoid buying something that's obsolete before it's delivered.

For the complete story on optimedia™ coordinated cabinets, call your local Wright Line office. You'll find it listed in the yellow pages in all major cities or contact us by writing direct or circling the readers' service number. Wright Line, a Division of Barry Wright Corporation, 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

Wright
LINE

MEDIA MANAGEMENT SYSTEMS



CIRCLE 79 ON READER CARD



STANDARD

Our New Model 20 Programmable Calculator. Latest In the Series 9800.

It speaks and understands English. It speaks and understands Algebra. It really understands your problems. It was designed for instant programming right at your desk. The Model 20 will take you from concept to final solution of your problems

faster than any other system on the market.

Incredibly Natural Language.

You'll quickly grasp the operating concepts of the Model 20, because it uses a natural but powerful language that lets you work with algebraic symbols, formulas, and English language instructions. And, if you already know how to program, you'll

appreciate features that once were exclusive to languages like FORTRAN or BASIC: Enter and Format statements, function subroutines, and callable subroutines with parameter passing.

Talk out a problem with your Model 20. Key in your problem exactly as you would write it on paper. Press EXECUTE and there's your answer. It's deceptively simple.

With the Model 20 you always know where you stand. Its alphanumeric display and printer give you operating instructions, show your formula as you key it in, and



completely label your input and output data.

Easy To Get Along With.

One of the nicest things about the Model 20 is that it doesn't bite. If you make a mistake, your display not only tells you there's an error — but precisely what and where the error is. Then it's a simple matter to insert, delete, or replace anything from one symbol to an entire line with just a few quick strokes on the editing keys. It adds up to this: You don't have to be an expert to operate the Model 20. Because of its error detecting and correcting techniques,

the Model 20 is the fastest and easiest programmable calculator available.

A Word About Power.

What really counts is not that our calculator will solve up to 36 simultaneous equations, but what you can do with that power. With the Model 20 you'll spend less time getting answers and more time building ideas. Another thing. Our keyboard is modular. So if you don't like our setup, you can build your own.

The Model 20 can be plugged into our hardworking Series 9800 Peripherals: X-Y Plotter, Type-

writer, and Card Reader, to name a few. An added plus — it interfaces with test instruments. The basic unit, including our built-in alphanumeric display and printer is \$5,475, with immediate delivery.

For more information or a "hands-on" demonstration, write: Hewlett-Packard, P.O. Box 301, Loveland, Colorado 80537. In Europe: 1217 Meyrin-Geneva, Switzerland.

C092/2

HEWLETT  PACKARD

CALCULATOR PRODUCTS

CIRCLE 8 ON READER CARD

If you like
good,
close harmony
don't miss
this concert.

The Remcom 2775 Remote Batch Terminal
teamed up with a 360/370 System.

The harmony is flawless.

135 LPM and 400 CPM for less than \$600
per month.

A few other rave notices about the
Remcom 2775:

- You can use it terminal to terminal over
the dial-up network.
- You can use it as a print-only station.
- You've got Data Compression as a
standard feature plus complete
compatibility with all Remcom 2780's.

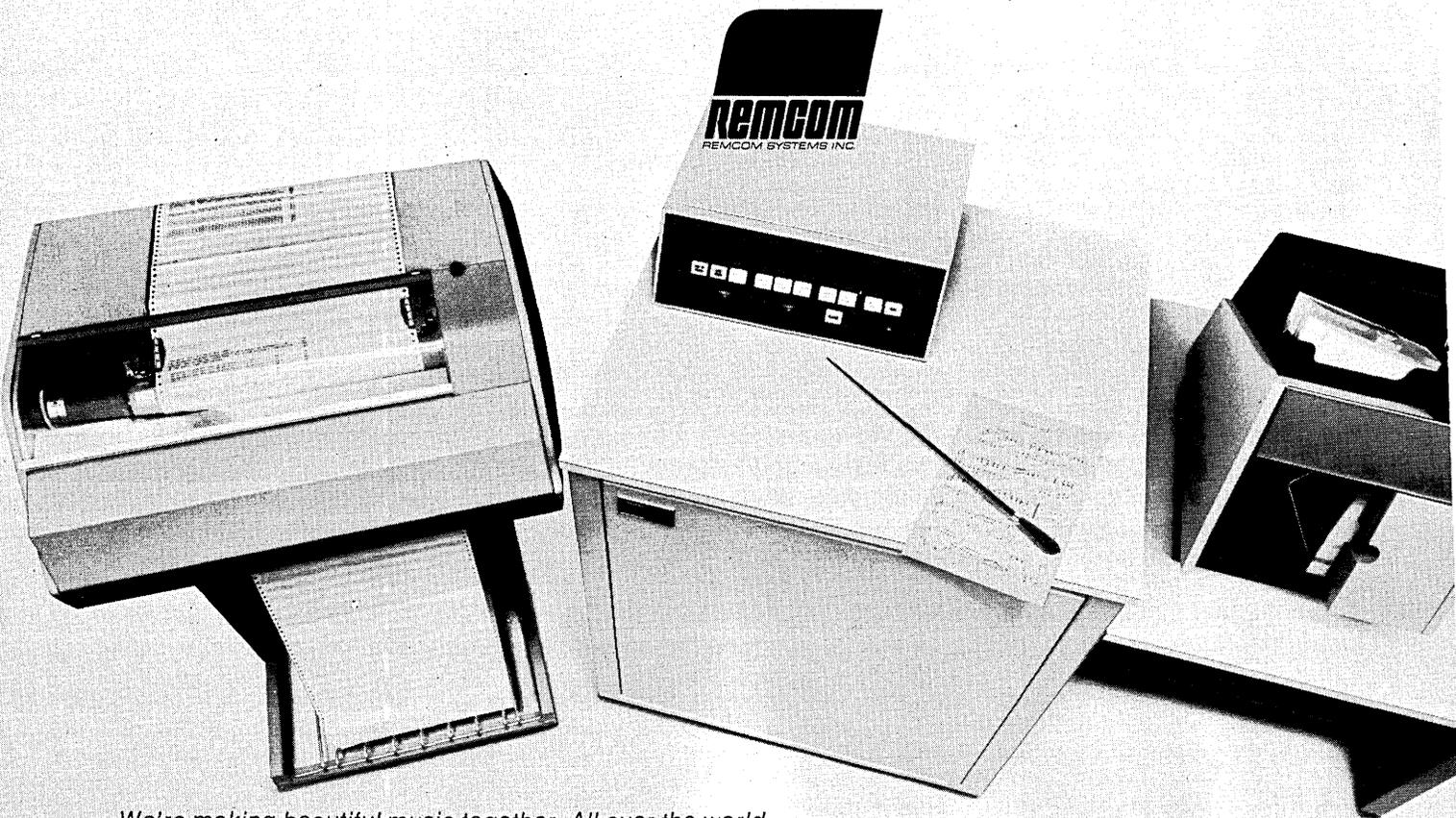
(Incidentally, the Remcom 2780 is another
thing you ought to look into if you like
beautiful music.)

Call one of our sales managers collect.

Let him schedule a private performance
for you. You'll like the music the 2775 makes.

United States: New York 212/838-1440; Chicago
312/298-5090; Detroit 313/477-2256; Los Angeles
213/386-5360; New England 617/246-1350;
New Jersey 609/858-6875; Washington, DC
703/893-2288; Texas, Garland 214/328-9991, Houston
713/772-1666. **Canada:** Ottawa 613/235-1458. **Europe:**
Oslo, Norway (Teamco) 02/67 53 37.

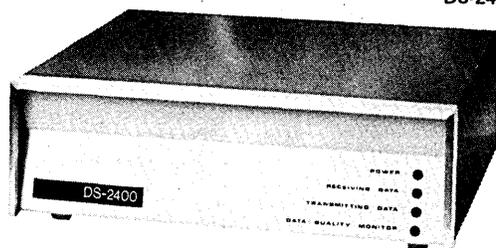
2705 National Drive / Garland, Texas 75041 / 214-328-9991



We're making beautiful music together. All over the world.

CIRCLE 71 ON READER CARD

THE RIXON DS-2400 DATA SET



DS-2400

Telephone lines aren't all perfect . . . and that's a good reason for considering Rixon's DS-2400 data set.

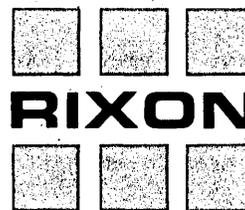
Those less than perfect lines have background noise, phase jitter, and lots of distortion. To combat this, the DS-2400 has differentially coherent modulation, an ultra-sophisticated clocking scheme, and a sharp, clean spectrum.

It means a more efficient system, fewer requests for retransmission, less need to dial alternate lines, higher effective thru-put.

Most lines are good and error rates are low with any data set.

But think about the other lines.

Rixon did!



Rixon Electronics, Inc.
2120 Industrial Parkway
Silver Spring, Maryland 20904
Phone: 301/622-2121
TWX: 710-825-0071
A Subsidiary of
United Business Communications

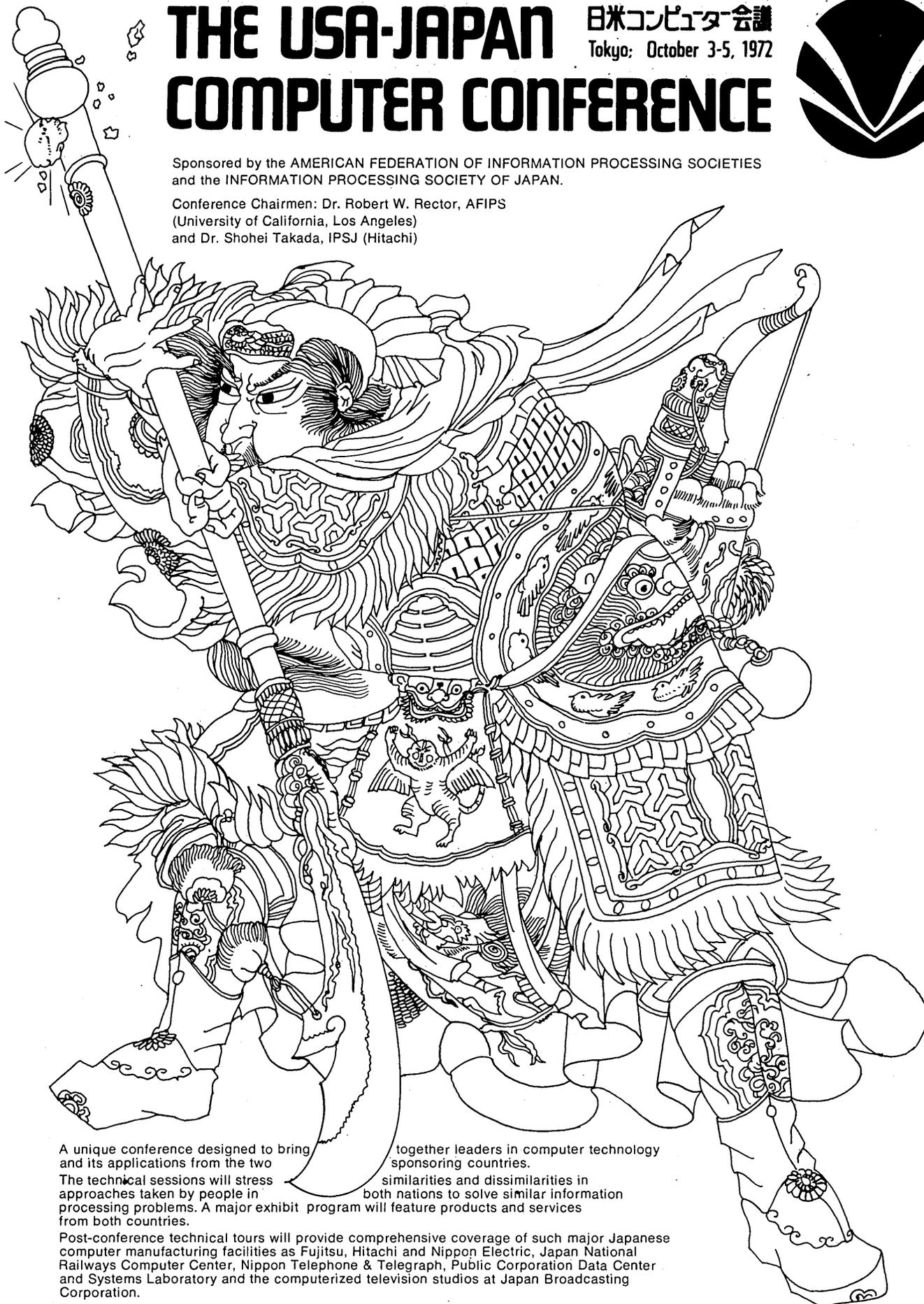
THE USA-JAPAN COMPUTER CONFERENCE

日米コンピュータ会議
Tokyo: October 3-5, 1972



Sponsored by the AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES
and the INFORMATION PROCESSING SOCIETY OF JAPAN.

Conference Chairmen: Dr. Robert W. Rector, AFIPS
(University of California, Los Angeles)
and Dr. Shohei Takada, IPSJ (Hitachi)



A unique conference designed to bring
and its applications from the two
The technical sessions will stress
approaches taken by people in
processing problems. A major exhibit
program will feature products and services
from both countries.

Post-conference technical tours will provide comprehensive coverage of such major Japanese
computer manufacturing facilities as Fujitsu, Hitachi and Nippon Electric, Japan National
Railways Computer Center, Nippon Telephone & Telegraph, Public Corporation Data Center
and Systems Laboratory and the computerized television studios at Japan Broadcasting
Corporation.

To accommodate U.S. registrants, special low cost flights are planned; tours of Japan and
the Far East are also available.

For registration, travel and/or exhibit information, contact: USA-Japan Computer Conference,
c/o AFIPS Headquarters, 210 Summit Avenue, Montvale, N.J. 07645.

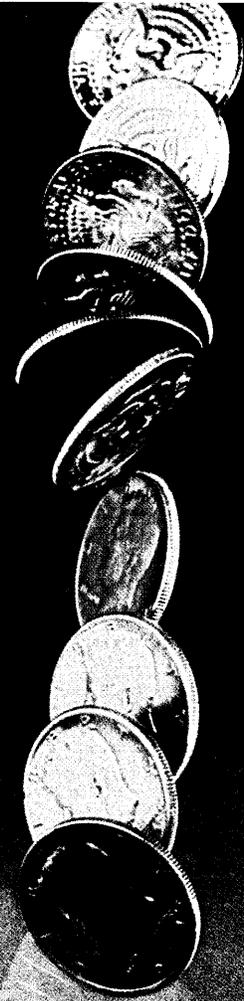
together leaders in computer technology
sponsoring countries.

similarities and dissimilarities in
both nations to solve similar information
processing problems.

For G.E. CIRCLE 84 ON READER CARD →

Before taking costly chances on data communication equipment...

There are some
important questions
you need answered



Teleprinters Data Sets and Multiplexers: a value analysis

Most of the things
you should know
AND HAVE TO ASK



Q When should a company start to consider a data communication network?

A When mail delivery of data to be processed is too slow for your business needs.

Q What are the major advantages of a CRT terminal and a teleprinter?

A A CRT (Cathode Ray Tube) provides a momentary visual display.

A teleprinter provides printed permanent data with multiple copies.

CRT's are also available with printed copy. All have advantages to meet specific requirements.

Q What are the advantages of an electronic teleprinter over a mechanical teleprinter?

A While a mechanical teleprinter is low in cost initially, there are major advantages and cost saving features in an electronic teleprinter worth considering. Features like quietness, small size, high speed, and reliability. Higher speeds mean a savings in operator time and line time and cost. Having fewer mechanical parts, an electronic printer's high reliability should mean reduced maintenance costs.

Q Is noise a factor in teleprinters?

A Absolutely. With electronic printers, you can place them in your front office — they're quieter than standard typewriters. This eliminates soundproofing rooms or isolating machines.

Q There are a number of options on an electronic teleprinter. Are they cost savings advantages?

A Yes. This allows you to tailor your machines specifically to each application. Or, you can change as the need arises. General Electric's TermiNet* 300 printer offers you over

20 easy-to-install options to upgrade systems. This eliminates complete re-equipping of a system as your network increases. For example, if you don't have error checking in your network, but decide to add it at a later date — you simply plug in a new circuit board — at minimum cost.

Q Is there a way I can obtain more capacity from my existing communications network?

A Yes. Consideration should be given to the use of multiplexer equipment to carry different transmissions over the same data path. General Electric's DigiNet* 150 and 160 multiplex equipment meets this requirement. These multiplexers are employed in the world's largest time-sharing network — the General Electric Information Services network.

Q Is it necessary to buy special test equipment for installation and maintenance of modems and multiplexers?

A No. Not if you buy features like the ones built into General Electric's data communication products. Built-in testing and diagnostics provide Total Line Control. General Electric's TLC enables the user to rapidly isolate his network problems.

Q Is quality control an important consideration in data communication equipment?

A Quality control is extremely important whether it be teleprinters, modems, multiplexers, concentrators, etc. At General Electric for example, we take extra care to see that you get the best product performance possible. General Electric's space technology experience has been useful in establishing rigid quality control procedures. After every component and sub-assembly is checked, final tests including vibration and noise are made. Then the entire system is checked, not once, but twice.

Q Is a nationwide network of maintenance service important?

A Data communication equipment requires regular maintenance and service. A nationwide network of locally available servicemen with factory training, special test equipment,

and spare parts provide the capability to get back on line quickly and efficiently. Downtime can be far more costly than any difference in hardware cost.

Q What about user-oriented product documentation?

A In order to best utilize hardware, it's highly recommended that you have complete detailed product literature on all facets of its operation. General Electric feels this to be very important and has developed a full set of user-oriented documentation for all of its equipment.

Q Should I buy or lease this equipment?

A Since General Electric both sells and leases this equipment, we feel we can give you an unbiased answer. Buying this equipment over the long term is less expensive. However, should you want to spread your costs, GE can offer you attractive lease rates.

Q Is it important to do business with a company that has received large repeat orders?

A We think so. It certainly indicates product acceptance and experience. GE has presently shipped 10,000 TermiNet 300 printers which are being used in a wide variety of applications.

Q Is doing business with a company who has single source responsibility important?

A Yes. A single source for data communication equipment gives you single source for service.

Q What about systems capability?

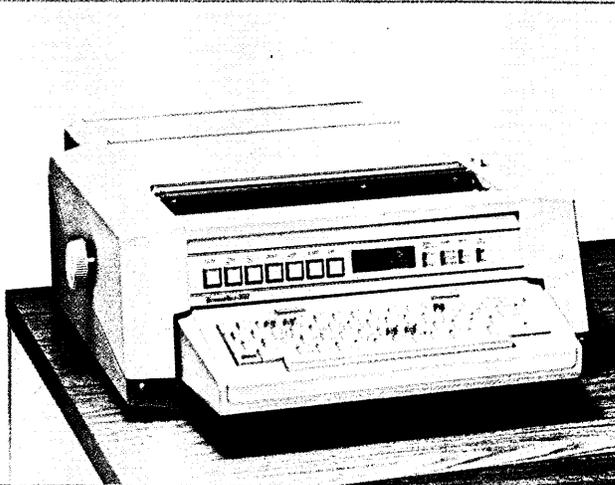
A If you do need systems capability, General Electric has an organization of experienced data communication engineers to help solve your problems.

This may take the form of offering you complete system design and application assistance. Or, the assurance that any one of General Electric's products will be compatible with your system.

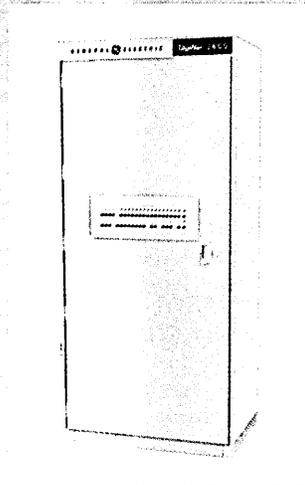
*Registered trademark of General Electric Company, U.S.A.

For data communication products, systems and service

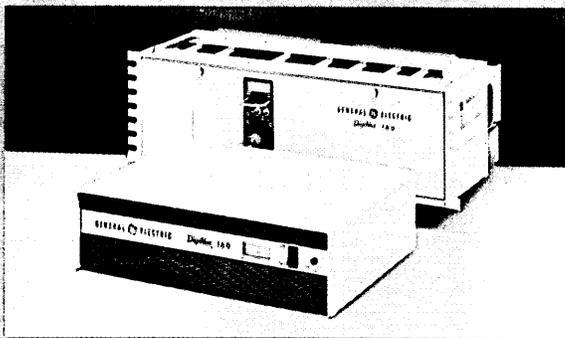
One of your best answers
is General Electric



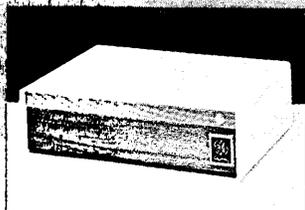
Terminet 300 Printer—Selectable printing speeds of 10, 15, and 30 characters per second. Prints an original plus 6 copies with all 96 characters of the ASC11 code set. Operates more quietly than an office typewriter.



DigiNet 1600 Data Concentrator—Low-cost communications processor. Reduces line costs by consolidating up to 256 terminal inputs for transmission over a minimum number of voice-grade lines.



DigiNet 160 Multiplexer—Offers the most cost effective means of connecting low-speed terminals in diverse locations to a central computing system. Optimum results are obtained when used in conjunction with the data concentrator.



DigiNet 330 Data Set—Short haul, high speed data set designed to communicate between Remote Job Entry terminals and central systems at significant savings over conventional methods—switch selectable speeds of 2400, 4800 or 9600 BITS/SEC.



OUR NO. 1 GOAL:
TO MAKE
GENERAL ELECTRIC
YOUR BEST BUY

For additional
information contact:

Robert G. Hoffman
50 Fordham Road
Wilmington, Mass. 01887
(617)657-4800

Michael E. Donlon
177 Columbia Turnpike
Florham Park, N. J. 07932
(201)377-0720

David A. Miles
777 14th Street, N.W.
Washington, D. C. 20005
(202)393-3600

H. W. Granberry
1860 Peachtree Rd., N.W.
Atlanta, Georgia 30309
(404)351-4400

Fred A. Duran, Jr.
999 Elmhurst Road
Mt. Prospect, Ill. 60056
(312)255-3200

C. H. Orndorff, Jr.
341 White Pond Drive
Akron, Ohio 44320
(216)836-0466

Donald G. Covert
P. O. Box 1316
Northland Center Station
Southfield, Mich. 48075
(313)355-4400

V. L. Hackney
2642 Andjon Road
Dallas, Texas 75220
(214)358-4566

George W. Brennan
4820 Minnetonka Blvd.
Room 301
Minneapolis, Minn. 55416
(612)544-6699

Joseph M. Burt
P. O. Box 4778
Sacramento, Calif. 95825
(916)927-0163

Kenneth C. Freund
228 W. Florence Avenue
Inglewood, Calif. 90301
(213)678-2531

IN CANADA

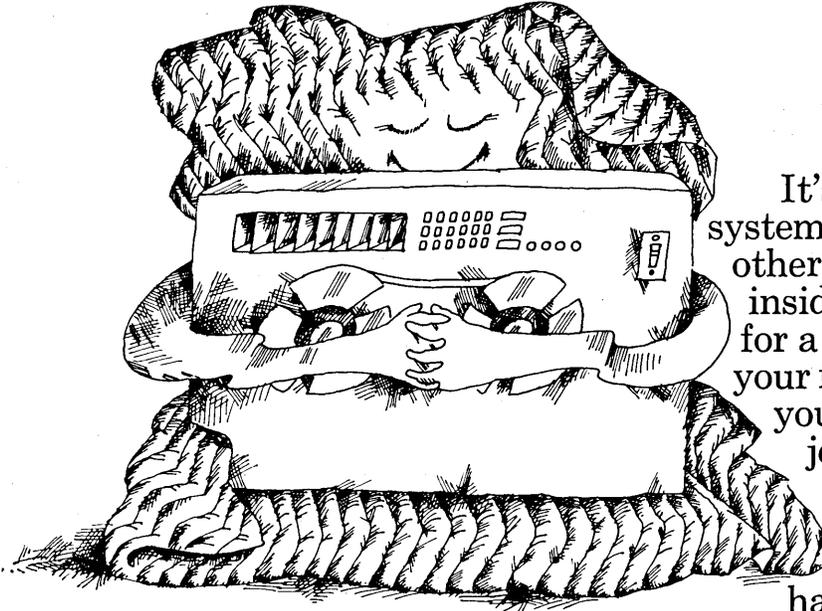
Canadian General Electric Company
100 Wingold Ave., Toronto 395
Ontario, Canada
(416) 789-3281

or write:

General Electric Company
Section 794-02
Data Communication Products Department
P. O. Box 4197
Lynchburg, Virginia 24502

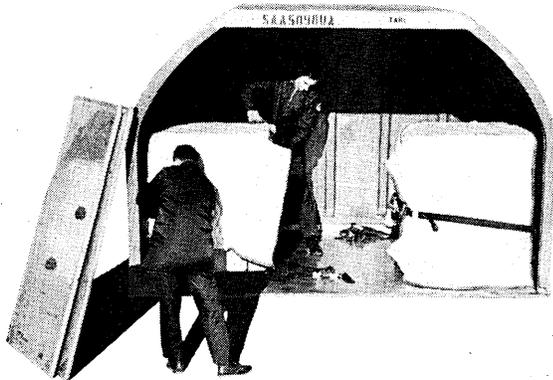
GENERAL  ELECTRIC

Nobody but United offers "Soft Touch"..the damage-free system for shipping computers.



It's called our "Soft Touch" system. It hugs computers or other delicate equipment inside a special container for a cloud-soft ride. From your floor to the exact spot your customer wants it. At jet speed.

There's no safer way for any delicate equipment—our people have the best record for safe handling in the industry. Talk to a gentle friend. Call United.



"Hugger" straps secure your delicate equipment in our special "Soft Touch" container—no skids or pallets needed.

United Air Lines 
Jet Freight *No. 1 in the U.S. sky*

Pin-point delivery gets it to the exact spot your customer wants it. And we're solely responsible.



© United Air Lines, Inc. 1972

Here's What DATA 100 Is Doing For Over 800 Terminal Users Today...

DATA 100 CORPORATION

MIDWEST:

Minneapolis, MN 612/941-6500
Chicago, IL 312/992-0850
Detroit, MI 313/642-3383
Lansing, MI 517/489-1700
St. Louis, MO 314/878-4911
Dallas, TX 214/638-7946
Houston, TX 713/772-2483
Dayton, OH 513/278-6723

SOUTHEASTERN:

Washington, DC 703/893-4356
Nashville, TN 615/329-3699
Greensboro, NC 919/273-6789
Raleigh, NC 919/782-2185
Atlanta, GA 404/432-7791

WESTERN:

Los Angeles, CA 213/645-4300
Palo Alto, CA 415/328-2100
Seattle, WA 206/228-4770

EASTERN:

New York, NY 212/868-7590
Nutley, NJ 201/667-2960
Philadelphia, PA 215/643-7677
Pittsburgh, PA 412/833-3633
Boston, MA 617/749-2683
Buffalo, NY 716/691-6036
Hartford, CT 203/525-7701

CANADIAN:

Montreal, Quebec 514/842-1721
Toronto, Ontario 416/447-6413

ENGLAND:

Watford, Herts Watford 39611
Hemel Hempstead, Herts
Hemel Hempstead 61711
Poynton, Cheshire Poynton 2129

DATA 100 Model 78, Model 70, and Model 88-23 Terminals are at work right now saving users money and speeding up data communications in talking with 360's, 370's, 6600's, 1108, and Spectras throughout the world. DATA 100, the leading supplier of plug-in replacement Batch Terminals, offers the following products:

Model 70 Remote Batch Terminal truly plug-compatible with 2780 featuring—

- Faster throughput on lines up to 9600 BPS.
- Selection of following peripherals: 300 & 600 CPM card readers, 300, 400, 600 LPM line printers, card punch.
- 15% to 30% savings in monthly rental.

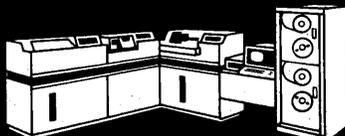
Model 78 Programmed Batch Terminal, plug compatible with 360/20 featuring—

- Simulation of 2780, 1004, DCT 2000, and 200 UT Terminals.
- All Model 70 peripherals plus magnetic tape, paper tape, CRT's and TTY's.
- Capability to concentrate data input from low speed terminals for high speed transmission to central computer.
- 30% to 50% savings in monthly rentals.
- Interleaving data transmission.
- Magnetic tape applications to fit your requirements.

Compat Model 88-23 family of Data Entry Terminals that—

- Validate input data at source and transmit directly to 360/370 central computer.
- Offers optional central off-line pooling of remote data entry terminals, thus freeing CPU of communications processing.
- Offers application software for order processing, billing, inventory control, and many others.

Find out today what DATA 100 can do for you to help solve your data communications problems with quality products, on-time delivery, and competitive pricing—all backed up with an established sales and service organization.



Editor's Readout

The Golden Horde

So far the meek haven't inherited the earth, but there are signs that the small may inherit a large part of the data processing world.

A couple of figures suggest why small business—the theme of this issue of DATAMATION—is beginning to have a large effect on our industry. The first figure is that IBM has now shipped 10,000 System/3s. The second is that the U.S. had 3,395,466 tax-reporting businesses at last count—and 3,371,284 of them had fewer than 250 employees. A lot of them are looking for help.

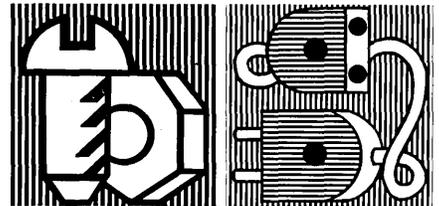
In an attempt to provide some, we've assembled three articles this month—a survey showing what equipment is now available and specifically aimed at this market; the results of an interview session with two consultants who know these users' problems and suggest here what they *should* do; and a roundup of such users showing what they *are* doing. The result, we think, is a picture of an intriguing new role for data processing.

"So what's it got to do with me?" is a fair question if you've been around a while, maybe managing a big and fancy computer installation.

In the long run, quite a lot. This horde of potential first-time users is going to affect the products being offered—and bring about the generation and growth of unique services, tailored to the unique needs of specific industries. It's sure to affect the attitudes of both the public and the computer pros—because the small users (as Edith Myers' article documents) are demanding

an end to the mystique and mystery so well-entrenched in edp. It will lead to changes in the job market, with the standard office skills going beyond operation of typewriters, adding machines, and copiers to basic computer concepts. And when the job markets change, eventually come the changes in education and training.

You might note, too, in Bob Forest's conclusion to our series on edp people, that the managements of companies that are big users are no longer in the mood for magic and miracles. If the off-the-rack approach works out well for the small



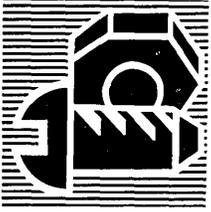
businessman, how about the next size larger . . . and the size after that?

So even if your knowledge and experience puts you beyond all this elementary stuff, take a look at these theme articles just to see what's going on. Some of the consultants' thoughts about pitfalls in dealing with vendors, in fact, just might turn out to be useful reminders.

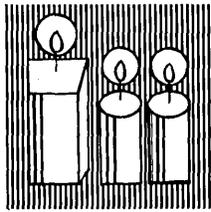
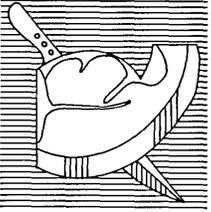
If the subject still doesn't turn you on, do us a favor. Pass this issue along to your friendly neighborhood small businessman.

He needs all the help he can get.

—W.J.R.



There is a new army of small business computer users forming, so we interviewed two independent consultants who know how to avoid the mine fields



How to Succeed

Datamation: We'd like to talk about what small businesses are doing these days to take care of their data processing needs—what their alternatives are and how they can make sensible choices. Maybe the first thing to do is define what we're talking about when we say "small business."

Lou: A small business—for our purposes, anyway—is an organization which is contemplating using computers for the first time. We're assuming that a large business is already using data processing. There's no size criteria that can be applied generally—it depends on the kind of business. I suppose a distributor with 7 to 10 million dollars in sales would be a candidate—or a savings and loan association with 10 or 20 thousand savings accounts—or a small chain of retail stores with sales of 15 to 20 million. It depends on the industry and it also depends on the kind of specialization within the industry.

Datamation: From all the announcements we've seen lately of new services and new computers, the vendors seem to be sure there is a big market. What are they seeing? Is it because System/3 came out and the other manufacturers think that IBM must know what's going to happen in this market?

Lou: Well, from the point of view of the computer manufacturers there are lots of small businesses and they don't have computers. Larger companies that have computers are a trade-in market, essentially. There are lots of advantages in supplying a small business: you're not displacing any other equipment; you're introducing a new user to computers and hopefully he will grow and so will his appetite for data processing.

Jack: I also believe it's a change in

technology that's affecting this market—a change in which computer capability can be manufactured at a reduced cost to the point that they're reaching the smaller user. Since I'm most familiar with wholesalers, a smaller user could be any type of wholesaler who's doing 2 million dollars a year up to 15 or 20 million. In the case of manufacturers, I think that in the range of 100 to 300 employees could be considered a small user.

Datamation: Why is this sort of company now interested in data processing?

Jack: For several reasons. One is that the owner is incurring increasing expenses without a corresponding increase in margin; therefore, he's in a profit squeeze. Government requirements have increased his paper work. And he has difficulty in finding and keeping qualified clerical personnel. Specifically, the wholesaler looks at data processing as an opportunity to increase his profit through decreasing his warehousing and shipping costs. He can decrease his inventory and uniquely, in this business, establish better margin control. Most nonautomated wholesalers do not know how much money they've made until they take a physical inventory at the end of the year. It's becoming increasingly important to know exactly how much money you're making every month and you can only do that by costing your sales.

Lou: Besides, I think there are certain internal administrative factors inherent in a small but growing business. In a small scale enterprise, the owner-manager has grown up with the business. He knows what's going on by the seat of his pants, and his administrative procedures are likely to be fairly simple and highly personalized. There'll be one chief clerk or office manager who

knows special prices and knows special rules of the game—methods for collecting cash, for handling certain types of customers As the business grows, it suddenly reaches a point where the administrative matters are out of control—where Mrs. Jones, who's been in the bookkeeping department for 15 years, can no longer handle all this. That's one breakpoint, where the owner-manager has to look around and institutionalize his administrative activities. Another factor which has been very important in the last few years is the matter of selling out to large organizations. When the small owner-manager suddenly finds himself with a very valuable business and forthcoming estate problems, he is very likely to sell his business for marketable securities. He suddenly finds himself in a position of having to report all kinds of budget plans and detailed operating matters to somebody on Park Avenue or some other office headquarters area.

Datamation: Can we really call this a small business if that happens? Isn't he just a division of a big business?

Lou: Yes, but he's likely to be an independent company from an operational point of view and he still has lots of reporting requirements. The acquiring company may leave the small company alone as long as the bottom line looks good, but in order to insure that the bottom line looks good they need more information than the ex-owner ever had to provide for himself. He knows what's going on but he's got to convince other people by producing lots of reports that are really superfluous to the operation inside but very important to the parent company.

Datamation: Let's try and take a spe-

in Small Business DP

cific example, a company that is on the threshold of going into data processing and what sort of thinking they go through to decide what to do.

Jack: Well, perhaps one of the best examples that I have is a company that had been considering data processing for the last five to ten years and looked at every type of equipment that became available. At one time they installed a ledger card machine that would theoretically have solved all the problems. That installation was a disaster and lasted only three days, because it wasn't able to get the work out. They lost faith in that machine but not in data processing so continued the search and as computers became smaller decided they would try again. They plan now to install a small computer system.

Datamation: Lou, do you want to comment on the differences between a ledger card machine—an operator-oriented machine—and a real computer?

Lou: I think that for purposes of this discussion the operator-oriented machines that perform a calculation—net pay, for example, while a check form is in the typing mechanism—can really be considered modern bookkeeping machines. They operate with electronic circuitry, but functionally are more or less like an old-fashioned bookkeeping machine. In data processing, a machine has to be able to update a file; second, it has to be able to abstract detailed information out of that file for purposes of information analysis; and third, it must be able to sort data automatically. A punch card computer really falls in this category because of course you do update a master record and you do have the opportunity to sort detailed transactions, using an-

other machine, and run them back through the computer. But I would arbitrarily say that a magnetic ledger card processor does not fall in this category, because you really have very little ability to sort the detailed information that might be stored on a ledger card.

Datamation: Going back to the example you gave, Jack, why couldn't they go to a service bureau or to a time-sharing company?

Jack: At the time they went into data processing they had a difficult time making a decision as to what type of data processing they needed. Regardless of who they talked to, whether it

was a manufacturer, a service bureau or a data center, all vendors claimed to have the answer to their problem. So they had several choices and alternatives but they didn't know which one they should take. The choices that they had would be to install an in-house computer—and this is one where they would be responsible for the operation; or to send the work out to service bureaus—they would carry the data over to the service bureau, have them pro-

cess it and bring it back. The third choice was terminal-oriented assistance in which they only installed a terminal on their premises and that terminal was in direct communication with the central computer. But when they put all of these options together they became very perplexed.

Datamation: Were the cost factors equal?

Jack: The cost varied from a thousand dollars a month for the total service up to three to four thousand dollars a month—and all of them, supposedly, perform the same function.

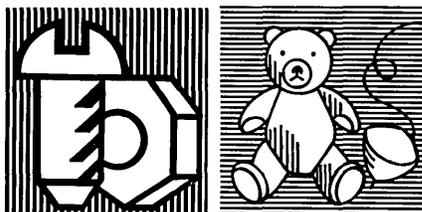
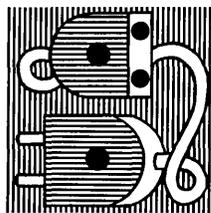
Datamation: How did they figure out these costs? Did they just take the vendor's word for it? Did the vendor do the analysis of what work needed to be done?

Jack: Normally, a vendor will ask for permission to do a limited survey, taking two to three days. Based on the results of that survey, knowing the capability of their equipment, and defining the job requirements, they'll make their estimate of total system cost.

Datamation: Must be a temptation to say they can do it cheap and get the guy involved and then add on—or do they give firm bids?

Jack: That could be true that it is a temptation to take it at a low price in order to get into the company, but I don't believe that most sales or systems people engaged in data processing are inherently dishonest. I believe that they may not have the time, or maybe the experience, to make the proper evaluation. I know that there's a reputation that they low-ball but I'm not convinced that it's that purposeful.

Lou: I think that there is low-balling, in effect. I agree with you that it's not



was a manufacturer, a service bureau or a data center, all vendors claimed to have the answer to their problem. So they had several choices and alternatives but they didn't know which one they should take. The choices that they had would be to install an in-house computer—and this is one where they would be responsible for the operation; or to send the work out to service bureaus—they would carry the data over to the service bureau, have them pro-

How to Succeed

necessarily motivated by dishonesty, but in some cases the manufacturers' reps are victims of their own internal propaganda. They believe that their packages are flexible and will perform beautifully for the potential customer, but, in fact, there's usually a good deal more tailoring required than expected. *Jack:* Lou, I think you bring up an important point here—packages. Anyone going after the wholesaler business has package programs of some sort to sell. The reason is that there are so darn many of them out there that aren't automated the only profitable way to sell is mass market. These packages are demonstrable and supposedly have all of the flexibility necessary to handle operations for this company. There are various price tags on these package programs. Some of them sell for as little as \$6,000, purchase price, others go to \$15,000, and they'll make this commitment without fully knowing whether or not this package can fit. My experience indicates that to know whether or not a package fits it costs me personally \$15-20,000 just to survey a company in enough detail to find out if the package does fit, and one of the great failings in data processing today is trying to adapt fixed packages to every type of business.

Datamation: Are you talking about a package that the guy will use on his own computer now, or is it one that may be used elsewhere?

Jack: Could be either way. Some of the services, like Xerox Computer Services, offer package programs. Digitek does too. Basic/Four has semipackage programs, the System Ten has package programs, and System/3 has an order billing and inventory control package program.

Datamation: In the last three, you have an in-house computer.

Jack: But a package program can be run either in-house or out. The advantage sometimes to running a package program on a large computer is that it can be a much more flexible and powerful program than a package program designed for a smaller computer.

Datamation: Can we go back to Jack's company? What did they do?

Jack: They decided to install their own computer without their own systems staff and without their own programmer. They contracted with an outside firm that had experience in their industry to do all of the systems design, programming, installation planning and the actual physical installation.

They will only have in their own house the capability of modifying the programs where necessary. They won't have systems design or systems programming capability.

Datamation: This is sort of halfway between in-house computing and facilities management. Why couldn't they do better to go to facilities management?

Jack: They could, if the facilities management company offered the expertise in their industry, knew their industry intimately, there isn't any reason they couldn't fully design the system, fully program it, and go in and take over the responsibility of operating it. But if you go to facilities management there's another level of overhead that you're introducing into the data processing cost—for the management of the facility once it's installed. It appears very likely that they can operate their own equipment without incurring this additional overhead.

Datamation: What size city are they in?

Jack: They're in a major metropolitan area.

Lou: I still think that who runs the equipment is less important than who controls systems and programming.

Jack: Well, I agree 100% that the success of a system depends upon its system design and the system design has to come from somebody who is good at it for that particular industry.

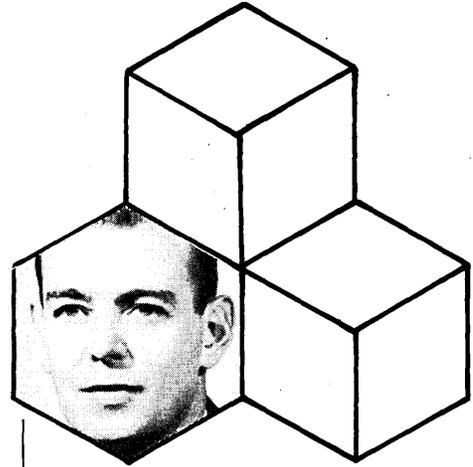
Datamation: Is specialized systems design widely available for specific industries?

Jack: Yes. I'm not familiar, really, with how many firms are engaged in this—I'd say that in industries like banking, savings and loan, there are several major accounting firms that specialize in specific fields. One large firm specializes in government accounting. I haven't seen much specialization in distribution companies or small manufacturing companies. The reason for this, I think, is this type of company for many years had the reputation of being a low-margin industry. So no one had felt that there's a mark for specialization and for system design. These are very expensive processes and they didn't think anyone was willing to pay the price for that.

Datamation: Is there much difference in the way one distributor operates compared to another?

Jack: Very definitely. The requirements are distinctly different. They usually start with order entry and their sales policies—what kind of a cata-

logue they sell from, what their pricing policies are, what their commission policies are, what their delivery policies are—if the order is entered at 3 o'clock, is it still delivered that same day—what kind of products they have, and so on. When you get into general accounting applications, things like accounts receivable, accounts payable, general accounting—those are very

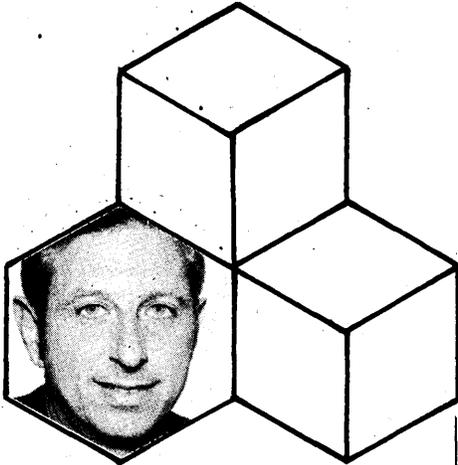


JACK MARQUIS was with IBM for 18 years, most recently as western regional manager of distribution industries. He is now head of the consulting firm Distribution Management Systems. From this accumulated experience, he offers the following guidelines for the newcomer getting ready for a first try at efficient use of business data processing . . .

1. Make a detailed survey and prepare documentation of existing systems, procedures, report requirements, operating requirements, schedules and volume statistics. This normally takes from 30 to 90 man-days. Based on this detailed study, begin preliminary design of the requirements and costs of a data processing system—reports, schedules, storage requirements, speed, etc. From these estimates of requirements and costs economically justify the investment in data processing.
2. Functionally design the complete system to fit the requirements of the business. This includes procedural flow, report design, and computer file requirements. This can be accomplished by either designing a tailor-made system or modifying existing package programs.
3. Based on this functional design, select the computer system either in-house or time-sharing that best fits the functional design.
4. Program or modify existing programs to fit the functional system design.
5. Prepare operating manuals for all departments and personnel that will furnish input to or use output from the data processing system.
6. Test the complete system on live operating data.
7. Implement the system one application at a time. Insure that each application is running smoothly before installing the next application.

packageable. But on the other side—the order entry, material handling, cataloging, and so on are most profitably done with individual tailoring.

Datamation: If these people go to a conventional service bureau, does the service bureau normally have the kind of systems people, and industry people, who understand what needs to be



LOU MARIENTHAL is now a consultant and was previously with Peat, Marwick, Mitchell & Co. for nine years. He also has worked for Burroughs and Univac. From a total of about 20 years' experience with computers, here are his opinions on what awaits the small business user, just getting into data processing for the first time . . .

Today, a small company—in theory at least—can buy a great deal of data processing capability for \$2,000 a month. There is a natural tendency to think back about how the companies of 15 or 20 years ago got their feet wet in data processing with a \$2,000 tab installation. The data processing vendors seem to work on this analogy, but it does not stand up to examination.

One generation ago, the customer for \$2,000 worth of data processing was often one administrative department within a giant company. The job was to mechanize the work of *x* clerks. The first criteria for success was to replace the salaries of these *x* clerks with another set of lower costs. The purchase decision was made by an administrator or by someone in the accounting department. His decision was not technically difficult since the only choices were square holes or round holes. There was a personnel department to recruit the new tab manager, and the new subdepartment was easily absorbed into the complex organization of staff specialties that exist in any large organization.

Today, the customer for \$2,000 worth of data processing is a whole company—not just one administrative unit. The job is to mechanize the guts of the company's operations—something like order entry and invoicing. The data processing is related to basic company policies involving customers and products. The criteria for success may be complicated: to reduce costs while maintaining customer service and/or to improve service and/or to reduce inventories. The purchase decision is

done?

Jack: A few do. Those that do have such expertise maintain it only by charging explicitly for it. I'd hazard a guess that most of the service bureaus or manufacturers that purport to offer free systems service probably supply people who might not really be capable of making the analysis and who might not be motivated or have the time to turn out a good system for the customer. They're really part of a sales staff designed to sell service or sell equipment. However, if an organization explicitly bills the customer for systems work, the people have a different motivation—to turn out a good job for the customer. I think one of the guidelines for a potential user is: since he's going to pay for this systems work, one way or another, he's better off if he's paying for it as a specific item on his bill.

Datamation: One alternative for the small business user that has been mentioned is to have his own systems people and programmers and rent computer time. When is this feasible?

Lou: We might go back to Jack's comment that packages on small machines are less flexible than packages on big ones. We all know that small machines are harder to use than big machines. Small machines are often more costly. With this in mind, I think that one way the small user can go is to hire known systems and programming expertise and rent a block of time on a large machine somewhere. This is practical only in a geographical area where there are plenty of computers around.

Datamation: Of course that's the market we're talking about.

Jack: Yes, and I am fully convinced that if you can absolutely insure success of an installation to process all applications profitably, they are willing to pay whatever the costs are for the original system design.

Datamation: That is, if they understand it's necessary.

Jack: If they understand it's necessary.

made by the owner-manager or by the general manager, and the decision is made difficult by the variety of choices: an in-house small computer that may come in many varieties, an on-line service bureau, facilities management, etc. Some kind of data processing capability will have to be recruited or trained, and the data processing specialist may be the first staff type in the company.

Today, \$2,000 buys a great deal more than a simple tab installation. Further, the price of clerks has nearly doubled in 15-20 years. Thus, the potential market for

Datamation: I have a question on this choice of in-house or out. Are there some applications for small businesses that you could say are better done in-house and others that perhaps would be better handled through a service bureau? For instance, is the accounting function under control so that you'd get in a little less trouble doing that than in doing something that's highly individualized?

Jack: You can take a company and separate the applications and some are better done in-house and some are just as well done outside. In distribution, order entry, stock availability, invoicing, inventory control are best done inside on-line. The applications such as accounts receivable, accounts payable, general accounting, sales analysis, inventory analysis—any voluminous type of reporting—are just as well done outside on a large computer and sometimes at less cost.

Datamation: About location, if you're in Alaska or North Dakota, should you go to in-house because there are no services available, or would you say the opposite, better to go on a phone line and get the service done than try to get a manufacturer to come up and maintain the system?

Jack: The only difference between Alaska or North Dakota and Los Angeles is the fact that you have to pay the transmission cost between wherever you're located and where the central facility is. I believe the transmission costs run roughly \$10 per mile and if you were 2000 miles away, why, you could be paying \$2000 a month for a dedicated line. But there isn't any reason the computer has to be located in the same city.

Datamation: How do these services handle this, like Digitek and Keydata? Doesn't Keydata cover a fairly large area?

Lou: Well, I don't know specifically how Keydata handles it. I'm reasonably certain that they have multiplexors located in the major dialing areas that they service, although they may

small-scale equipment and for services now includes most enterprises above the Mom and Pop store. The industry should be having a ball, but—while the industry is recruiting thousands of new customers every year—the new generation of customers is not as easy to sell and is not proving as profitable as the old generation of small users.

The discussion here attempts to describe the bewildering picture of data processing as it exists in the mind of the potential new (and small) user. Mr. DP Salesman, meet Mr. Confused Customer.

How to Succeed

have more than one installation. Digtex is planning to open in San Francisco with multiplexors and they will be absorbing the cost of the line from the multiplexor in San Francisco down to the computer in Los Angeles. The user either pays for the terminals directly or he's billed at cost by the provider of the data processing services. The user usually pays his own telephone bill but the telephone is usually set up so that it is a local line.

Jack: There's one large company in the middle west that prorates the line cost over all of their customers. Each one of them will be paying the same amount for transmission. The cost is hidden in the price of the whole package.

Datamation: If we agree that proper system design is the essential ingredient of success, maybe we should define it—describe what it really consists of.

Jack: To me systems design is simply a description of how a business application operates and is described in layman's terms, not computerese. A person should be able to pick up a typical systems design or procedural manual, take it home, and read it to fully understand how his business will operate under this new system. He is able to do this because it is well documented including a procedural flow, a description of all of the jobs that will be performed outside of the computer, layout and precise definition of all reports and their use. In other words, it is an operating manual. This is all completed before programming or even computer selection starts. Several years ago, on one of my first accounts, I had designed a work order for the warehouse and an invoice that we were going to mail to the customer and I laid out all the blocks on the chart and filled them in with x's showing that the name and address is here, the description is going to be here, the price is going to be here . . . I walked into his office and he looked at those x's and he looked at the form and he kicked me out. He said, "You come back with something I can read and understand." So I came back then three days later with a very detailed layout and everything I had on there then was actual—it was the actual name and address of a customer, it was actual bill-to instructions, it was actual item descriptions with the prices correct, and so on—exactly like it was a live document that had been prepared on the computer. I even go to the point now that I prepare them by simulation on the computer.

Lou: I think this extra effort is particu-

larly important for small businesses because when you're doing systems design in a small business, you're dealing with operating executives, often the owner-manager, or people like the sales manager or the production manager. In large companies systems designers frequently deal with administrative types. There's a big difference between designing systems for operating executives and designing systems for administrative people. You have to be realistic and graphic and speak in laymen's terms when you talk to operating executives.

Jack: I can't overemphasize that when you give this much detail, show them precisely what they will be using, it takes a tremendous amount of time and there's a tremendous expense involved. But once you have incurred that front-end expense and know exactly how the system looks, then you can almost turn it over to any programmer or any computer service and have them program it and make it operate.

Datamation: Can the customer actually defer the decision of whether to get a computer in-house or not if he takes this approach with a consultant or systems company?

Jack: Well, he can, unless the company he's doing business with is the manufacturer, who cannot afford to do the survey and the system design without a contract in hand. If he is dealing with an outside party who doesn't have any interest in the computer, then he can and should defer the decision until he knows exactly what the system is going to look like. Then he can lay that system on several alternative computers and services and know exactly which one to get. It becomes a very easy decision.

Datamation: But can't he work that way with a vendor? Can't the customer say "I'm willing to spend \$50,000 for a complete systems design and then I'll decide later if I want to buy a machine from you?"

Jack: Yes, you could go to IBM and get this service today; you could go to several of them, I guess, if you're willing to pay the price for the services. I think that most companies would be willing to come in and do a complete design.

Datamation: Will they design a system that would work best on their equipment?

Jack: If you design a system that is optimum for that business, then you will have made the decision as to whether it is on-line or batch oriented. Once that decision is made it will run on any computer; the only difference is a few dollars a month rental. Good

system design will run on anything. Hardware becomes less important.

Datamation: We keep mentioning these three services companies—Xerox, Digtex and Keydata. Do they all do approximately the same thing or do they have different approaches?

Lou: Generally the same in that the only thing that a customer has on his premises is one or more Teletype devices. All of the input is via Teletype terminal; the output can be either from a Teletype terminal or batch processing at night. In an order entry system, for example, the customer orders are entered via terminal and you can have another Teletype unit on the premises loaded with invoice forms and the system can print invoices on-line. Alternatively, it is possible to delay the printing of the invoices until that evening when the computer will put out the invoices on a line printer. The invoices are then delivered by messenger from the computer center to the customer.

Datamation: Do they handle the whole system design in the sense Jack was talking about?

Lou: Yes. But organizations like Digtex or Keydata or Xerox Computer Services have highly structured systems. They will make a brief survey and estimate how much work it will require to tailor the system to fit the requirements of the user. They will give a quote in a formal proposal. This front-end expense can be on the order of \$5000 or \$10,000—depending on how much the user needs that is not already in the system.

Datamation: What are some of the advantages for a small business in using these service companies?

Lou: The office manager can stay as an office manager. The functions of the equipment using Teletype units are very close to a natural manual way of doing things. The girls in the office who were operating the billing machines generally have no trouble making the change and the flow of paper in the office under these kinds of systems is very close to what goes on in a manual system. This, of course, is not true with an in-house computer where you have a discrete step of keypunching or other kinds of data translation. So there are really two advantages. One is that to the people in the office—and for the flow of paper—things are close to a manual system. And the second is that the office supervision does not get shaken up with the intrusion of a new kind of animal in the company, the computer and its supporting organization.

Datamation: What are the disadvantages?

Lou: If you are a national organization with warehouses on the west coast, in the middle west, and in the east there isn't, as far as I know, an on-line service that can tie all of these operations together with an order entry billing system. Xerox has plans to go national, but they're not there yet.

Datamation: Every conversation about how you use computers lately seems to include the comment that new computer users tend to do the obvious thing and ignore the most profitable thing. Do these services take this into consideration?

Jack: Well, the Xerox installation program is that way. The first application on the terminal is general accounting and the next one is accounts payable and the next one is accounts receivable. They stage it on up and inventory control is the last one.

Datamation: Does the owner of the business have a voice in this?

Jack: Yes, but they don't encourage it. However, their approach has a lot of logic to it. The reason you install general accounting is because it's easy, gets you used to the terminal and is the basis for all input that's going to be fed into it. Once you learn the general accounting, then you can learn to do some of the more sophisticated things. So then they start adding the payoff applications.

Datamation: Could you give us an example of a small business that chose a service vendor instead of an in-house computer—and their reasons?

Lou: I know of one whose choice was a System/3 or Digitek. They decided on Digitek because they didn't want to hire a dp manager. Or they didn't want to convert their office manager into a dp manager and hire a new office manager. The costs of the two alternatives were virtually identical.

Datamation: What's the size and nature of this company?

Lou: That's an interesting point because it really shows that size doesn't mean much as a guide on computers. This particular company does a modest amount of light manufacturing, and some importing and some assembling. I think they've got something on the order of 80 people out in the warehouse and the factory area but they could be doing the same volume with 40 or 50 people less were they to do more subcontracting.

Datamation: You've mentioned that one reason small businesses choose a service is to avoid hiring a dp manager. Why is this such a problem?

Lou: Putting in somebody who is in charge of the operations and manage-

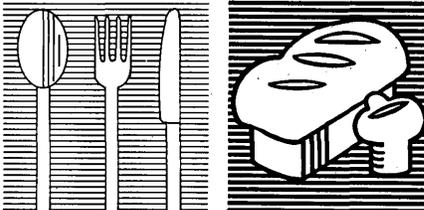
ment of a computer is a big problem for a small business.

Datamation: Isn't it a problem for a large business?

Jack: Sure, but a large business has established techniques for managing staff people. The management of the small company doesn't, from experience, know how to manage data processing and technically oriented people. There is usually a communication gap between that person and the management of the company. The data processing man is technically oriented and not business oriented—but the management is business oriented and not technically oriented.

Datamation: At what stage would they bring in a dp manager? Let's consider a company now that for some reason has rejected services and service bureaus and decided that they should have their own computer.

Jack: The worst time to bring in the dp manager is after you have ordered the



equipment. Because then the same salesman has sold the equipment, has sold its capabilities, told them how much it's going to cost to install it, how much to operate it, all the wonderful things it can do—and the dp manager is obligated to fulfill the promises of someone else.

Datamation: So when is the right time to get him in?

Jack: At the time that you've decided that your company is large enough for dp and want to go to in-house computing, then you should bring in the dp manager to assist in your decision.

Datamation: Do you look for a guy who's had experience in a similar kind of business?

Jack: You should look for someone who has had experience in your kind of business, yes, and you should look for one who has a proven record of designing business systems successfully.

Datamation: You are saying, though, that you have to have a dp manager if you have your own hardware, no matter what it is—System/3, Basic/Four, or whatever. Yet there are an awful lot of people out there operating these things without one.

Jack: They're kidding themselves. Whether you call him a dp manager, an operations manager, or a computer operator, there has to be someone in that organization who is devoting full time to dp. It can't be a part-time job. This is not true, of course, with the lower level of equipment we discussed previously—what we would call a fancy bookkeeping machine. We're talking about a full-fledged computer operation. The best dp manager any of my clients have is a former assistant to the vp of operations. His specialty was warehousing and he is an outstanding dp manager. At this time, he can't program a computer but he can certainly design systems.

Datamation: How did they train him? What's the first thing that he did to get ready for this new kind of job?

Jack: The first thing they did was to have him, with assistance, make a complete survey of the company and document everything that he found out in very precise detail. He identified every job position, every piece of paper, how it was used, what the information was that was shown on it, how that information was going to be used. It took three months to document the company and that was a full-time job for him and another person.

Datamation: How big a company was this?

Jack: This was a \$20 million company. But the same technique has been used in \$6 million companies. The first step is to document the company so that you fully understand how it operates. This is very useful because most companies are not documented today; you can't find a procedural manual. The second step was to have him, with some assistance from computer-qualified people, do this system design that we have discussed.

Datamation: The assistance was from outside people?

Jack: Yes. And the new applications to be run on the computer were defined as precisely as the original survey documentation. This took approximately five months.

Datamation: Was he in a position to decide what applications to do first?

Jack: That was decided by an outside consulting firm with the participation of a major executive of the company who made the final decisions. Systems design should involve a high level exec-

How to Succeed

utive who has authority in all areas of the business.

Lou: One other point that needs to be made here is that in hiring a dp manager from outside, you're often considering someone whose only experience with computers is programming. A programmer, in a small company, is not a good man to be dp manager, for a couple of reasons. One is he may have very skimpy experience in systems design. The second reason is that the dp manager in a small company is a dual job. He's not only programming but he is also operations manager. Lots of programmers don't like to get involved in this.

Jack: I'd say the normal approach, historically, is to look for an experienced man on the outside. I didn't learn until three years ago that you could train somebody to do it from within.

Lou: I think IBM presents their System/3, in their original presentation, proposing to train the office manager in the use of the equipment. They have, as a matter of fact, taken tremendous pains to simplify the program functions and the operations of the System/3 and I think they have been reasonably successful.

Datamation: They claim you don't need a dp manager?

Lou: They claim you don't have to hire one. They don't claim that the existing staff can put the equipment in without training—and without spending a good deal of time on the project.

Jack: The thing is, you have to look at the size of the system, what applications are installed—complex ones or very simple bookkeeping type applications.

Datamation: Basic/Four claims they can go in with their biggest and that very little training is necessary, using existing personnel.

Jack: We'll have to wait and see how successful they are.

Datamation: What can be said in general about data processing for a small business? What does any first-time user have to do, regardless of the alternative he chooses?

Jack: First, I can't state unconditionally what is the best alternative for a company. It's completely dependent upon the individual and how he runs his business, the services that are available in his area, what his requirements are and so on. But I do think that a company can enter dp, regardless of which alternative they plan to use, by following the same general procedures.

The first thing they must do is, in a very formal way, survey and document their existing operations. This usually takes from two to three months if only one individual is involved in it. Then they will fully understand exactly how their business operates. Next, they must personally be involved in designing a system that will fit their business. This design can be done with whoever they want to do business with. Based on this functional system design, they then know if the computer system or packages fit their business. At that time they can select the alternatives—from any of these we've been discussing. Once they've decided which way they're going they must thoroughly examine everything they're doing and write procedural manuals for the people in the organization who are going to use the new system. Thus, the day it arrives, everyone who is going to provide input to the system, or use the output, thoroughly understands what his job is. Further, when they make the decision to install, they must establish a very orderly conversion schedule that includes a budget, a time schedule, and a plan for conversion from their manual records to their dp records. Another thing that they must do—and this is perhaps the hardest—is to require discipline in the company. Manual systems operate in a very undisciplined manner and you can change policies and practices quickly. But in data processing all policies have to be examined thoroughly and decided on months ahead of time.

Datamation: Do you know of any cases where people change to computer processing and then want to get out?

Jack: There are cases where they start and want to get out a year later but there are very few instances where they are able to do it, because they are so far into it that they have to wrestle through it.

Lou: I think the perspective of money is an important point. There are lots of small businesses that are in the habit of giving very careful consideration to very modest expenses—the purchase of an electric pencil sharpener, for example. In dp you have to learn to think in reasonable money terms. When you analyze costs and come up with a \$50 difference, you do not have a significant number. You have to start rounding things off to the nearest \$500, the salary of one clerk, and thinking in terms of thousands for the front-end systems work Jack has been talking about. This perspective is very important. The salesman makes a pitch on the basis of the fact that a company can save \$100 . . . or it will only cost an extra \$100 but management is going to get many wonderful reports. The

buyer ought to beware, because things in dp never come out to where you're going to be plus or minus \$100.

Datamation: Would a vendor ever make a proposal based on a tiny saving?

Lou: To small users, it happens all the time . . . big debates on whether you're going to add a \$125 disc storage unit or whether you need six disc packs or five disc packs, where the difference might be \$30 a month.

Jack: Realistically, the buyer should always justify his cost based on his anticipated reduction of personnel. He should not base it on decreased inventory, increased sales, or any of the glamorous things as a result of dp. And quite frequently, you can't justify it, based on realistic costs, but if you can't you should know it in advance. It shouldn't be a surprise to you that it's now costing \$1,000 more a month to be in business than it did the day before the installation.

Lou: One thing about intangibles and small machines that I think is worth mentioning here: the advantages of extra management information, whether they are evaluated or not, are always noted in the proposals. The availability of this management information is in most ways dependent on the storage of large quantities of detailed data and in many of these stripped down systems all you get is an updated accounts receivable file and an updated inventory file. But if you're going to analyze inventory trends over a period of time, you need a good deal more detailed information. If you're going to get sales by item, by customer, over a long period of time, you have to be very certain that the capacity of the computer will in fact accommodate the volume of detail. Often, this means that there must be some capability for communication—tape or cards—with a large computer.

Datamation: Is this another argument for the service company?

Lou: It's an argument for the service and for using large computers.

Datamation: Although the service is going to charge you according to storage space?

Lou: Not always. Some services store detail on tape.

Jack: It's an argument for being certain that you have enough computer when you go in so you don't have to upgrade it later. And you can go in with skeleton files and do at least normal daily functions but these skeleton files won't last you and you're automatically going to have to upgrade. Again, you can determine that ahead of time—if you really know what your requirements are. □

The butcher, the baker,
the candlestick maker—and scores
of others who wouldn't have considered it
five years ago—are now using data processing

Small Business DP: User Experiences

by Edith Myers,
Associate Editor

"Using an in-house computer to get what I have now would be prohibitively expensive."

"An outside service would be prohibitively expensive if I were to get what I wanted."

Both these statements were made by small businessmen who use data processing. Both are probably true, and their contradictory nature underscores a basic fact of life in the small business market for data processing. The wants vary as widely as the nature of the businesses in this category.

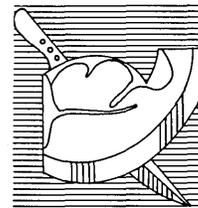
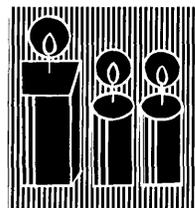
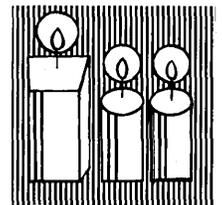
The first quote is from William Stabler of Sta-Lube, Inc., Compton, Calif., manufacturer of lubricants and petroleum products. The second statement was made by Dave Berkus of Custom Fidelity, a Los Angeles producer of phonograph records and custom sound equipment. Each firm has 50 employees. Sta-Lube's annual sales are around \$3 million; Custom Fidelity's run about \$1.5 million.

Sta-Lube pays an average of \$1500 per month for an on-line service provided by Digitek Corp. of Marina del Rey, Calif. Custom Fidelity pays \$1000 a month for a small computer

system produced by Basic/Four Corp., Anaheim, Calif. Many of the applications of the two firms are similar, such as accounts receivable, inventory, accounts payable, and general ledger. Neither does payroll on its system.

The differences in their needs are harder to recognize than the similarities. A lot of them have to do with attitudes. When Stabler took on the Digitek service three years ago he was "looking for a better way of doing things." Sta-Lube had several IBM 402

accounting machines and was doing some work with outside service bureaus, but "reports were delayed and people would drag their feet." There was no immediate need for a change,



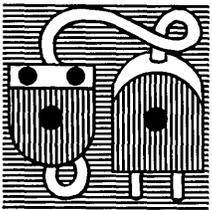
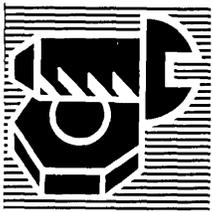
and Stabler shopped around for six to eight months. He wasn't interested in computers then, and he isn't now. "I don't want to be bothered with on-staff programmers or equipment maintenance." What he wanted was fast, accurate reports, and he says he's getting them. He has added to his applications

User Experiences

gradually and currently is in the process of adding raw-materials and goods-in-process inventory to the finished-goods inventory which already is on the system. "We do the pre-work, and the Digitek programmers take it from there," said Stabler. "In the beginning we found the programmers didn't know as much about business needs as they should, but we're educating them."

Having a ball

Berkus' needs were more immediate when he ordered his Basic/Four system last August. He had been looking for a year, and in that time his business had grown to its present size from six employees and \$400,000 annual sales. He first saw the Basic/Four at a show at Los Angeles' Ambassador Hotel. "I said when I saw it, 'I'll buy your stupid machine; come see me tomorrow.'" They did, and the system was delivered in October and was running parallel with Custom Fidelity's Friden 6610 bookkeeping machine in November. Berkus was interested in computers. He wanted internal control. He had



considered the Honeywell 58, Friden's System Ten, Burroughs L 5000, and the IBM System/3 Model 6 before selecting Basic/Four, which he said "is 100 to one over all of them."

He wanted a system which would be "transparent to the user," and he feels he has one. The machine runs reports only two hours a day. The rest of the time it is available to the 13 executives of the firm who can use it on an interactive, multiuser basis simply by typing in a vendor name or an account name to retrieve needed information on one of three crt's the firm has. Berkus circulates regularly an updated library listing of available programs.

Custom Fidelity does not have an on-staff programmer. Basic/Four did the initial programming. "I would recommend that no user of small systems try

to do his own primary applications," he said. "Let the vendor do it or get an outside programming service; but after that, go to town—have a ball." He is. He's added two programs of his own so far, one which sorts mailing lists of radio stations by a variety of parameters, and another which produces progressively harsh dunning letters. "How did I learn? I read the manual twice."

Berkus' firm has a maintenance cost advantage over other small systems users. "We're a firm of electronic technicians, and we feel we can take care of that ourselves." For most Basic/Four users maintenance runs from 6-7% of total purchase price of the machine per year. Custom Fidelity has its \$50,000 system on a lease-back arrangement with Union Bank.

Nothing like what Custom Fidelity or Sta-Lube have was available to small businesses five years ago. Accounting or bookkeeping machines or some degree of service bureau use was the only form of dp they could use. An article in *Management Accounting* of August 1967 advocated use of a small service bureau as a sound solution to the data processing needs of small companies, yet it contained a case history of a firm which had carefully selected a small bureau after a long evaluation period only to have that bureau bought out by a larger bureau it had earlier rejected for reasons which proved valid—and they had to start all over again.

Today data processing is feasible for even the smallest of the small and for as little as \$100 a month. Of course, turnkey services like Digitek's and systems like Basic/Four can't be had for that little, but the advent of the small systems has led to inexpensive services.

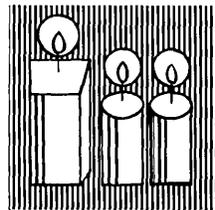
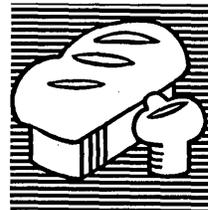
Myro Maccho operates a service bureau in La Crescenta, Calif., based on a Basic/Four system. His five clients, in the \$500,000 to \$4 million annual sales range, pay from \$200 to \$1200 a month, and he designs their system. In El Paso, Texas, Bill Fletcher of El Paso Data Services is offering a service he calls Comp-U-Share in which he puts small firms who could use a limited amount of dp in touch with IBM System/3 users in the area who have extra time available. He trains the small firms to use the system, provides programming, and the cost to the user can run as low as \$100 per month. Small businesses also can get data processing, albeit disguised, through CPA firms, many of which use either service bureaus or a computer of their own in support of the business guidance they dispense.

Small business definitely represents big business for those who would provide data processing. An internal marketplace strategy sheet put out by Basic/Four Corp. indicates that out of

3,395,466 tax-reporting business units in 1967, 3,371,284 had fewer than 250 employees.

Butcher, baker . . .

Who are these firms? They are Del Pero Mondon Meat Co., the butcher; Pisano, the baker; and Farby, the candlestick maker. They are vending machine operators, collection agencies, medical clinics, bankers, insurance agents, wholesale grocers, radio stations, morticians, amusement parks, hospitals, sign makers, land developers, and retirement home managers. They also make and/or distribute zippers, statues, motorcycles, oil and fuel products, photographs, calculators, pharmaceuticals, furniture, janitorial supplies, lumber, heavy construction vehicles, extrusion dies, industrial chemicals, donuts, auto parts, bricks and tiles, paint, and air conditioning units. Each has some common and some unique business problems that



could be helped by data processing.

There is a common attitude, though, toward those who would sell them some sort of data processing. They don't want to talk about data processing; they want to talk about their business. Those vendors who recognize this need and can fill it are three giant steps ahead of their competition.

A programmer who has earned the undying admiration of at least one of his customers is Dennis Kanzawa of Eldorado Electrodata Corp., Concord, Calif. The office manager of a North Miami, Fla., tool and die maker which is using an Eldorado 140 small business system called him "just marvelous," because "he walked into our company and learned more about our business in two weeks than some employees learn in six years. He knew our problems and translated that into effective programming."

The computer doesn't matter

In Hayward, Calif., a former small businessman has started a new service based on the belief he knows small business problems, can talk to the small businessman, and consequently can

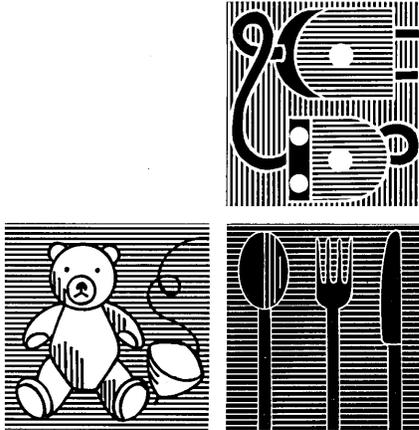
help him into computing. Eli Neilson started his firm, Comp 3, with two former programmers. Their market is small companies about to go into dp. Neilson is the contact man. He approaches the small business and evaluates its problem. Then, with his programming associates, he finds a data processing solution, usually a small system. They design the system and provide the software and training. Comp 3 has used such hardware as a Data General Nova, a Digital Equipment Corp. PDP-8, Qantel V, and IBM's System/3. The computer doesn't matter, says Neilson; it's the system.

And the computer really doesn't matter to many small users who aren't even sure whether what they have is a computer or not. Mrs. B. Brunz, secretary-treasurer of Stayner Corp., an Oakland pharmaceutical distribution house, likes to think she has a mini-computer; but many who draw the technical fine line would say her Burroughs L 5000 is a sophisticated accounting machine. Whatever it's called, it does what Mrs. Brunz wants. The firm had been using a Burroughs 2100 bookkeeping machine for five years, and it was overloaded. Mrs. Brunz considered other systems but liked the L 5000 "because it was like what we had; it was all laid out for us." The L 5000 is used for finished goods inventory and accounts receivable. Stayner would like to put total inventory on, but there isn't enough capacity; and they're considering adding a second L 5000 in the near future. Mrs. Brunz says "all the girls in the office" can use the L 5000. She has had some training in COBOL and directs programming, all of which is done in-house.

Neilson of Comp 3 says he has found the basic needs of small firms he has studied to be 8-16K or core, support of "some decent language"—he puts RPG far down on his list, with COBOL on top, except for those who have linear programming needs, where he'd prefer FORTRAN or assembly language—and a few "unexotic" peripherals, with crt's being the most exotic.

Max Ferber, who ran a small Los Angeles collection agency which he recently sold out to a national organization, advises small businesses just starting out in dp to "go slow and take it step by step. Computer services, if not thought through properly, can lead to confusion, expense, and even disaster." He suggests bookkeeping as a natural first step, with internal analysis of such factors as expense categories as a possible second. "Too much, too fast can lead to mounds of meaningless paper, as I've seen in my experience," he said. He advocates use of a small service bureau for beginners, preferably one specializing in their type of business.

Ferber (and other small businessmen expressed similar feelings) sees use of data processing as a welcome relief from dependency on a bookkeeper "who has become so ingrained in the business that she feels no one else knows as much about it as she does and who has become so far re-



moved from intracompany personal relationships that her feelings have become ultratender." Use of computerized bookkeeping, he said, makes possible use of less highly trained personnel.

Promises, promises

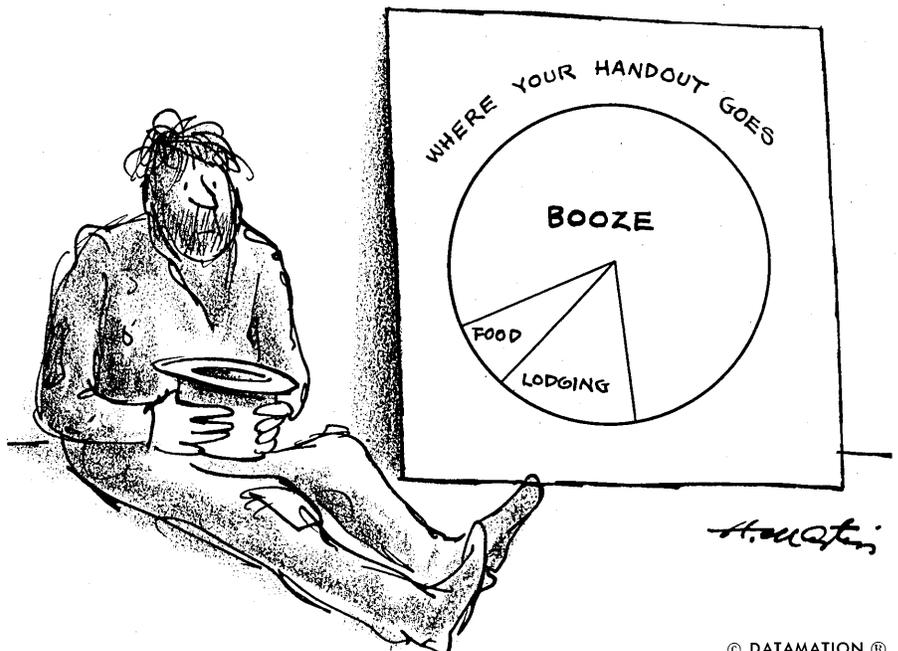
As is true with anything as new and fast-spreading as the sale of data processing to small businesses, there are the promises that can't and aren't kept. Ferber advises: "Be wary of the promises made by the people who sell automation. They say anything can be done and there will be no problems, but too often there are many problems and their solutions are expensive."

This is extreme. Lesser breaches,

usually unintentional, are more common. Donald Buford, of Del Pero Mondon Meat Co., Marysville, Calif., supplier of meats to restaurants, has been using a Qantel V system since February 1971. "If it had done what we were told it would do, it would have been an ideal set-up." But he's not entirely unhappy. "The bugs are out now, and we're getting a lot of information we didn't get before." He said the cost "far exceeded what was laid out to us," primarily because of programming problems at the outset and because they had to hire three extra people. He's paying \$1300/month for the Qantel, where before he paid \$1500 for a service bureau which wasn't giving him as much, and the system has saved time.

Martin Cohen, treasurer of Washington Federal Savings & Loan, Miami Beach, Fla., which installed an Eldorado 140 system last November, said "we're still not using it as extensively as expected because of programming problems." Eldorado was to have done all programming, but transcontinental communications proved too much of a problem. The task was transferred to a local software house which felt it had to start from scratch rather than working with what Eldorado had started. But Cohen is happy. "The Eldorado will be the nucleus of a nice little operation once we get it going, and the extra programming isn't costing us anything because programming was in our contract." Cohen took a high school night course in basic programming principals and has been "fumbling through" some programs of his own.

Robert Sybrandt, vice president of



© DATAMATION ®

User Experiences

Paul Sybrandt, Inc., Bakersfield, Calif., insurance agency, said he felt IBM's promise that the System/3 Model 6 could be run by anyone was not valid. "We found out early that we'd have to hire a programmer, and we did. We also had to hire a trained computer operator."

Another System/3 user, Dakota Hospital of Fargo, hired a programmer but didn't find it necessary to hire an operator. L. Bud Hanson, the hospital's administrative assistant for financial affairs, said its S/3 has been a big money saver. Before its acquisition the hospital was using IBM's SHAS (Shared Hospital Accounting System) along with five other hospitals, and it was costing \$3 per patient per day. Cost of the S/3 operation is 61¢ per patient per day. The 154-bed, 285-employee hospital pays \$1500/month for the S/3 and gets back royalties from some packages it developed that are now being sold by IBM. Best of all, said Hanson, "now we're getting what we want, not what we're told we should want."

Accounting to product appeal

Hanson uses the system for accounts receivable, general accounting, accounts payable, patient accounting, and some inventory. Payroll for him is not a factor, which seems to be true for most small businesses. They plan to extend their inventory applications, and they've put on two applications they hadn't planned to do. One is an X-



ray diagnostic program, and another involves diagnosis coding for medical records. "They came about as a result of casual conversations," said Hanson, "in which the guys involved asked me if it could be done, and I decided it could."

These applications may seem highly specialized for a small, general-purpose system, but so are many in use:

Nicholas Lerek, vp and general manager, Pisano French Bread Baking Co., Redwood City, Calif., uses his System/3 Model 6 to, among other things, calculate amounts of flour and other ingredients needed to satisfy the next day's demand for his bread.

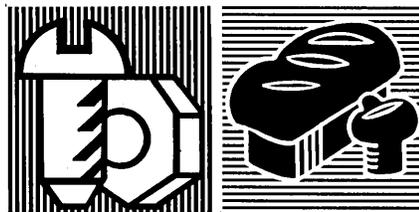
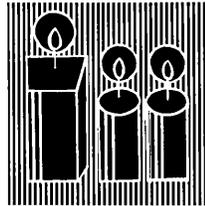
Sam Palmer, Pactra Industries, Up-land, Calif., uses his Basic/Four to

plan paint production.

Stagg Zipper Co., Brooklyn, N.Y., uses a system designed around a Digital PDP-8 by Symbolic Systems, Inc., to keep track of zippers which come in 10 different chain sizes, five tape widths, in 500 colors, and with a variety of types of sliders, bottom stops, and other components.

Universal Statuary Co., Chicago, uses a Singer Business Machines System Ten to keep track of statues.

Kawasaki Midwest, Inc., uses a Cascade Data Computer Systems model



80 to control an inventory of motorcycles.

Gerald Hubenak, controller of Farroy, Inc., Houston candlemaker, uses a System/3 Model 10 to measure the appeal of his products and to analyze sales by volume and geographic location.

Few companies report a cut-down of personnel because of the system, although one did. Lerek of Pisano French Bread Baking said he was able to cut his office staff in half when he got his System/3 and since its acquisition has acquired another bakery that he is able to run with no staff at all. Others, including Berkus of Custom Fidelity, report they have been able to grow without an increase in staff. Berkus said his Basic/Four system is saving him a controller and a bookkeeper.

Time is the essence

The most important savings for most small-scale dp users would seem to be time. Arnold Boyd, controller of Conexco, Inc., Los Angeles dealer in heavy construction vehicles, replaced a Burroughs B2100 accounting machine with a turnkey service supplied by Xerox Computer Services because "everything was taking too much time. There was too much hand posting, hand writing of documents. Now everything is updated automatically." Conexco has accounting, inventory control, receivables, payroll, and order entry on the system.

Stagg Zipper, which purchased its Symbolic Systems system outright for about \$40,000, said it simply couldn't

do the volume of business it now handles without the system.

Tom Lane, of National Sanitary Supply Co., Gardena, Calif., which uses the xcs service, said its time-saving features have made possible a 20% reduction in the accounting staff and the transfer of these people to other, more productive functions.

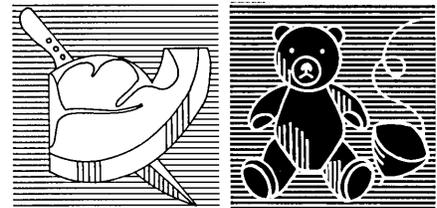
The Brandt Corp., Long Island City, N.Y., a manufacturer of custom enclosures for perimeter heating and ventilating units for commercial buildings, has employees in outlying cities for whom payroll timing is critical. Its use of a Victor Comptometer system has eased the payroll timing and has saved additional time in that job-cost information is produced as a by-product of payroll.

David Johnson, assistant controller of Pacific Homes, a retirement homes operation, said the fact that financial reports are available three to four weeks earlier with his use of xcs' service makes it possible for him "to make business decisions much more effectively."

And so it goes across the small-business spectrum. With or without problems, speed and the resultant increase in efficiency is what's important.

But dp doesn't always help. A British package travel tour company recently decided it was too small for data processing. Blue Sky Air Holidays was using a batch processing system called System's Aid Tour Pack, and it decided it could save about \$200,000 per year if it stopped. It did. It's too early to add up the savings.

And the question of in-house or outside would seem to boil down to a question of knowing exactly what you



want as well as what you can afford. A businessman who doesn't want to think computers probably shouldn't have one, for there will be programming involved and maintenance problems. A firm whose business volume fluctuates greatly from one time of year to the next would probably find an outside service more economical since charges are based on usage. With Xerox Computer Services, for example, charges run from a low of \$500 a month up to \$20,000. But for someone like Dave Berkus who likes to "go to town and have a ball," there's no doubt about it; the computer's the thing. □

For additional detail on hardware mentioned here, see Michael Cashman's survey article beginning on the next page.

A survey of vendors catering to the small business user, with characteristics of their equipment.

Small Business Computers

by Michael Cashman, Assistant Editor

Though it was long ago predicted that computing power would one day become economical enough to be used in the small business environment, it's nevertheless exciting to see that prediction coming true. Advances in technology during the last several years have combined with that ever-present catalyst competition to make it possible for a number of vendors to offer full-fledged data processing systems that small businesses can afford.

These developments come none too soon. Business in general in this country faces increasing pressures from cost-conscious customers on one hand, and an inflation-wary government on the other. Certainly the small businessman doesn't escape from these pressures—and may even be more sensitive to them, since by definition he operates on a smaller cash reserve. And the future seems to portend that small business will be asked to supply an increasing number of reports to various government agencies. Together with other business problems such as increasing labor rates, and the need to improve productivity, it would seem that the small businessman will soon need all the help he can get. 1980 may well see every business in this country doing more than \$5 million annually either owning a computer, or attached to one at a service bureau.

The small businessman we're concerned with is the one who already has some accounting machines to help out with billing functions. There are a large number of these machines on the market that might even satisfy the total business requirements of companies billing less than the \$5 million figure above. But this equipment is really ledger-oriented, and is not the subject of this survey. By small business com-

puters, we mean turnkey user-programmable systems with off-the-shelf programs available for processing commercial applications like payroll, accounts receivable, inventory, billing, etc. The user should be able to implement some form of management information system on it if he chooses to do so. Our attempt was to define the type of system typified by IBM's System/3 computer, and others. And we felt that to be competitive in this marketplace vendors should be restricted to a maximum monthly rental of \$2000.

In an attempt to screen out such types of equipment as batch terminals, ledger card computers, and general-purpose computers that might qualify for the survey under these criteria, we informed the vendors submitting entries that their equipment would not be included in other surveys if they chose this one. Our attempt was to find out what the manufacturer's emphasis with the equipment really was. After reviewing the large number of machines submitted for the survey, we then evaluated them to see whether a company would reasonably consider the equipment as an alternative to a Univac 9210 or an NCR Century 50, for example. This was an attempt on our part to roughly equate the processing power of the various systems. And finally we decided that to be a true data processing system, it would have to be capable of performing sorting and file updating tasks, and have on-line access to at least 500,000 bytes of data, or its equivalent.

The good news is that we found 17 firms supplying the equipment and services necessary to fit our criteria. Listed on the following pages are their 19 data processing systems. Every effort has been made to verify the infor-

mation supplied, but *caveat emptor* is still a good policy. Interested parties should verify specifications on the chart if they are seriously considering the acquisition of one of the systems listed.

In looking at the chart, some of the machine characteristic questions should be explained. The decimal arithmetic line indicates whether the computer is a decimal machine by design. Machines that are not decimal arithmetic computers by design require some software overhead to do mode conversion and rounding off. Many business customers prefer that the machine do all its arithmetic in decimal mode to cut down this overhead.

The questions regarding execution times for decimal addition and variable length decimal compare is supposed to include the fetch of two words, the operation, and the storing of the result. It would seem that times supplied by some of the vendors are optimistic.

A word about channels. Some computer designs have individual, defined channel structures, and some do not. By selector channel we mean a high-speed channel with multiple ports for connecting a number of devices, but only one channel is selected for transferring data at a given time. A multiplexor channel is a similar channel, except that its channel rate can be shared by a number of devices simultaneously. The direct-memory-access channel on most minicomputers is a primitive form of a selector channel by our definition. Some of the vendors in our survey have taken oem-purchased cpu's and then designed interface cards to support the peripherals they offer. That is the reason the chan- (Text continues on page 56; machine characteristics charts: 52 through 55)

	Basic/Four Corp. (Genesis One)	Cascade Data, Inc.	Clary Datacomp Systems, Inc.	Computer Interactions, Inc.
Model	300/350/400/500	Cascade 80	Datacomp 404	Models 1 and 2
First acceptance	06/71	01/70-	1971	NG
Number installed	35	85	NG	NG
CPU	Basic/Four	Cascade 80	Datacomp 404	DEC PDP-8/i, PDP-8/e
Decimal arithmetic	Yes	Yes	Yes	Yes
Hardware mult/div	No	Yes	Yes	Yes
Decimal add time	5.28 usec	13.8 usec	296 usec	Approx. 4.8 usec
Decimal compare time	NG	13.8 usec	196 usec	Approx. 4.8 usec
Central Memory				
Cycle & type	1.1 usec (core)	900 nsec (core)	2.2 usec (core)	1.2 usec (core)
Word/Byte	8 bits	8 bits	16 bits	12 bits
Size	20K-64K	8K-64K	4K-64K	4K-32K
I/O Channels				
Direct memory access	1@900K words/sec	1@800K words/sec	4@62.5K words/sec	1@833K words/sec
"Multiplexor"	1(14 position)@20KB	1@10K words/sec	—	1(8-position)@833K words/sec
Dedicated	—	—	—	—
Total channels (Total rate)	15 (900K words/sec)	2 (800K words/sec)	4 (250K words/sec)	2 (833K words/sec)
Communications	300-9600 baud	2000 baud	110-9600 baud.	71,000 baud
Comments				
Peripherals				
Mag tape (1/2-inch)	10KB	75KB	11KB	—
Mag tape cassette	—	3.6KB	0.5-1.3KB	33.5KB
Fixed disc or drum	1.05-16MB(195KB)	—	—	—
Disc pack or cartridge	1.05-16MB(195KB)	5MB(195KB)	—	24MB(156KB)
80-col card reader	400 cpm	300-600 cpm	—	—
80-col card punch	—	120 cpm	—	—
96-col card reader	800 cpm	—	—	—
96-col card punch	—	—	—	—
Line printer	200 lpm	200,300,600 lpm	60 or 600 lpm	350 lpm
Serial (typewriter) printer	165 cps	30 cps	10 or 165 cps	—
Other	Accounting machine terminal, 27-line display	—	Crt, 17 cps ledger card printer, 25 cpm mag stripe card reader	—
Operating System				
Tape-based	—	Yes	Yes	Yes
Disc-based	Yes	Yes	—	Yes
Core-based	—	Yes	—	—
Memory requirement	16K	4K	1.5 - 2.5K	4K words
Comments	Time-sharing of up to 8 terminals, multiprogramming		Time-sharing, multiprogramming	Multi-tasking
Program Library				
Assembler	—	NC	NC	NC
Basic compiler	NC (interpreter)	—	\$1000	—
Cobol compiler	—	—	—	—
RPG	—	NC	\$1000	—
Core sort utility	—	—	—	NC
Disc sort utility	NC	NC	—	NC
Tape sort utility	—	NC	NC	NC
Payroll	NC	\$2500	NG	NC
Accounts receivable	NC	\$2000	NG	NC
Accounts payable	NC	\$1500	NG	NC
Inventory	NC	\$1600	NG	NC
Billing	NC	\$2000	NG	NC
Sales Analysis	NC	\$1600	NG	NC
Approx. number of application programs available	NG	11	60	100*
Rental/Maintenance				
"Best" terms	\$550/mo.(5-yr purchase)	\$668 (5-yr lease)	\$800/mo. (5-yr lease)	\$1300/mo.(5-yr payout)
Configuration quoted	4K user core, acct. mach terminal, 2.1MB disc	16K, keyboard, tape drives & printer	8K, crt, 60 lpm printer	4K, crt, 4.8MB disc, 350 lpm printer
Purchase price	\$23,900	\$33,226	\$26-30,000	\$60,000
Maintenance	\$150/mo.	\$150/mo.	\$125-200/mo.	\$255/mo. (1-yr plan)
24-hour extra charge	\$26/call	\$50/mo.	NG	NG
Availability	90 days	60 days	60 days	60 days
Support				
Installation	NC	\$150	Yes	NC
System training	NC	\$200 (2 people)	Yes	NC
Education courses	\$150	NC(operator's training)	Yes	NC
Documentation	Available	NC	Yes	NC
Systems analysis	50 hours NC	NC	Available	—
Programming service	Available	NC	Available	NC

*Plus Fortran(NC) and Focal

Custom Computer Systems, Inc.	Eldorado Electrodata Corp.	Honeywell Information Systems Inc.	IBM Corp.	IBM Corp.
Simplex 70 06/71 3	Model 140 1970 Approx. 80	Series 50 Model 58 12/70 NG	System/3 Model 6 12/70 NG	System/3 Model 10 02/70 (card), 09/70 (disc) NG
Data Gen. Nova 1200 No Optional Approx. 6.3 usec NG	Model 140/200 No No 10 usec 20 usec	Model 58 Yes No 120 usec(9-digit signed field) 120 usec(5-byte fields)	Model 5406 Yes No 12.2 usec 40 usec	Model 5410 Yes No 12.2 usec 40 usec
1.2 usec (core) 16 bits 4K-32K	1.2 usec (core) 8 bits Two 64K	1.2 usec (core) 8 bits (+1 parity) 5K-10K	1.52 usec (core) 8 bits (+1 parity) 8K-16K	1.52 usec (core) 8 bits (+1 parity) 8K-64K
1@330K words/sec 256@10K words/sec 62@demand rates 319 (340K+ words/sec) 110-9600 baud	319 (340K+ words/sec) 1@10K words/sec 15@10K words/sec NG@833K words/sec 1200 baud	1(8 position)@300K wds/sec — 3@28K words/sec NG@300K words/sec 660-9600 baud	— — 1@ 50K words/sec NG@669K words/sec 600-50,000 baud Natively attached I/O devices operate on cycle-stealing basis	— — 1@50K words/sec NG@660K words/sec 134.5-50,000 baud Natively attached I/O devices operate on cycle-stealing basis
30KB — — 20MB (200KB)	26KB 0.5KB 2.5MB (200KB) 2.5MB (200KB)	— — — 3.4-23MB (156KB)	— — — 2.45-9.8MB (199KB)	20, 40 or 80KB — — 2.45-9.8MB (199KB) 20,48-40.96MB (312KB) 300,400,600 or 1000 cpm 80/160 cps 250 or 500 cpm 60 or 120 cpm 100,200,300,600 or 1100 lpm 15.5 cps
400 cpm 67 cpm — — 150 or 600 lpm 10,15 or 30 cps Crt	300 cpm — — — 600 lpm 15 cps Paper tape equipment	100,200 or 300 cpm 26-40 cpm — — 100 or 200 lpm — Optical mark reader optional, keyboard and numeric display standard	50 cpm 12-50 cpm 22 cpm 22 cpm — 85 cps MICR reader, paper tape reader/punch, plotter, ledger card printer	— — — — — — — MICR reader,optical mark reader,paper tape reader/punch, plotter, data collection terminal
— Yes — 8K	Yes Yes — 4K	No Yes — —	— Yes — 8K (disc support)	— Yes — 12K (disc support) 8K (card support) Multiprogramming
8K supports two terminals and line printer	Multiprogramming	Multi-tasking, occupies 1.6K	—	—
NC NC — — NC \$500 \$1000 NC NC NC NC NC	NC —* — — NC NC NC NC NC NC NC NC	— — NC — — — NC NC NC NC NC	— — \$110/mo. — \$35/mo. — \$10/mo. — — \$665, \$765 (custom) — \$665, \$765 (custom) \$665 (order/invoice), \$765 (custom)	\$75/mo. — \$75/mo. \$35/mo. (card), \$45/mo. (disc) — \$10/mo. \$70/mo. \$410 (card) \$655, \$325 (card), \$755 (disc) \$370 (card) \$680, \$325 (card), \$780 (disc) \$705, \$350 (card order/ invoice), \$805 (disc order/ invoice)
\$1500 NG	NC 40	NC NG	\$665, \$765 (custom) 47	\$630, \$305 (card), \$730 (disc) 44
\$935/mo. (5-yr lease)	\$435/mo. (5-yr lease)	\$1238/mo. (5-yr lease) (\$885/mo. for card system)	\$984/mo. (1-yr lease)	\$1400/mo. (1-yr lease)
8K, 5MB disc, ASR tty, line printer	8K, 3 cassette drives, Selectric typewriter, 10- key auxiliary keyboard	5K, 3.4MB disc or 40 cps punch, 100 lpm printer, 100 cpm card reader, keyboards, display	8K, 2.45MB disc, 85 cps printer, keyboard	12K, 100 lpm printer, 250 cpm reader, 60 cpm punch, 60 cpm printer, 2.45MB disc
\$42,500	\$21,050	\$59,090 (\$37,040 for card system) \$379/mo. (purchased system)	\$46,925	\$61,475
\$170/mo. (5-yr lease)	\$116/mo.	—	\$239/mo. (purchased system)	\$366/mo.
\$170/mo. or \$28/call 90 days	NA 15-30 days	— 30 days	— 180 days	— 180 days
NC NC NC NC NC NC	Yes Yes Yes Yes NC up to 40 hrs. NC up to 40 hrs.	NC NC NC NC NC NC	NC Available NC NC Available Available	NC Available NC NC Available Available

*A proprietary language said to be similar to Basic

	Martin, Wolfe Inc.	Mobydata, Inc.	NCR Co.	Qantel Corp.
Model	Simbol	Commander 500 & 1000	Century 50	Q-Series
First acceptance	01/72	NG	NG	06/70
Number installed	NG	NG	NG	100
CPU	Data Gen. Nova 1200	Data Gen. Nova 1200	Century 50	QA-2
Decimal arithmetic	No	No	Yes	Yes
Hardware mult/div	Optional	No	No	Yes
Decimal add time	Approx. 6.3 usec	Approx. 6.3 usec	37.6 usec	58.5 usec
Decimal compare time	NG	NG	37.6 usec	61.5 usec
Central Memory				
Cycle & type	1.2 usec (core)	1.2 usec (core)	800 nsec (short rod)	1.5 usec (integrated circuit)
Word/Byte	16 bits	16 bits	8 bits (+1 parity)	8 bits
Size	8K-32K	4K-32K	16K-32K	4K-32K
I/O Channels				
Direct memory access "Multiplexor"	—	1@200K words/sec 16@15K words/sec	2@108K words/sec	9@666KB 12 "controller"@143KB
Dedicated	64@833K words/sec	64@66K words/sec	2@148K words/sec	—
Total channels (Total rate)	64 (833K words/sec)	64 (200K words/sec)	2 (148KB)	12 (666KB)
Communications	110-9600 baud	300 baud	110-50K baud	75-9600/40,800 baud
Comments				
Peripherals				
Mag tape (1/2-inch)	30KB	—	—	10KB,20KB,30KB,40KB,60KB
Mag tape cassette	—	—	—	5KB
Fixed disc or drum	—	1.8MB (200KB)	—	—
Disc pack or cartridge	2.5-10MB (153KB)	1.8MB (200KB)	8.4MB (108KB)	7.6MB & 30.2MB (143KB)
80-col card reader	—	—	800 cpm	300 cpm
80-col card punch	—	—	82-294 cpm	—
96-col card reader	—	—	—	—
96-col card punch	—	—	—	—
Line printer	60-120 lpm	100 lpm	200-900 lpm	200, 245-1100, & 700-1800 lpm
Serial (typewriter) printer	30 cps	10 cps	6 cps	8 or 60-100 lpm
Other		Keyboard/crt, point-of-sale terminal with cash drawer		10-key keyboard, crt, paper tape reader and punch, console
Operating System				
Tape-based	—	—	No	Yes
Disc-based	Yes	Yes	Yes	Yes
Core-based	—	Yes	—	Yes
Memory requirement	4K	8K	16K	6K
Comments		Multiprogramming		Multi-tasking, multiprogramming
Program Library				
Assembler	—	NC	NC	NC
Basic compiler	—	NC	NC	—
Cobol compiler	—	NC	NC	—
RPG	NC	—	NC	NC
Core sort utility	—	NC	—	—
Disc sort utility	NC	NC	NC	NC
Tape sort utility	—	—	NC	NC
Payroll	NC	NC	NC	NC
Accounts receivable	NC	NC	NC	NC
Accounts payable	NC	NC	NC	NC
Inventory	—	NC	NC	NC
Billing	NC	NC	NC	NC
Sales Analysis	—	NC	NC	NC
Approx. number of application programs available	NG	NG	NG	6
Rental/Maintenance "Best" terms	\$1260/mo. (7-yr lease)	\$577/mo. (3 to 5-yr lease)	\$1575/mo. (1-yr lease)	\$489/mo. (5-yr lease)
Configuration quoted	16K, 4.6MB disc, crt, keyboard, 165 cps printer	8K, crt, disc, 100 lpm printer	16K, card reader, disc, printer	4K, I/O typewriter, two mag tape transports and controllers
Purchase price	\$70,000	\$25,100	\$95,000	\$22,215
Maintenance	\$250/mo.	\$100/mo. (3 to 5-yr lease)	\$275/mo.	\$111/mo. (5-yr lease)
24-hour extra charge	NG	\$40/call	\$157.50/mo.	\$25/hr. *
Availability	120 days	120 days	60 days	60 days
Support				
Installation	Yes	NC	Yes	\$ equal to 1 mo. maint.
System training	Yes	NC	Yes	NC
Education courses	Yes	—	Yes	NC
Documentation	Yes	NC	Yes	NC
Systems analysis	Yes	NC	Yes	Available
Programming service	Yes	NC	—	Available
				*Plus transportation within service areas

RCS Data Systems	The Singer Co.	The Singer Co.	Search Computer Systems	Ultimacc Systems, Inc.	Univac
ADS-1 NG NG	System 10 Series 102 11/70 400+	System 10 104 & 106 11/70 400+	System 70 06/70 10	Ultimacc Disc 02/71 8	Model 9210 09/69 125
Varian 620/f No Yes Approx. 5 usec NG	Model 20-102 Yes Yes 68 usec 134 usec	Model 20-104 Yes Yes 68 usec 134 usec	DEC PDP-8 No No Approx. 4.8 usec Approx. 4.8 usec	Data Gen. Nova 1200 No No 6.3 usec NG	Model 9210 Yes Optional 86.4 usec 86.4 usec
750 nsec (core) 16 bits 4K-32K	3.3 usec (core) 6 bits 10K-30K	3.3 usec (core) 6 bits 20K-110K	1.2 usec (core) 12 bits 4K-32K	1.2 usec (core) 16 bits 12K-32K	1.2 usec (plated wire) 8 bits (+1 parity) 8K-32K
1@1.33M words/sec 64@276K words/sec 64 (1.33M words/sec) —	1@330K words/sec 2@1500 words/sec — 3 (330K words/sec)	1@330K words/sec 20@1500 words/sec — 21 (330K words/sec) None (110-9660 baud*)	12@120K words/sec — 20@120K words/sec 20 (120K words/sec) 2400 baud	1@833K words/sec 62@400K words/sec 62@400K words/sec 62 (833K words/sec) 50,000 baud	— 1@85K words/sec 3@peripheral demand rates 4 (85K words/sec) 150-240K baud
20KB 786KB (412KB) 2.5MB (195KB)	— — 8MB (229KB)	20KB — 10MB (229KB)	20KB 2.5 KB 4.8MB (60KB)	30KB 1.8KB 2.5MB (200KB) 2.5MB (200KB)	34KB — 12.8MB (34KB)
300 cpm 35 cpm — —	— — — —	300 cpm 100 cpm — —	300 cpm — — —	267 cpm — — —	400 cpm 75-200 cpm — —
600 lpm 30 cps	110 lpm 24.4 cps Crt	110 or 450 lpm 24.4 cps Paper tape reader, punch, crt, job info. station, attendance terminal, POS terminal, (split disc*)	60 or 200 lpm 30 cps Optical card reader, video display	135-300 lpm 30 cps Keyboard/printer, ledger card printer	250-300 lpm 30 cps Console, paper tape (300 cps read, 110 cps punch), 300/600 document/min. optical reader
— Yes — 8K	— — — —	— — — —	— Yes Yes 4K	— Yes Yes 3K	— Yes Yes 2K-9K
Multiprogramming	Hardware executive	Hardware executive		Real-time interactive; handles up to 15 I/O devices simultaneously. Multiprogramming	5K supports 5 symbionts & 1 main-chain program; inquiry capability requires max. 9K
NC NC — NC — NC NC NC NC NC NC	NC — NC — NC — NC — NC — NC	NC — NC — NC — NC — NC — NC	NC NC — — NC NC NC NC NC NC	NC NC (licensed) — — NC NC NC NC NC NC	NC — NC NC — NC NC NC NC NC
NC 15	\$800 NG	\$800 NG	NC 15	NC 25	NC 10
3rd party leases can be arranged 8K, teleprinter, 30 cps printer, 5MB disc \$25,000	\$813.75/mo. (5-yr lease) 10K, split-disc drive, workstation \$38,230	\$1318.45/mo. (5-yr lease) 20K processor, 2 disc drives, 2 workstations (disc drive, commo adapt- er, 3 workstations*) \$61,430	\$880/mo. (5-yr lease) 8K, 4 mag tapes, video display, line printer, workstation \$40,000 (tape version)	\$1075/mo. (5-yr purchase) 12K, 30 cps key- 5MB disc \$50,900	\$1469/mo. (5-yr lease) 12K, 250/500 lpm printer, 400 cpm reader, 75-200 cpm punch, 3.2MB disc. hardware mult/div/edit \$52,320
\$160/mo. NG 90 days	\$201.25/mo. (5-yr lease) \$130.75/mo. 120 days	\$291.55/mo. (5-yr lease) \$188.45/mo. 120 days	\$155/mo. — 45 days	\$200/mo. (1-yr lease) — 90 days	\$488/mo. — 180 days
Available Available Available Available Available Available	NC NC \$375 NC Limited \$25/hr.	NC NC \$375 NC Limited \$25/hr.	NC NC NC NC NC NC	NC NC \$500 NC NC NC	NC NC NC NC NC —
		* For 106 only			

Small Business Computers

nel configurations vary so widely for cpu's of the same model. Most mini-computers provide a number of buffered channels similar to the multiplexor channels on IBM's 360 and 370 systems for support of high-speed devices. The channel rates shown are maximum individual rates and cannot exceed the maximum aggregate data rate of the machine—usually the reciprocal of the storage cycle time.

For consistency of notation in our specifications, we have used KB (1024) for both characters and bytes in the peripheral transfer rate tables. Small-scale computers are often more I/O bound than compute bound, so special attention should be paid to the speeds

of the peripherals supported. In many cases this gives a better indication of the system's performance than the cycle time figure does.

In the program library section we asked whether a core sort utility was available. Most of the equipment shown can sort very small files without the need of intermediate storage on tape or disc. We did not define a file size to be sorted, and it's safe to assume that the core sort utility would be restricted to files of relatively small size. If "NC" is indicated beside a certain program, that means there is no charge for the program supplied in basic form. If a dollar figure is indicated, that is the price of the program customized to the customer's specifications.

The rental figure applies to a configuration capable of processing payroll, inventory, and accounts receivable/payable, and including either a tape or

disc sort. We originally asked for this figure to be based on a two-year lease, but it turned out that most vendors do not offer such contracts. Since we also asked for a "best terms" rental, that is what is listed. Some vendors do not offer leases longer than one year, and their rental rates are higher compared to the others.

The vendor information chart contains a thumbnail sketch of the vendors and whom to contact for additional specific information on the systems.

So there they are. If you choose to do your data processing in-house, you'll be joining a rapidly-growing number of businesses—approaching 15,000. (IBM alone is said to have more than 10,000 System/3 models installed.) That's a small percentage of what the number will be five years from now. Here's your chance to get in on the ground floor. □

The Vendors

BASIC/FOUR CORP.
18552 MacArthur Blvd.,
Santa Ana, Calif. 92707
Ph. (714) 833-9530
Sub. of Management Assistance,
Inc. (MAI) New York
Date Established: NG
Number of employees: NG
Gross sales last fiscal year: NG
Sales/service offices located:
Nationwide, Canada, Europe, South
America
For information contact:
W. C. McKee, Branch Manager
(213) 380-0180

CASCADE DATA, INC.
3000 Kraft Avenue S. E.
Grand Rapids, Mich. 49508
Ph. (616) 949-8850
Date Established: 1969
Number of employees: 200
Gross sales last fiscal year: \$5 million
Sales/service offices located:
Nationwide, Canada, Europe
For information contact:
S. W. Fordell, Markt. Ser. Mgr.

CLARY DATACOMP SYSTEMS, INC.
2041 Business Center Drive
Newport Beach, Calif. 92664
Ph. (714) 833-0934
Date Established: 1967
Number of employees: less than 100
Gross sales last fiscal year: less than
\$500,000
Sales/service offices located:
N.J., Ill., Calif., Texas, Europe,
South America
For information contact:
George G. Boyden, Marketing Mgr.

COMPUTER INTERACTIONS, INC.
425 Northern Blvd.
Great Neck, N.Y. 11021
Ph. (516) 487-9810
Date Established: 1968

Number of employees: 12
Gross sales last fiscal year: NG
Sales/service offices located:
Nationwide (agreement with Digital
Equipment Corp.)
For information contact:
Harold Saphin, President

CUSTOM COMPUTER SYSTEMS, INC.
40 South Mall
Plainview, N.Y. 11803
Ph. (516) 293-5353
Date Established: 1968
Number of employees: 12
Gross sales last fiscal year: \$250,000
Sales/service offices located:
New York City (sales), nationwide
third-party maintenance
For information contact:
Richard Peck, V.P., Marketing

ELDORADO ELECTRODATA CORP.
601 Chalamar Road
Concord, Calif. 94520
Ph. (415) 686-4200
Date Established: 1961
Number of employees: 200
Gross sales last fiscal year: \$3.5 million
Sales/service offices located:
Nationwide, Canada
For information contact:
Clarke Hoagland, Dir. of Mktg.

HONEYWELL INFORMATION SYSTEMS INC.
200 Smith Street
Waltham, Mass. 02154
Ph. (617) 890-8400
Sub. of Honeywell Inc.
Date Established: 1955
Number of employees: 46,000
Gross sales last fiscal year: \$950 million
Sales/service offices located:
Nationwide, Canada, Europe, Orient,
South America, Africa, Australia
For information contact:
Kenneth S. Hoyt, Senior Product Mgr.
(617) 237-4100, ext. 3484
60 Walnut Street
Wellesley Hills, Mass. 02181

INTERNATIONAL BUSINESS MACHINES CORP.
Data Processing Div.
1133 Westchester Ave.
White Plains, N.Y. 10604
Ph. (914) 696-1900
Date Established: 1911
Number of employees: 265,493
Gross sales last fiscal year:
\$8,273,603,369 (Corp.)
Sales/service offices located:
Nationwide, Canada, Europe, Orient,
South America, Africa, Australia
For information contact:
Local branch office

MARTIN, WOLFE INC.
7528 Clairemont Mesa Blvd.
San Diego, Calif. 92111
Ph. (714) 277-3700
Date Established: 1971
Number of employees: 9
Gross sales last fiscal year: NG
Sales/service offices located:
Currently home office only
For information contact:
William Lee, V.P.

MOBYDATA, INC.
One Nouvelle Park
New Hartford, N.Y. 13413
Ph. (315) 797-0397
Date Established: 1969
Number of employees: 10
Gross sales last fiscal year: NG
Sales/service offices located:
Currently home office only
For information contact:
B. L. Matteson, V.P. Mktg.

THE NATIONAL CASH REGISTER CO.
Main & K Streets
Dayton, Ohio 45408
Ph. (513) 449-3670
Date Established: 1884
Number of employees: 95,000
Gross sales last fiscal year: \$1.5 billion
Sales/service offices located:
Nationwide, Canada, Europe, Orient,
South America, Africa, Australia
For information contact:
Paul Hensley, Mgr. EDP Products

QANTEL CORP.
3474 Investment Boulevard
Hayward, Calif. 94545
Ph. (415) 783-3410
Date Established: 1969
Number of employees: 75
Gross sales last fiscal year: NG
Sales/service offices located:
Nationwide
For information contact:
Andrew Emery, Dir., Mktg. Services

RCS DATA SYSTEMS
Post Office Box 94
Lathrop Village, Mich. 48076
Ph. (313) 557-3533
Date Established: 1968
Number of employees: 3
Gross sales last fiscal year: less than
\$100,000
Sales/service offices located:
Michigan, Ohio
For information contact:
D. P. Apt, President

THE SINGER CO.
Business Machines Div.
2350 Washington Avenue
San Leandro, Calif. 94577
Ph. (415) 357-6800
Date Established: 1934
Number of employees: 12,770
Gross sales last fiscal year: \$240 million
Sales/service offices located:
Nationwide, Canada, Europe, Orient,
South America, Africa, Australia, Middle
East
For information contact:
C. W. Proctor, Dir. Mktg. Services

SEARCH COMPUTER SYSTEMS
111 Ash Street
East Hartford, Conn. 06108
Ph. (203) 289-9506
Date Established: 1969
Number of employees: 90
Gross sales last fiscal year: \$980,000
Sales/service offices located:
Currently home office only
For information contact:
Ronald Cerri, Sales Manager

ULTIMACC SYSTEMS, INC.
9 Brook Avenue
Maywood, N.J. 07607
Ph. (201) 845-0500
Date Established: 1968
Number of employees: 35
Gross sales last fiscal year: \$1 million
Sales/service offices located:
New York, New Jersey
For information contact:
Ernest Sabato, Dir. of Sales

UNIVAC DIV., SPERRY RAND CORP.
Post Office Box 500
Blue Bell, Pa. 19422
Ph. (215) 646-9000
Date Established: 1955
Number of employees: 33,000
Gross sales last fiscal year: \$700+
million (Div.)
Sales/service offices located:
Nationwide, Canada, Europe, Orient,
South America, Africa, Australia
For information contact:
Arthur Geilfuss, 9000 Series Sales Mgr.

A PROVEN, INTEGRATED ACCOUNTING AND FINANCIAL MANAGEMENT SYSTEM...

... modular in
composition . . . integrated in operation . . . gives you
one input, one pass data processing . . . with
multiple record generation from single data entry . . .
allows you or your clients to start with one or
more of these modular subsystems;

- Accounts Payable
- Invoicing and
Accounts Receivable
- Payroll and Labor
Distribution
- General Accounting
- Inventory Management
- Fixed Assets

. . . and expand as you need to into Job Cost
Accounting, Program Planning—Financial
Projections, and other custom designed features.

**It would cost you a lot of money and a lot of time
to do it yourself.** We can give it to you now . . .
for less than 25% of what it would cost you to do it
yourself . . . and have the system up and operating,
with your personnel trained, in 30 days.

**Management Control System . . .
designed for IBM 360/30/40/50, Univac 9400,
Burroughs 3500, and Honeywell 200 series
equipment.**

It has to be worth 30 minutes of your time to find out how you can put
this proven system to work for your company . . . quickly . . . economically.
Just return the coupon and we'll get in touch with you for an
appointment. Or call collect today to: Gordon Teter (614) 267-6351.

Name _____

Title _____

Company _____

Street _____

City _____

State _____

Zip _____

Phone No. _____

**ACCURAY
INFORMATION
SERVICES**

Industrial
IN/nucleonics CORPORATION
AccuRay

Division of Industrial Nucleonics Corporation 1125 Kinnear Road, Columbus, Ohio 43212

CIRCLE 54 ON READER CARD

Effective data systems have communications built in. Not built on.



Since most computers are linked to other computers through the telephone network, and send and receive data that way, it makes sense to involve telephone people early in the planning of your system.

And it can save you time and money.

Because a Bell System data specialist knows the latest developments in data communications, he'll assist in selecting the communica-

tions services that will enable your system to work most effectively.

So when you first begin to make new data plans, call your local Bell Company Communications Consultant.

He'll come to talk with you.

And it won't cost you a cent.

We are continually looking for new ways to improve our service.

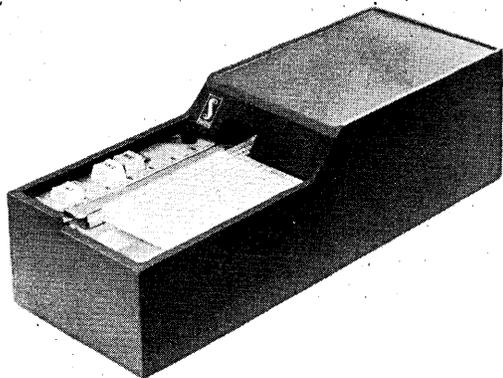
This time, by helping you plan your data communications.

AT&T and your local Bell Company.

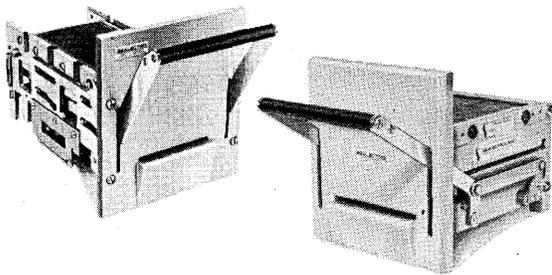


TAB CARDS TO CREDIT CARDS...
TOLL TICKETS TO TRACK TICKETS...

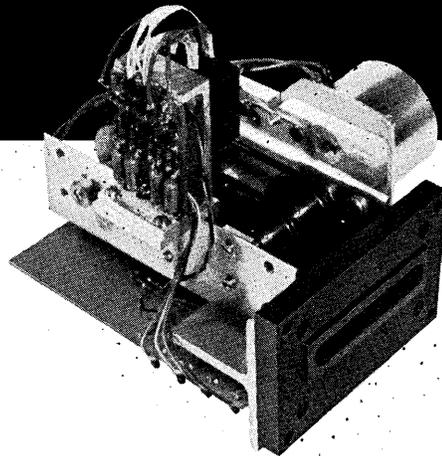
Sealectro has a reader that's just right for your requirements...



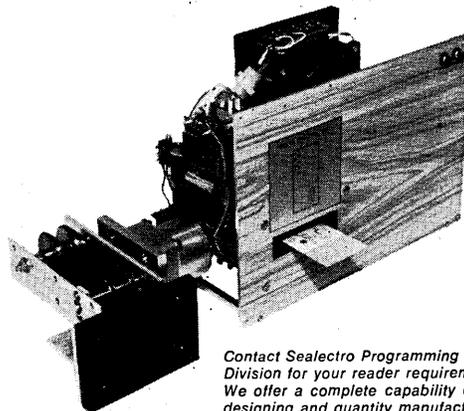
INCREMENTAL 80 COLUMN CARD READER provides a static readout from each column of a standard 80 column tab card, with reading speeds up to 80 columns per second. The DS-80 incorporates an output signal coincidental with every column, whether or not data is punched into the column. The unit can be set to read any number of columns and then automatically reverse and eject the card.



STATIC CARD AND BADGE READERS are available featuring exclusive remote contact design for optimum reliability. 80 column, 51 column card readers and 10 X 10, 10 X 12, 20 X 12 and 22 X 12 badge readers offer discrete inputs and outputs for every data point. A system of bus and discrete tab connectors make any electrical combination possible.



OCR SENSING READERS, a complete line of card and ticket readers using OCR sensing of bar-coded binary data. Utilizes reflected light to distinguish between data/no data. Output is serial as the document is transported under the read elements. Units can be designed to provide such features as automatic cancellation of the document after reading, or issuance of credit vouchers after verification. Reading techniques are available for Hollerith, bar code, embedded metals and magnetic stripe media.



Contact Sealectro Programming Devices Division for your reader requirements. We offer a complete capability of designing and quantity manufacturing to your specifications.



SEALECTRO CORPORATION

MAMARONECK, N. Y. 10543

PHONE: 914 698-5600 TWX: 710-566-1110

Sealectro Ltd., Portsmouth, Hants, England
Sealectro S.A., la Garde 83, France

New Sabre II puts American Airlines years ahead in data traffic control.



Data traffic at American Airlines is expected to triple by 1975.

American isn't worried.

The airline just installed a system that can handle the traffic explosion.

It's the new SABRE II network, and by 1975 the system will be controlling the flow of an anticipated 11,000 messages a minute.

Traffic flow in the new network is handled by Collins processors. They create a computerized loop. The loop interconnects some 2,000 American agent terminals, the SABRE I center in New York, and the SABRE II center in Tulsa.

Because of the tremendous routing capability of the Collins processors, expensive conventional computers on the loop can be used 100 percent for computation.

The processors also give the network an almost unlimited expandability. The airline should never have to face the costly problem of starting over with bigger computers and new software. Any company that depends on data collection or message switching ought to know the potential of this communications-oriented computer system.

Get in touch with Collins.

We can protect your investment in existing hardware and software.

We can eliminate your costs of change-out and unnecessary duplication.

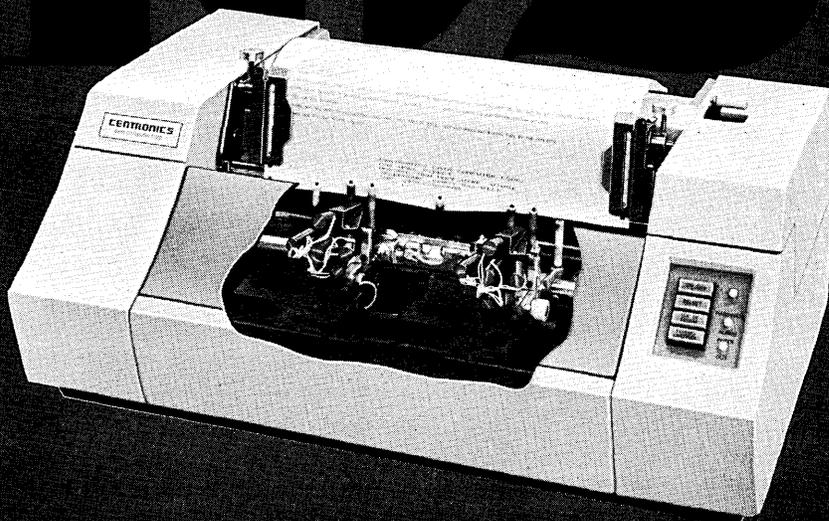
We can help you achieve a more efficient and profitable operation.

Contact Collins Radio Company, Dept. 300, Dallas, Texas 75207. Phone: (214) 235-9511.

Collins: where computers are born communicators.



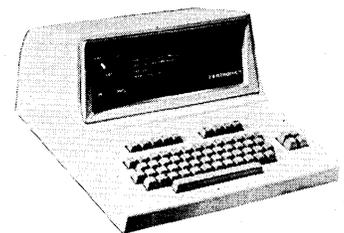
Introducing the



Centronics can show you why two heads are better than one in many applications

If you'd like complete information and performance specs. on our new 102A printer that turns out up to 125, 132-column lines a minute, write Department 1027 or call 603-883-0111 (New Hampshire), 513-294-0070 (Ohio), or 415-228-7178 (California).

Centronics has a new CRT, too, the 401, to go with your printer. For complete information and specs. write Department 1028 or call any of the numbers listed.



CENTRONICS

Centronics Data Computer Corp. One Wall Street Hudson, N.H. 03051



We'll take on any computer

Now you don't have to worry about service. Whether you're buying, selling, or interfacing a computer system, Raytheon Service Company can handle your service needs.

If you're a manufacturer, leave your servicing to us. Twenty-seven manufacturers have chosen Raytheon Service

Company to maintain their computers and systems.

Regardless of the make we can provide complete service. Our service network will let you do what you do best. Produce. And sell. We'll keep your equipment working in Macon or St. Louis or Seattle, or anywhere else.

If you're a computer user you

in the house.

can go ahead and buy the special equipment that really provides the features you want. And you'll save money. Just be sure to buy equipment that's backed by a reliable service organization. Our service network is supporting a company that makes just what you need.

So remember our name. And

our specialty. Service. We'll take on any computer in the house. For more information, write our Marketing Manager or call us at 617-272-9300.

Raytheon Service Company,
12 Second Avenue, Burlington,
Massachusetts 01803.



"HOW CAN A SMALL COMPANY LIKE OURS GET INTO COM?"



If you've been looking for a way to get in on the time-and money-saving advantages of computer output microfilming, but without making a big investment, here's the perfect solution:

Simply go to a COM service bureau equipped with a Kodak KOM-80 or KOM-90 microfilmer. They'll convert your computer tape data directly to microfilm in one of several handy forms, ready for fast, easy retrieval. In fact, they offer truly COMplete service, backed by Kodak's software programs, national service organization, and information management know-how.

For the COMplete story, fill out the coupon and send it in.

**Bring your computer tapes
to a service bureau
offering COMplete service.**

I'd like to know how to get into COM. Please send full details on COMplete service bureaus.

Name _____

Position _____

Organization _____

Address _____

City _____ State _____ Zip _____

Eastman Kodak Company
Business Systems Markets Division
Dept. DP559, Rochester, N.Y. 14650

For better information management

Kodak Microfilm Products



How does management's view of you and your job differ from your own? Unless you know, you'll be handicapped in making the right career choices forced by future change

EDP People... Review and Preview

by Robert B. Forest, Editor

Over the past few months, DATAMATION has published a series of articles that have attempted to grasp and give shape to some of the basic attitudes that affect the careers of computer professionals.

We've taken a look at what makes Computerman run—at his goals, at the hurdles he faces, how he hopes to get ahead. We've examined the term "computer professional," as defined by several groups and forces, and what they hope to achieve. We've examined career paths—both up and out.

In this, the last of that series, we will attempt to sum up the major basic attitudes as found in the in-depth interviews and in the long, freewheeling answers to our open-ended questionnaire, answered by hundreds of friendly, cooperative edp professionals, industry watchers, wisemen, and victims of our arcane technology.

Before moving on, we would like to thank Milt Stone for the work he did in formulating the series, the research, and for his work on the previous articles. Milt has moved on to become the editor of Business Automation. We wish him well.

Mirror, mirror on the wall . . .

How does Computerman view himself? First of all, how does he feel about his work? Says one, whose work includes programming, systems analysis/design and user liaison: "My job is personally rewarding, always demanding, sometimes exhausting, very often frustrating. With such a wide variety, mostly dp related, it is challenging—never monotonous."

Some can't imagine doing anything else. One speaks with some wonder about "the difference between having a job you tolerate and being employed in the profession you really enjoy." Many

drifted, wandered, or were sucked into the computer industry, of course. A typical comment: "I had a math degree and it was either this or teach." Such people feel either lucky . . . or vaguely lost: "What's a nice math major like me doing in a job like this?"

Some spell out a bit more explicitly what it is they like about the work they do. Says one, who maintains the terminal system at a petroleum research center, "I enjoy my work very much. I guess my primary love is software and hardware. I am not applications oriented."

A similar technical orientation is revealed in the comments of one programmer with five years' experience who complains about her "inability, especially due to the current employment situation, to influence which assignments I accept, which languages I

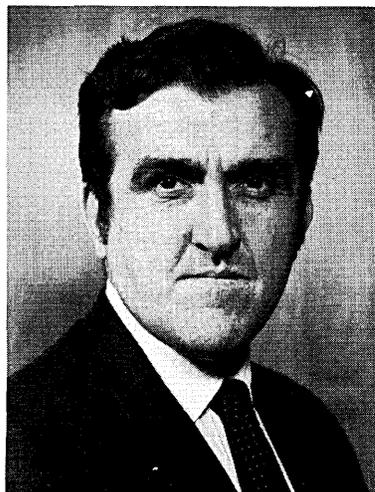
code in, and equally important, the hardware involved."

It would be easy to scoff at such an attitude, to treat it as a sign of machine worship, technical narrowness and immaturity. But the same programmer shows us one other attitude common to most of her peers. Listen: "Specifically, my job is to design and implement a section of a generalized report/plot generator. Originally, the results of this work were to be a system, and the idea of working on an application *system* was not objectionable to me. But, compromises have changed it into a specific application job, and that is less demanding and satisfying professionally."

One of the reasons Computerman likes his work, then, is because it's challenging, demanding. Another aspect (or consequence) of that attitude is that Computerman—certainly at the programmer/analyst level—seems driven by a desire to pioneer, to do something that hasn't been done before.

That's good. But it can be bad, too. It can mean programmers and analysts reluctant to document or to try to improve upon an earlier version. And in the days when there were many more jobs than there were adequately trained programmers and analysts, it meant that a lot of dull, necessary work just never got done. By the time the dreary part of the assignment came around, Computerman was off and running to another exciting assignment at another company . . . at a sizable hike in pay.

That's changing now. There's a lot less room now for the leading-edge-of-the-art high priest, the os diddler, the one-time flash with grandiose dreams of thousand-terminal glory. One top edp man at one of the nation's largest



Theodore Bellan, McDonnell Douglas Automation vp, sees the operator's job being upgraded as it becomes more critical with the newest equipment.

companies told me about how, when he arrived at his new post a couple of years ago, he wiped out messing around with the operating system. One of the guys who liked to do that sort of thing quit. "He came back about nine months ago," says the manager. "We took him back. But he doesn't fiddle with os anymore." But you might be surprised at the number of experienced professionals with richly varied backgrounds who once commanded high salaries . . . and are still on the beach.

In general, then, Computerman likes his work. He likes it because it's demanding, and because he feels that it's important, different, varied. And because it pays well. It has not interfered too greatly with an individual's dress or behavior codes, his life style if you will. Because he could, to a certain extent, dictate where he worked, and on what kind of assignment. (That part varied a lot, of course, depending on age, experience, level of job—operators have never been in charge of their careers—and degrees. Mainly it depended on gall. That and the degree of desperation systems management was feeling at the time a man applied.)

Which path to glory?

It's not so easy to summarize Computerman's goals. They vary a great deal. But it does seem to us that there is a rather direct correlation between salary level and the scope of the goals. And the higher the salary, the more likely Computerman is to see (or to dream of) the transferability of his skills to non-edp assignments—mostly in top management or in corporate staff management. This belief seems to be based on a feeling that the systems approach, the mastery of computer technology, qualifies a person to lead a project of any size or complexity, and to manage an organization, no matter what its products or its environment.

But the number of high-level computer people who feel this way is dwindling, thanks probably to management's disparagement of such a foolish notion. (How many computer professionals have vaulted—or have edged, crept, or sneaked—into top management spots? Not many. For reasons we'll discuss later.)

But while computer operators see little application of their skills outside of the computer room, middle- and top-technical management often dream of breaking out. Many do not. We asked the top edp man at a \$2 billion firm, "Where do you go from here?" (He reports to one of seven corporate staff vps who report to the chief executive officer.) His answer: "What's the

matter with where I am?" He likes the work, thinks he's good at it, feels appreciated and adequately reimbursed. He's gotten good support—all the budgets that he's asked for. A vice presidency would be nice even if "it doesn't mean a damn thing." He has no hankering to run an operating piece of the company—but thinks he could—and greener pastures don't really appeal to him all that much. It would take a fantastic offer to move him. One has to have, he points out, "a rational view of oneself."

His view of himself is that of a computer professional who is applying his professionalism to solve his company's problems, help it make an extra buck. That's what he tries to instill in his people, too, he says. While identifying with his company's problems, he keeps the technical mantle. His boss once asked him—in effect—if he was getting "enough supervision."

Our friend's answer: "We have a director of research. How much do you expect to supervise him?" The an-



J. Daniel Couger, Univ. of Colorado, expects new kinds of computer professionals, including the business specialist.

swer: "We don't. He's a technical expert. That's why we got him." And the edp head responded: "Why am I any different?"

Other professionals at lower levels likewise avoid advancement that takes them away from what they know how to do and like to do. They want to avoid even technical management at the subdepartment level. Some see administrative chores and paper work as the biggest obstacle to their professional development . . . and that's more important to many than prestige or pay. One well-traveled pro is the technical right-hand man to the top man at an aerospace company. He wouldn't want his boss's job. "He's political, I'm technical. We complement each other." One honcho says that some programmers keep "the interesting jobs" when they get promoted to a supervi-

sory post.

While Computerman at the programmer/analyst/design stage may not want to have to manage others, he still wants to be paid at an equivalent level. Says one veteran who leads a small corporate research project while doing her own thing: "It's a mistake to take a sharp technical person from where he's had his greatest growth, to tell him he'll make more money if he's a manager. His technical knowledge is not going to go all to waste. But a lot. He won't be a sharp technical manager. This salary bit is wrong. A highly skilled technical person should make more than a manager." She goes on to point out that she has served as a manager earlier in her career . . . but that she found herself staying late, working Saturdays on budgets. She didn't have enough time for herself.

Advancement, then, for some is more money and more technically inspring work . . . without added responsibility. The have-your-cake-and-eat-it-too school?

That rocky road

The obstacles to advancement or success, however Computerman defines them at whatever level, are varied too. One major scapegoat is management's failure to understand: "I seriously doubt that many companies' top management recognize the experience potential of the man that most likely has dealt with every facet of their business." Another grizzled veteran of wars as head of software development for a major manufacturer, as a consultant, and now as a user sighs: "The biggest obstacle in my professional development is the increasing degree of complexity in the systems which we manage, with insufficient time to understand them, and the fact that our overall competence level doesn't seem to improve."

Others complain that not enough is being done to upgrade people, that there is not enough time on the job to grow . . . or even to keep abreast of what is going on. Some see the major obstacle in their path as "my own competence," or "personal limitations." For some it's the label of data processing specialist.

Charity doesn't begin at home

Despite a fairly elevated view of their own competence and importance, the computer people we talked to had a rather uniformly dismal view of their peers and of the contributions of their own technology.

Many feel that edp has not contributed substantially to the company. Says one edp manager: "We would be fooling ourselves to think that an edp organization is doing all that it possibly could." He feels we may be ready to

"quit putting out fires and start improving the system." Another, who thought his shop was one of the best three years ago, isn't quite so sure now: "We forgot the users and how important it was for them to have a say in the way things are done around here."

Carl Reynolds, director of computing and data processing at Hughes Aircraft Co., says of information processing, "It's not nearly as important intrinsically as we in the business seem to think. I believe that it's not yet managed properly, and by that I mean I don't think it's managed as well as other business activities." His technical aide-de-camp, Dr. Robert R. Brown, agrees: "What's lacking are good managers" . . . people able to "plan, lead, organize and control."

Brown again: "What we lack are people who are empathetic with the users' problems (which are also the corporation's problems), people who know systems and hardware and can make efficient use of them."

To many of the people we talked to, the reasons edp has failed to make significant contributions can be traced to one single aspect of the people problem: the ascendancy of the technician over the manager. One aerospace honcho describes himself: "I'm more a management type than a technician

type. It worked to my advantage not having a dp background. Had I been a dp expert I might have looked at it (centralization vs. decentralization) from the standpoint of exploiting the equipment, as opposed to the standpoint of what was best for (my company) in pure dollars-and-cents terms."

Other ways of saying the same thing: "tunnel vision"; "too hardware oriented." Says Paul Wierk, data processing manager for Northrop, "One of the problems is the system analyst eagerness to automate for the sake of automation, which results in a gross misuse of the computer." One hard-working technical services manager for a major hardware manufacturer fears there are too many charlatans in the field.

Too technically oriented, insensitive to user problems, lousy managers. That's how Computerman views himself.

Nobody loves me

Computerman's view of management and his customers (the end users of his services and his systems) is less critical. About the worst complaint is "They don't understand our problems." Says one sorrowful soul: "I personally believe that few outside of dp ever give a single thought to those in dp, as to what they might do, and what

their problems are, and how they might help or cooperate. They are mostly only interested in receiving a report on time." Later, he adds, "Actually these people can not be judged too harshly in this matter; those of us in dp have just failed to educate them."

Others try to look at the problem more objectively. They see management as the victim of many traumatic experiences at the hands of edp technicians, now skeptical of edp. Says Jack Lever, director of information services for Pillsbury, "Now I think management is taking a lot tougher look at edp; they're just not happy with what they got, and are acting to change. They're going with top managers—rather than technical people. The computer has been oversold and underdelivered. The generation changes in machines have also left a sour taste in industry's mouth . . . the conversions involved."

Another says his company's attitude can be summed up as "wary, unsure, unsatisfied." Says a big aerospace technical honcho: "Other people in our company range from sympathetic to downright unhappy, unbelieving and unknowing."

Clearly Computerman is not kidding himself about his acceptance by his customers and by management.

If Computerman feels that manage-

management's view...

If Computerman thinks that management and his customers are fairly critical of his technology and the results of his work, he's right.

Most of the bigwigs contacted by DATAMATION agree that the computer professional is a specialist, a technician who is difficult to work with and to manage. They use such terms as "prima donna," "aloofness," and "mechanistic approach" to describe these qualities. The biggest obstacle to working with the computer specialist seems to be linguistic. Jargon gets the blame, but it is also recognized as merely a front for other qualities.

One controller ascribes to the mystique that computer people build "an ego factor because they feel the uninitiated cannot understand computers . . ." John J. Feldman, executive vice president of the Bank of the Commonwealth, in Detroit says computer people have difficulty believing " . . . that they may be (not *are*, mind you, just may be) guilty of causing the error (disaster?) that has just occurred. The automatic reflex among this group of people is unbelievable."

But many top and user management people are willing to take at least some of the blame. Al Grant, Aerojet-Gen-

eral Corp. executive vice president, feels that the cause of problems lies not with computer professionals, but with " . . . the lack of management direction to these specialists."

Others feel that computer specialists cause no more problems than engineers, or people from any other kind of technical discipline. Francis H. Heller, vice chancellor of the University of Kansas, puts the computer professional in different company. Noting the natural tendency of people pursuing the same calling to adopt a common vocabulary, he notes, "Street gangs and outlaws do this, and so do the country club set and the astronauts." Such specialized vocabulary, he feels, is merely "the hallmark of a guild. But it is one of the characteristics of a guild system that it should intensify in-group feelings and impede intergroup communication." And, he suggests, the "involvement with a sophisticated technology enables the computer professional to indulge in the comfort of an in-group interaction more readily than any other group in our society with the possible exception of physicians."

One of the strongest threads in the management/user attitude toward

Computerman is their feeling that the computer specialist is not interested in, or lacks an understanding of, other aspects of the business. This, as management sees it, is one of the major obstacles to computer people reaching management ranks. The feeling about whether or not the specialist is good management material is about evenly divided between "never" and "good potential." In some cases, of course, the computer man is already there. Says Nat S. Rogers, president of the First City National Bank of Houston: "The head of our data processing department is broad-gauged and interested in all aspects of the business. He already occupies a senior operational responsibility and is expected to fulfill a general management role in the foreseeable future."

How important are computers and the computer specialist? The answers range widely, from "Without them our bank could not operate," to "No more important than a sales staff, a service staff, etc." . . . to " . . . some pieces of the total system . . . are invaluable."

Even those top and user management people highly critical of the computer specialist are often willing to praise him. Energy, dedication, willingness to work hard, pride in accomplishment are all mentioned, as is "missionary zeal." That last one may not be *completely* laudatory.

ment and customers distrust him, he feels that his family and the world at large don't understand what it is he does. Says one senior analyst, "At home, people are not quite sure what I

do—and it wouldn't be too interesting except for a few instances. People in general don't really think I do anything!" A research group supervisor: "People generally think that you work with a mechanical brain and I spend my time patiently explaining that this thing can not think, it only does what people tell it to do." Adds Carl Reyn-

olds: "People in general seem totally confused about computers, and I seem totally unable to discuss them intelligently with people who don't work with them at all." Computerman realizes that the man in the street doesn't know what computers are all about . . . but he doesn't know how to explain. □

tomorrow's jobs... how will they differ?

Just about all the "wise men" that we interviewed agreed on at least one thing: tomorrow's jobs, their requirements and functions will differ—perhaps strikingly—from today's. And they tend to agree that the applications programmer and the systems analyst will have to become more aware of the informational needs of the organizations they are serving . . . that is, the end-user outside the edp department.

Many educators are thinking hard about the kinds of courses and curricula needed to produce tomorrow's information specialist. And Jim Emery (Wharton) and Dan Couger (Colorado) are putting their ideas into practice. Emery is trying to develop "the broad professional who knows the technology as well as the management functions." His role: to translate ". . . management needs into a feasible (gross) design."

Couger, dean of the school of business and professor of computer and management science at the University of Colorado, sees two main types of computer professionals emerging: the information analyst (a business specialist) and a systems designer, who will specialize in computers. But each will devote one-third of his course work to the other's specialty.

The fact that both young men represent leading-edge business schools underscores another attitude common to most of DATAMATION's wise men: the relative uselessness of departments of computer sciences . . . and the people they are turning out. Says Equitable's outspoken Phil Dorn, who's in charge of the company's data processing accounting group: "There is no such thing as computer science yet, though people get degrees in it. I live in the commercial world. The cs degree holder writes compilers and we don't need them.

An MBA with a few courses in edp would be more useful."

Couger thinks that today's systems analyst may have to go back to school. The application programmer will slide down the ladder, and the systems programmer become more important. The newly created systems designer, meanwhile, will replace the dp manager (who will probably try to save himself by calling himself a systems designer).

Many of our sources agree with Couger on the diminishing importance of the applications programmer. Janet Norman sees intelligent terminals as making the computer available to nontechnical people (but not in the near future). When that happens, says the attractive



Janet Norman, systems head at Singer: ". . . the programmer as we now know him is likely to disappear."

head of systems at The Singer Co., ". . . the programmer as we now know him is likely to disappear."

There's more bad news for today's programmer: salaries will level off; the degree of training and/or education will increase. There will be less mobility in the programming workforce (I called programmers technological fruit tramps in one talk), and—shriek—more careful hiring. The head of application analysts for a mainframer thinks

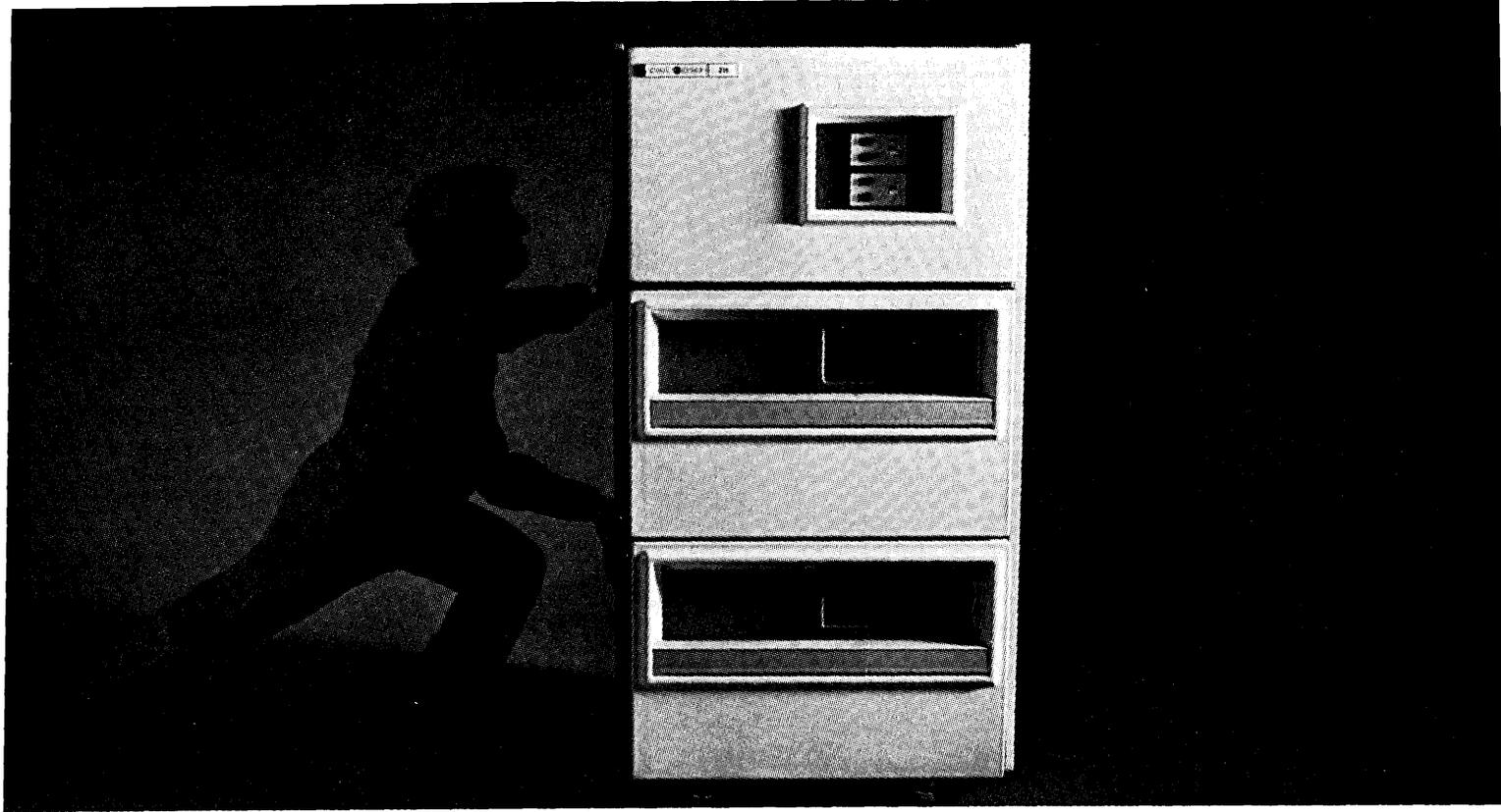
that among his customers the dp people are becoming company people first and computer specialists second.

Views are mixed on the future of the operator. Some believe that function will become simpler. Others like Ted Bellan of McDonnell Douglas Automation Co. see the job being upgraded as it becomes more critical. Bob Harmon, MAC's executive vp-commercial agrees: "Six glitches in one day by a computer operator on our 195 and our profits for the day are wiped out." But operators of small systems may become less important, as canned software and firmware get a stronger grip on system control.

For those people thinking about entering the field, the consensus advice seems to be: stay out of computer sciences. Take a bachelor's degree in a technical subject, add a master's in business administration. Still, if systems programming becomes more important, the software technician might well consider a degree in cs. Especially if he doesn't mind the "technical" stamp . . . isn't interested in moving into the ranks of management.

But if you plan to be a plain old programmer, forget it. Here's the advice of one grizzled veteran about to retire from the wars: "I wouldn't stay in programming, personally. Oh, you've got to have programmers . . . just like you have to have mail boys." His attitude is *not* uncommon.

If you've already been in the industry quite awhile, and are trapped (by choice or otherwise), it appears as if you had better do some re-treading. Try to work for a company that believes in growth, training, career pathing . . . and that will help you get as many courses, seminars and workshops as you can. A stint in a user department might open some doors. If you can swing it, work toward an MBA surely couldn't hurt. That and prayer . . . and looking around a lot for the next magic technology in which you can shine. □



A disk storage system for people in between Courtesy Chevrolet and General Motors.

The bigger the store, the bigger the storehouse has to be. It's the same with the storing of information. And if you store yours on disks, the time comes when the storage system you started with isn't big enough any more.

If you're using an IBM 2314, *their* next step up is a 3330. And maybe even a new computer. That's okay if you're the Library of Congress. But *you* may want to talk to CalComp.

The most realistic step up from an IBM 2314 is a CalComp 1015 Dual Density Disk System.

With it, you double your capacity for only 40% more

cost. And you can grow out of your old storage system without growing out of your old storage room.

The floor space remains the same. So do the disk packs.

You can use the old ones with our new machine. With IBM, you can't save them.

The programming even stays the same.

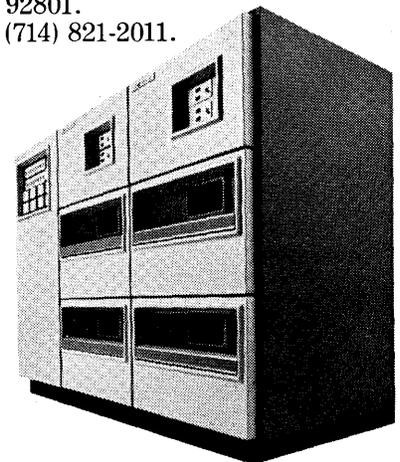
Naturally the CalComp 1015 is compatible with IBM System 360 and 370 computers.

Next time you look around your computer room, and you wonder where to put all the new storage you need, think of CalComp.

Remember, one small step for your business doesn't have

to be one giant leap for IBM.

Call your local CalComp office, or contact California Computer Products, Inc., DM-M6-72, 2411 West La Palma Avenue, Anaheim, California 92801. (714) 821-2011.



CALCOMP

Honeywell launches a new attack on communications and control problems: System 700.



The new Honeywell System 700 can turn your computer into a complete information network. Even if your computer isn't a Honeywell computer.

The new Honeywell System 700 is more than a minicomputer, it's a minicomputer system that can be combined into networks capable of carrying on intelligent two-way conversations with hundreds of

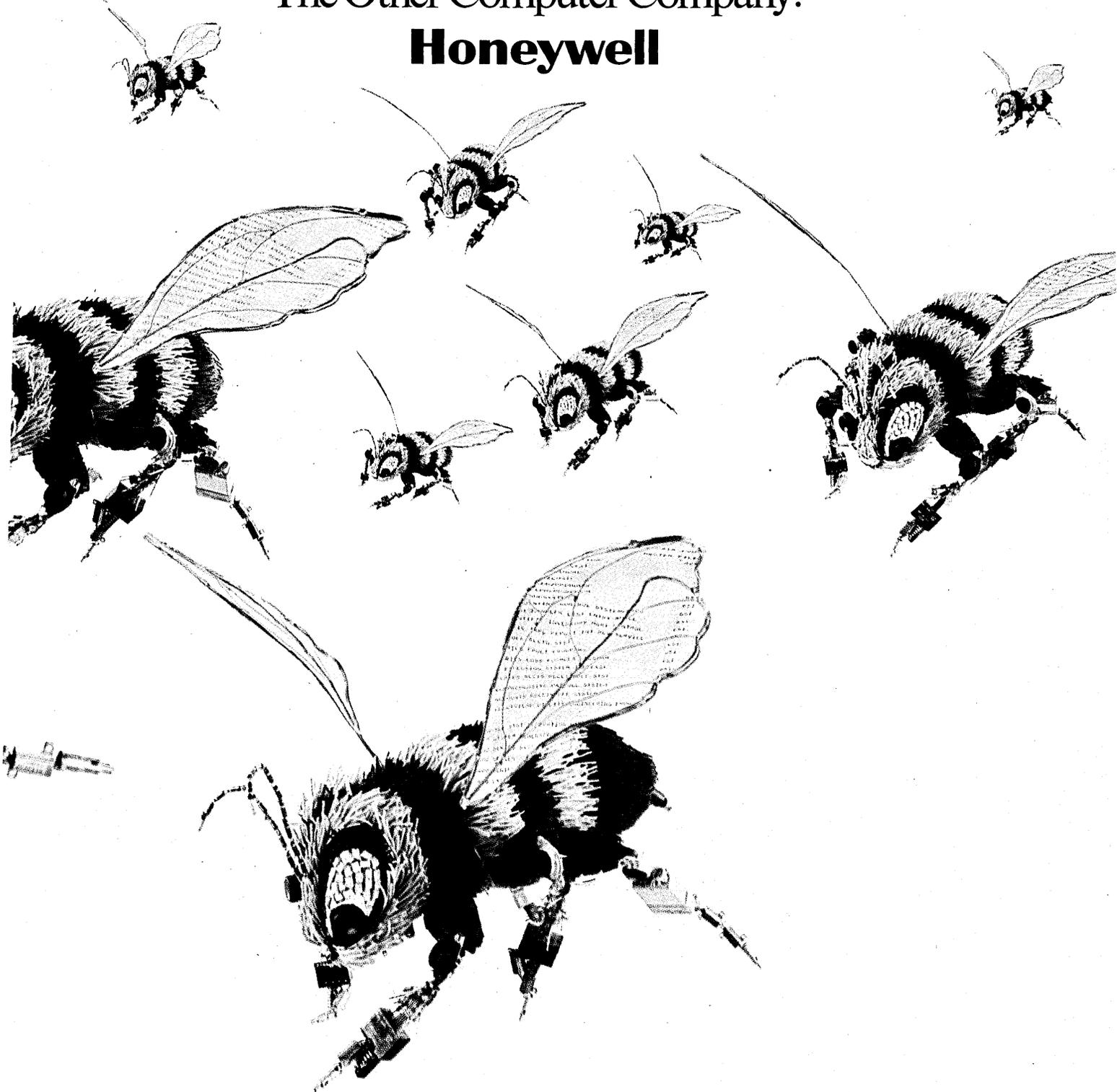
data control points— wherever those points may be— on your production line, in scattered departments, or in distant plants.

The new Honeywell System-700 combines hardware and software to become a communications processor, remote line concentrator, terminal controller, sensor multiplexor, store and forward system, peripheral con-

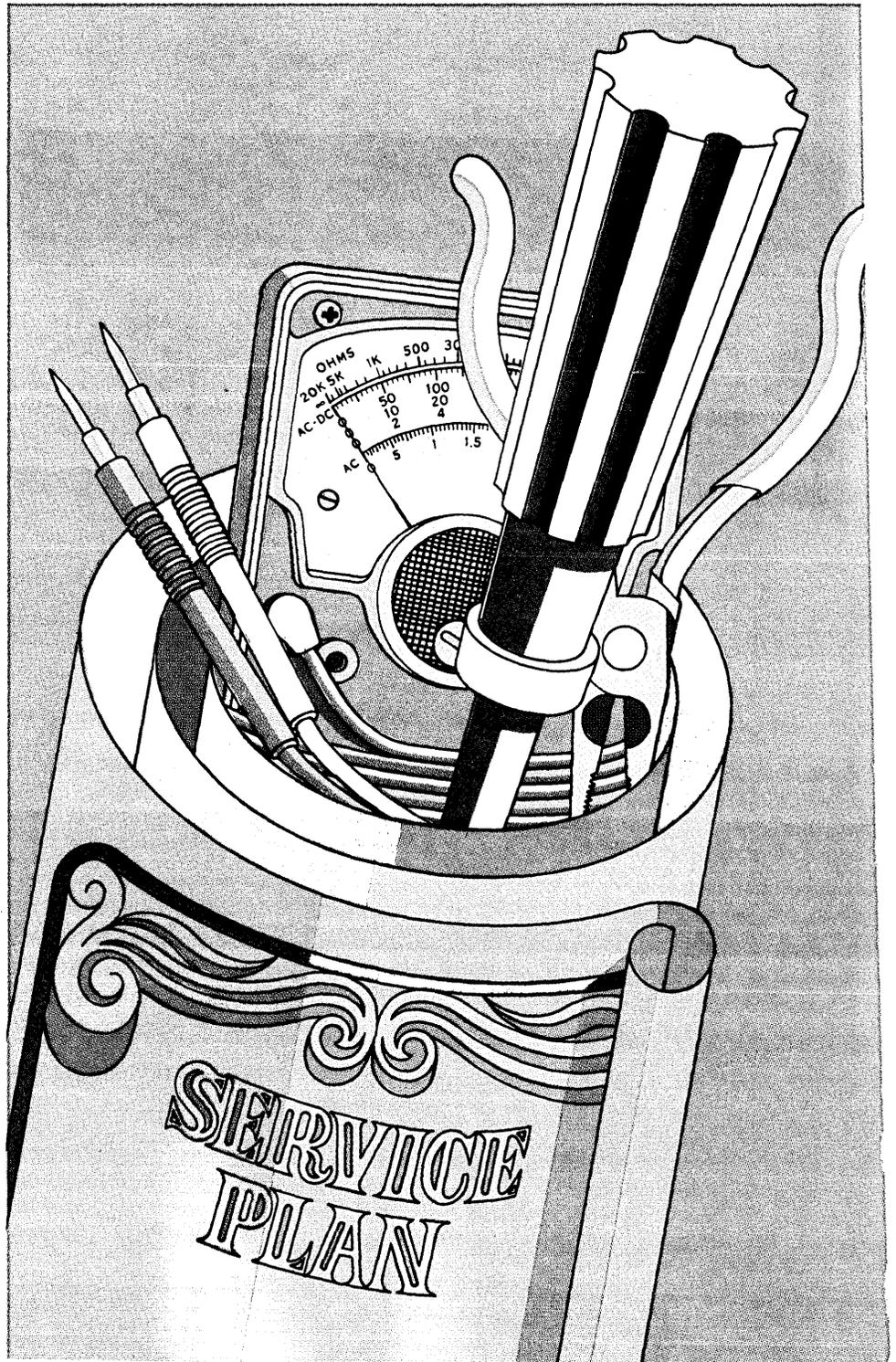
trol system— whatever you need.

Thanks to compatible software, our System 700 builds on the continuing success of our Series 16 minicomputers. And, thanks to the communications and control experience we've gained installing thousands of minicomputer systems, we'll keep your data coming and going, and your System 700 buzzing productively.

The Other Computer Company: **Honeywell**



**Our service
policy:
as much or
as little as you
need.**



At Teletype Corporation, we build different terminals because our customers have different terminal requirements.

And that's why we offer national product service for our equipment in a variety of different service plans.

For example, there's our "Scheduled Maintenance with Repair Service" plan. We'll set up a schedule at your convenience to inspect, clean, lubricate, adjust and replace worn parts. We'll also make as many unscheduled trips for repairs as necessary during regular working hours. And no matter what kind of grief or woe our factory-trained representatives run into, it won't cost you a cent more than the rate in the service agreement.

Another plan calls only for "Scheduled Maintenance" at a specified charge. The maintenance is the same as in the first plan, but if something should go haywire between scheduled calls, we bill you extra for the repair service.

Then there's our "Maintenance Only" plan. It offers full maintenance protection at a very low cost. But repair work and parts are extra.

Those are the three basic types of maintenance and repair services available. But our service offer doesn't end there. Because if none of these plans suits your needs, we have others.

Like our "On Call" plan. This means we don't give you any service—until you ask for it.

Like our "Installation Checkout" plan. This service primarily applies to new Teletype® equipment, but it also covers old units if you relocate them or change the operating parameters of your system.

And like our "Exchange Repair Service." We stock many reconditioned assemblies like circuit cards and punch blocks. So when one of yours goes wrong, you can trade it in on a fully-tested, warranted replacement. You save money because exchange parts cost less than new ones. And you save time since we usually ship what you need within 24 hours.

Overhauls and feature additions are other services available.

There's one more service plan we should mention. It's called "Yours." It covers exactly

what you want it to cover. Because we design it to meet your needs—and yours alone.

As you can see, we can offer you a lot of service or no service at all. And anything in between. Because the kind of service you need is the kind of service we offer.

It takes more than manufacturing facilities to build the machines Teletype Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.

That's why we invented a new name for who we are and what we make. The computer-cations people.



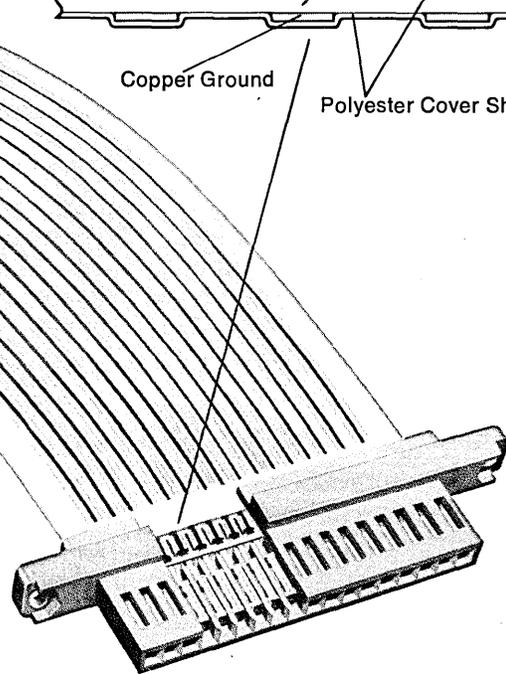
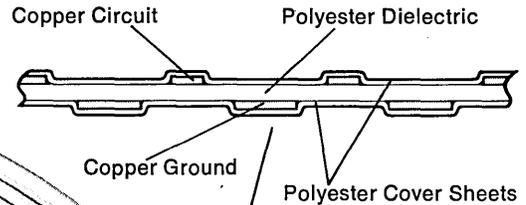
For more information about Teletype product service, write or call: Teletype Corporation, Dept. 81K, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-3920.

Teletype is a trademark registered in the United States Patent Office.

Finally...

there's a new and better way to transmit high-speed digital data.

AMP econo mation
COST SAVINGS BY DESIGN WORLDWIDE



Better than ribbon cable, twisted pairs, shielded and coaxial cable.

It's AMP-manufactured flat-conductor transmission cable assemblies.

With impedance and cross talk matched to user requirements. Closely controlled by our own design and flat-cable manufacturing process.

Which brings us to terminations. Connectors specially designed for flat-conductor transmission cable.

Result? Flat-conductor transmission cable assemblies, custom made in sizes up to 32 conductors, in lengths up to 50 continuous feet, with matched impedance from end to end—ready for installation.

That's it. The whole story except for some technical details on our flat-conductor transmission cable assemblies which we'll be happy to supply when you write:

**AMP Incorporated, Industrial Division,
Harrisburg, Pa. 17105.**

AMP INCORPORATED

Manufacturing and Direct Sales Facilities in: Australia, Canada, France, Great Britain, Holland, Italy, Japan, Mexico, Puerto Rico, Spain, Sweden, United States and West Germany.

The UCLA/Informatics Symposium was another soul-searcher, with some kind words about people being even more important than the machines

Effective vs. Efficient Computing

"I regard computers and the structures we build on them as much too important to leave to computer people."

Not a statement to warm the heart of a computer person, but it was addressed to computer people at a UCLA/Informatics symposium on Effective vs. Efficient Computing, by Terrance Hanold, president, The Pillsbury Co., Minneapolis. It was a soul-searching conference which posed the question: "Are you doing the right thing or just doing the thing right?" The answer which seemed to emerge was: "We're not doing the right thing right now but we're getting close."

Not everyone was this optimistic. Keynote Dr. Herbert R. J. Grosch amended "Grosch's third law"—things can get worse without limit—to make it, things will continue to get worse without limit. "We have our yachts, but where are the customers' yachts? Where are society's yachts?" demanded the voluble Dr. Grosch. He accused computer people of "using our racket for our own benefit, for fun, and making our racket so esoteric we can call it a profession." Regarding professionalism, he said, "we don't qualify in ethics. We don't qualify as to certification, but we do qualify in not taking directions from anybody."

"We should be looking for ways to do payrolls more cheaply, to handle magazine subscriptions more quickly. We should be trading skills and attitudes. But"—and he pointed to the disposition of the first two Star 100s, noting it can handle 100 million multiplications per second—"the first, unfortunately, is going to Sid Fernbach at Livermore and the second to only a slightly less dubious user, General Motors Research, which will use it to develop curlier and more expensive fenders."

Despite his comment that they shouldn't have ultimate responsibility for computers and the structures built on them, Hanold expressed a little

more faith in computer people than did Dr. Grosch. In the drawing in of all of Pillsbury's operations to a centralized information system, he noted, a computer professional was assigned to every division. Pillsbury's system was not an overnight success. "We took off in 1959 in an evangelistic mode and we made mistakes," said Hanold. "But we have learned to limit our objectives to those that the immediately emerging state of the art can support." Today Pillsbury has a smoothly running information system which is almost totally centralized. Those operations not directly served by the central system have systems capable of transmission to it.

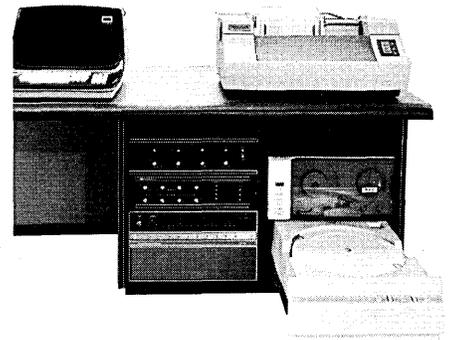
Another speaker took a different view on centralization. "Small decentralized systems produce better results than large centralized systems in a very large number of cases," said consultant Jerry Wiener of Armonk. "The efficiency of large systems is usually gained by forcing the varying needs of the users to conform to the rigid format of the large efficient system."

One of the stated purposes of the symposium was to "shake the tree of present data processing utilization to expose the expensive bad apples." That Wiener believes in the existence of these apples was evident. He started his presentation by saying "computing expands so as to fill the time available," and ended it by asking, "why is there so little budget for intelligence and so much for capital equipment?"

Ephraim R. McLean, assistant professor of information systems, UCLA, evidently believes in rotten apples too. He offered the following as "an all-too-true life cycle of a typical edp system: unwarranted enthusiasm, uncritical acceptance, growing concern, unmitigated disaster, search for the guilty, punish the innocent, and promote the uninvolved."

McLean shares Wiener's concern for intelligence. He listed people as the

If you'd like a disk system, but just don't have the space . . . let Xebec get it together for you.



We sell more computer peripherals than anyone except the mainframe manufacturer himself. That's because we put them together to suit each customer's special needs.

Even if you're short on space, we can put together a top-loading, low-profile disk system that's ONLY 8-3/4" high, meets your requirements, and interfaces with the mini-computer you now have.

We can get you 5 million 8-bit byte storage per drive (up to 4 drives can be daisy-chained to one controller). Our disk drive features head positioning using a voice coil and optical positioning techniques.

In fact, we can even put together your extensive supporting software.

So, if you can't get your disk system together in the space you have, fill out and return the coupon below. We'll do it for you.

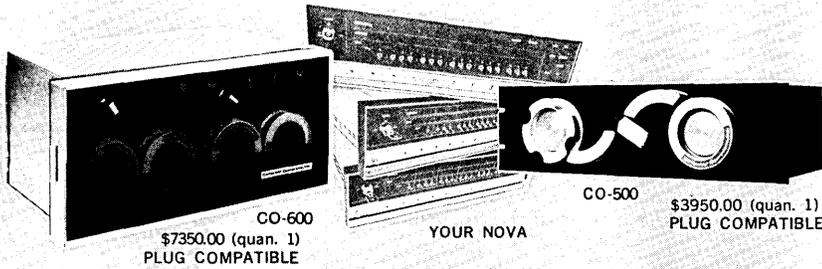
- Please rush me more information on your XMD 7224.
- Have a salesman stop in to discuss my special requirements.
- My application is _____
What can you do to help me?

Name _____
Position _____
Company _____
Address _____
City _____ State _____ Zip _____

xebec

Xebec Systems—The Company That Puts It All Together. 566 San Xavier Avenue, Sunnyvale, CA 94086.

CIRCLE 101 ON READER CARD



**PLUG A LINC TAPE INTO YOUR NOVA.
HERE'S WHAT YOU GET**

- Most Reliable Tape System in the Industry
- 100,000 Tape Passes Guaranteed
- 8,400 Bytes/Second Transfer Rate
- Block Addressible Disc Format for True Random Access
- 204,800 Bytes/Reel in Blocks of 512

PLUS

A complete operating system to expedite program preparation through a powerful text editor, assembler, two loaders, and 7 file utilities. Completely eliminates paper tape. All files, source, object, and image, are stored on LINC tape. Up to five times improvement in throughput over high speed paper tape.

Send for Reference Manuals.

Computer Operations, Inc.

10774 Tucker St. • Beltsville, Md. 20705 • 301-937-5377

CIRCLE 17 ON READER CARD

**If you're
adding computer power
you'll need
added air conditioning too.**

No matter how your computer room is air conditioned now, a Blazer Computemp packaged system—designed specifically for data processing rooms—is the best means of providing the additional cooling power your new computer will require. Computemp units are available in modular sizes—3, 5, 8, 10, 15 or 20 tons—air cooled, water cooled, glycol cooled or chilled water. They can be added to your present system—whether you have central air conditioning or packaged units—to match whatever load is required.

Computemp units are designed to provide the total reliability and tight control of both temperature and humidity demanded in computer rooms. They are easy to install, easy to maintain.

If you've ordered a new central processor—addition or replacement—let a Blazer Computemp computer room air conditioning specialist help you plan now—before you and your computers begin to feel the heat. Just fill out and return the coupon below.

Have a Blazer Computemp representative call. Send literature only.

CPU on order _____ Delivery Date _____

Name _____ Title _____

Firm _____ Phone _____

Address _____

City _____ State _____ Zip _____

If you haven't a computer on order but are interested in receiving Computemp literature, please circle No. 85 on Readers' Information Card.

BLAZER 410 Paterson Plank Rd., E. Rutherford, N.J. 07073. (201) 933-1111
Cooperation

CIRCLE 85 ON READER CARD

top consideration in improving resource utilization. McLean's talk was titled, "Assessing Returns From the Data Processing Investment," but he said it should have been called, "The Type III Error." This is the error which follows Type I, rejecting a true hypothesis, and Type II, accepting a false hypothesis. Type III, which McLean feels is a greater error source, is solving the wrong problem. This can happen, he says, when an edp system is designed for the dp department and not for the user. "We tailor the user to the system instead of the system to the user." A suggested reason for this was poor communication and a tendency on the part of some users to say "I can't get involved; I'm busy with my own job."

"The corporate executive today," said Frank Carlin, director, financial operations, Lockheed California Co., "often has a very imperfect line of communication with the data processing organization. The negative information flows upwards in the organization more easily than the positive."

Carlin's topic was, "Getting the Right Results From Your DP Investment: the Corporate View." A conclusion: "We have given too much emphasis to machine optimization and to the processing of large quantities of data and voluminous reports. We have given too little emphasis to manager optimization."

He suggested opportunities which currently exist for improving the corporate-computing interface. One was "the current trend of bringing the corporate manager and his staff into direct contact with the computer through the use of various on-line terminals."

Another, which he says has been approached so far "only on a very preliminary and superficial basis," is the use of the computer for industrial and managerial training purposes. "The computer provides teaching capabilities and potential which are largely untapped in the corporate environment. The use of the computer for management, technical and professional training at all levels should increase exponentially in this decade."

Carlin sees help coming from the manufacturers. "They are going to upgrade their marketing strategy from selling hardware and software to selling service."

He believes there has been improvement along the way. "The computing function within the large corporation no longer has the pioneer characteristics of 10 years ago. Both the function and our attitude towards the function have matured." But he

wants more. "In view of this maturity, another area requiring more sophistication is computer cost analysis and cost justification."

Top management, said Carlin, "has frequently been too easily convinced that expensive upgrading of equipment is necessary, providing the corporation with more capability for more dollars. There should have been greater insistence on more capability for fewer dollars. In some cases, the economic picture has probably called for less capability for disproportionately fewer dollars."

A need for improved cost analysis also was cited by McLean, who said, "We are a little like Oscar Wilde's cynic who knows the price of everything and the value of nothing."

The "unwarranted enthusiasm" part of McLean's life cycle was touched on by Carlin. "The last few years have witnessed much disillusionment with the utilization of the computer in improving clerical and other operational systems and with related quantitative approaches to management theory." This disillusionment, he said, "is partly attributable to the overly optimistic and enthusiastic reception given to computers and quantitative techniques in their first decade."

But this is a new decade and "hopefully we are entering a period of reasonable and balanced attitudes toward computer management and innovation where investments can be made that will have a substantial and tangible pay-off appreciated by all levels of the organization." This, presumably, could be the period in which computer people wind up doing the right thing and not just doing the thing right.

Some speakers offered suggestions toward this end. Henry C. Lucas, Jr., assistant professor of computer and information systems, Graduate School of Business, Stanford, advocates more attention to the physical user interface in the design of information systems. Lack of sufficient attention to date, he said, has resulted in computer systems being associated with rigidity and complicated input-output procedures. He feels this could be partially alleviated by "using fully explanatory texts, crt's, and courteous messages to help educate rather than alienate the user."

The impact of a system on the organization, said Lucas, "is something which should be planned in advance rather than discussed after the impact has already occurred."

Peter F. Gustafson, supervisor, computer software planning and control, Ford Motor Co., went beyond the "doing the right thing" goal to concern himself with "doing the right thing right." His topic was "Evaluation of Hardware, Software and Sources of Service." He defined services as refer-

ring to people engaged in supporting all aspects of computing, including hardware, software, administration, systems, programming, operations, and maintenance. And, he said, of the three general categories of computing resources, "services is typically the most expensive in today's environment."

Gustafson calls his approach to evaluation the functional approach. "The key ingredient in all cases is the functional requirement of the applications, whether they be implemented by hardware, software, or through the use of services. It is in terms of the cost of these functional requirements that the evaluation criteria must be specified in order to select the most effective alternative." He defined functional requirements as relating to the applications rather than to capabilities of the resources. Use of the functional approach in the evaluation of computing resources was called by Gustafson "the only practical means for satisfying the goal of doing the right thing right."

And then there were those who had some ideas on where we should go from here. Robert L. Patrick, a computer specialist from Northridge, Calif., suggested these "musts": "establish a glossary of terms and keep it current; evolve a body of preferred practice from the best that is now done; separate out systems in which the public has at least a third-party interest; establish guidelines for the development of such systems; prepare to certify such systems prior to use; plan to recertify such systems following change; and hope that private systems adopt the best of these guidelines for their internal use."

Guy Dobbs, vice president, technical development, Xerox Computer Services, who chaired the symposium's final session, and Walter Carlson, ACM president, were concerned with the general public's view of the computer and computer people. Both had participated in a National Academy of Science study on the subject.

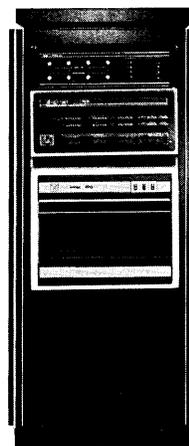
Said Dobbs, "The public's view of the computer industry is not very flattering. There is a public perception of failure to deliver what was promised." He called for more standards and/or criteria. "We must not be guilty of the ultimate sin, the sin of intellectual arrogance. We must know and understand the user's problem better than he does. We must have a sense of our own fallibility, a sense of humility."

Carlson said computer people, to combat "the blame-the-computer syndrome," should "start talking about what they do, what the computer does, instead of how they do it."

So maybe things won't continue to get worse without limit.

—Edith Myers

Let Xebec get your disk system together . . . nearly everybody else does.



NO matter what mini-computer you use Xebec can put together a disk system that will interface to give you continuous transfer of multiple sectors, overlapping seek and user error checking. That's why we sell more computer peripherals than anyone except the mainframe manufacturer himself.

We can get you from 1.5 million bytes to 20 million bytes of storage at densities of 1025 BPI or 2200 BPI in one removable or one fixed and removable cartridge. We can get you disks in one removable or one fixed and removable cartridge. In fact, we can even put together your extensive supporting software.

So, if you need a disk system, but just haven't gotten it together, fill out and return the coupon below. We'll put it together for you.

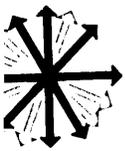
- Please send me more information on your XMD series.
 - Have a salesman stop in to see me.
 - My application is _____.
- What can you do to help me?

Name _____
Position _____
Company _____
Address _____
City _____ State _____ Zip _____



Xebec Systems. The Company That Puts It All Together. 566 San Xavier Avenue, Sunnyvale, CA 94086.

CIRCLE 88 ON READER CARD



News in Perspective

Some like it, some don't. But most of those who are potential users of IBM's Information Management System Version 2 are waiting around for the big computer company's next move. Opinions of users, competitors, and the IBM spokesman are reviewed on page 79 ...

Mainframer management met their stockholders this spring, as reported on page 87. It was the first annual meeting for IBM's Learson as the top man, and for RCA's Robert Sarnoff, it was the last as the top man of a general-purpose computer manufacturer. ...

Computer science education lost a great leader in the death this spring of Prof. George E. Forsythe, page 94. His colleagues at Stanford tell why ...

Geoffrey Cross is returning to his native England from Univac for the key post of managing director of ICL, the company that seeks to unseat IBM from its leadership in the U.K. Page 96 ...

How far along is the American Stock Exchange in its much-ballyhooed trading floor automation program? There are a lot of hurdles ahead, page 98 ...

Electronic Data Systems and Ma Bell have trouble interpreting the FCC's recent ruling on who provides date communications. Page 100 ...

Research & Development

Rand Corp. Group Finds Home at USC

That strangling sound being heard in Santa Monica these days comes out of Rand Corp., and it may signal the beginning of the death rattle of computer science research at that fabled government brain farm and others like it.

In 1965 a federal ceiling was placed on the amounts of money that can be spent at such organizations, labeled officially "Federal Contract Research Centers." Late last fall, a House Appropriations Committee slashed funding for Project Rand — an Air Force project that was the heart of Rand activities — half way through the budget year. (See Dec. 15, 1971, p. 7.)

In effect the ceiling is being slowly but steadily lowered at FCRCs. As funding drops, the pressure increases to produce important, valuable research, and it must have military relevance. Added to that is the pressure to spread the federal favors. The R&D spending watchword in Washington: If the work can be done at a university or in private industry, so be it.

Famous for its far-sightedness, its ability to plan, Rand was not exactly caught by surprise. After the ceilings were announced, Rand took a look at alternatives that might resolve the crunch. One of the alternatives: institutes, perhaps affiliated with universities, that could provide a home for research outside the military and funding limits being imposed by a hostile Congress. (Congress has not gotten any friendlier since the leak of the Pentagon papers by a former Rand researcher.)

Rand never got around to pursuing the institute idea ... until late in April, and then it did so with a gun at its head.

One of the people who had investigated the institute idea earlier for Rand was Keith Uncapher, associate head of the Information Sciences and Mathematics Dept. As the ceiling descended, Uncapher got restive. As head of the Computer Systems Group of the Information Sciences and Mathematics Dept. at Rand, he watched his group begin to disintegrate. "We had a crew with demonstrated ability, turning out exciting proposals — work in the public interest that got gold stars from in-

dependent reviewers. But they couldn't get the work because of the ceiling. That happened three times. And that can be discouraging. Key people were looking for jobs."

New home at USC

So Uncapher — a dynamic and an articulate man who holds the prestigious title of AFIPS president — went looking for a new home for his group. It looks as if he's found one at the Univ. of Southern California, which welcomed him with open arms.



Keith Uncapher, left, and his new boss Zohrab Kaprielian of USC.

Starting July 1, Uncapher becomes the director of the newly formed USC Information Sciences Institute, a computer sciences research and development arm of the famous football factory near the heart of Los Angeles.

It appears that Rand president Donald B. Rice became aware of Uncapher's shopping expedition, because he called up Keith and asked him not to plan the new institute on Rand time. Says Keith, "I agreed. And we agreed that the four principal people involved would leave as quickly as possible." By May 8 they were on the USC payroll.

There's some confusion about what happens next. The understanding at Rand is that "a dozen Rand professionals together with some laboratory support personnel will leave to form the nucleus of the institute staff, beginning July 1, 1972." What they will do there is not clear, because Uncapher insists that there is no instant support, no transfer of government funds involved. But he admits that the institute has already submitted several "unsolicited

proposals," one of them to DOD, two involving hardware.

At Rand, we got the definite impression that Uncapher was taking with him \$750,000 worth of work, plus equipment. The work included microprogrammed computer exploitation, interactive graphics, the security part of a computer privacy and security project, and computer-communications networks. The equipment would include a PDP-10 and an MLP 900 (see April, '72, p. 155), and perhaps, some interactive graphics terminals.

The solution to the apparently disparate views is, undoubtedly, that neither Uncapher or his friends in federal contracting offices can promise that he will get the chance to continue at USC what he started at Rand. But several people at Rand are, according to Uncapher, "committed to come to USC." And if the agencies involved — ARPA is one of them — want the work to be continued, they know where it has to be continued.

Crippling move?

Uncapher has promised to confine his recruiting for the Institute to his former group. If someone outside his group contacts him he says he'll notify that person's supervisor. That holds for the calendar year.

If, indeed, 12 professionals leave Rand to join their former boss, it would seem to rather severely cripple the Computer Systems Group, which numbered 24 before the defection of the advance crew. The Rand FCRC ceiling will evidently not be affected if \$750,000 in current work follows Uncapher. And Rand hopes that new R&D contracts it receives may be more attractive to the group than what they might find to do at USC.

That may be difficult. The impression of Uncapher is that he is a popular leader of loyal workers. He is, according to his new boss at USC, Dr. Zohrab A. Kaprielian, "a leader." According to others, Uncapher is also very good at winning contracts in Washington. He was the "program coordinator" for the Information Sciences and Math Dept., which drags down about \$1 million a year out of ARPA alone. In other words, Uncapher was the department's marketing man, and evidently was a good one.

And at USC he finds what will undoubtedly be a more hospitable atmosphere for R&D. According to Dr. Kaprielian, vp of administration and research, the federal government spent more than \$32 million at USC last year.

That, he points out, is more than Caltech and UCLA combined, and — more significantly — more than at Rand itself. There's no ceiling at USC. And, says Dr. K., a short, swarthy man who exudes confidence and quiet aggressiveness, "defense work doesn't upset me."

Research targets

Uncapher, who has declined an automatic second term in his AFIPS post, hopes for a "reasonable degree of focus" to permit the development of "some unique research facility." Early targets will be in medicine and biosciences (augmenting other USC activities at Los Angeles County Hospital and at a new biosciences institute), man/machine communications, and in applied artificial intelligence.

He brings to the USC Institute not only his contacts, his crew, and his leadership credentials, but a background of over 20 years at the oldest and most prestigious of the nation's think tanks. Freed from the ceiling, he can be expected to build at USC a happy home for federal R&D funds.

The future of Rand and other FCRCs, meanwhile, appears a lot less bright. The ceiling is encouraging defections. Uncapher's is the second at Rand in recent months. Only last spring, 37 of the 45-man Physics Dept. left to set itself up as an independent company.

As the FCRC fades in the west, a bright new star appears in the form of the university-affiliated institute, the latest pal of the federal research establishment.

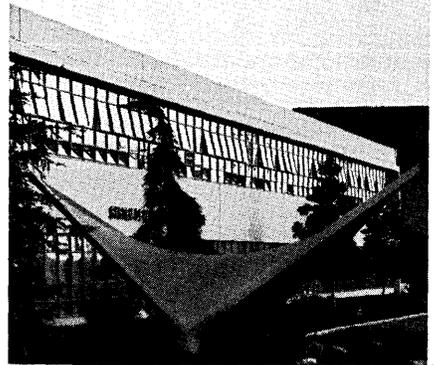
—Robert B. Forest

"Diaper" Makes Way for Profit Image

One of the last vestiges of System Development Corp.'s think-tank days went when the blue hyperbolic paraboloid, fondly known as the blue diaper or the flying diaper, which had graced the front of the company's Santa Monica, Calif., headquarters building since December 1957, was torn down to permit remodeling of the building's facade and main lobby "to more adequately reflect a new image of a for-profit company."

The symbol, which has its roots in classical mathematics and more recently has been associated with the game theory, was adopted as the official company logotype and began appearing on letterheads and documents in January 1958. Until a new logo is

found, the company will use block initials against a black background. But the diaper won't disappear entirely. SDC, which claims to have "more old



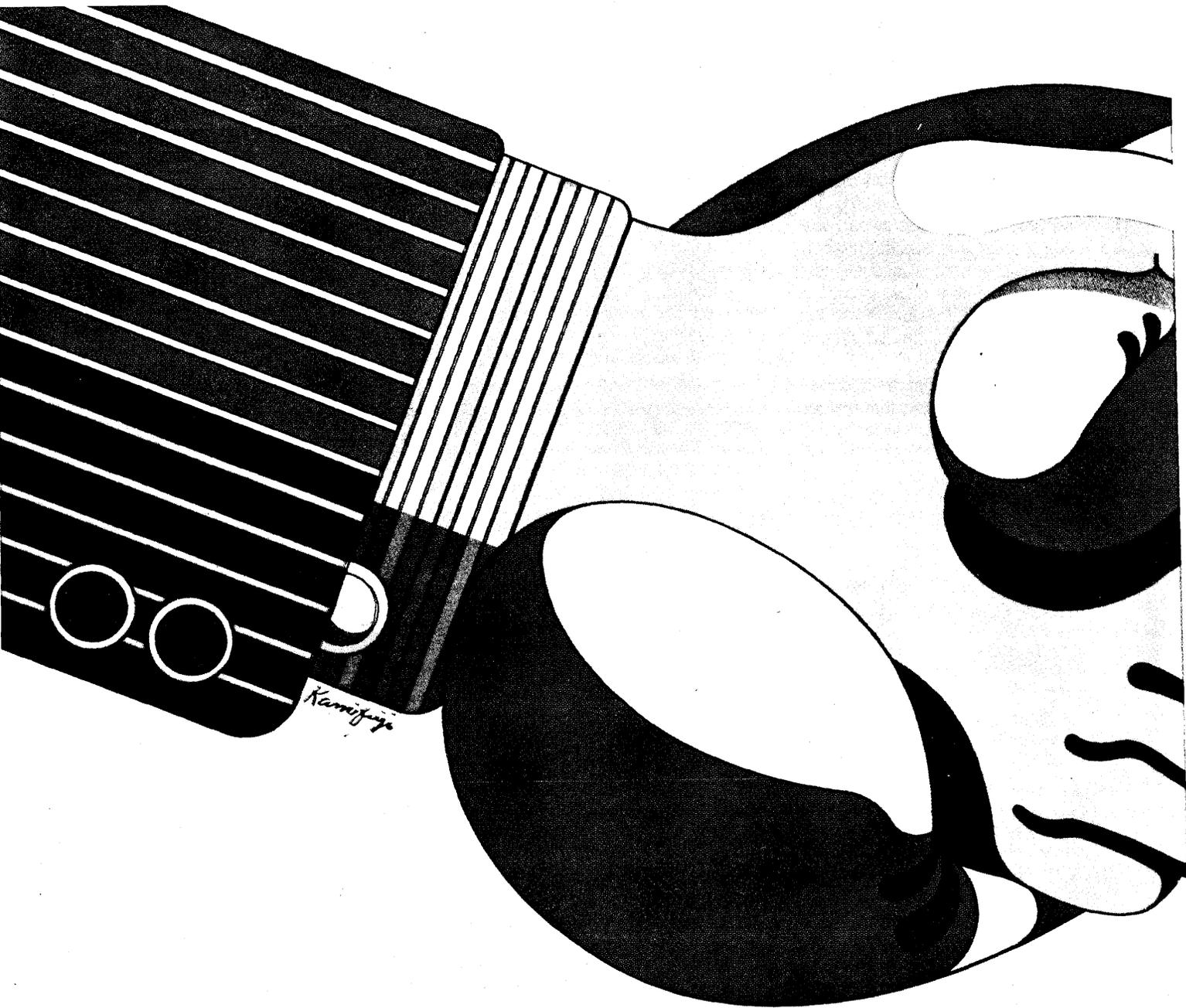
timers around than most firms," will retain the symbol for the pins it awards to employees with more than five years of service.

Software

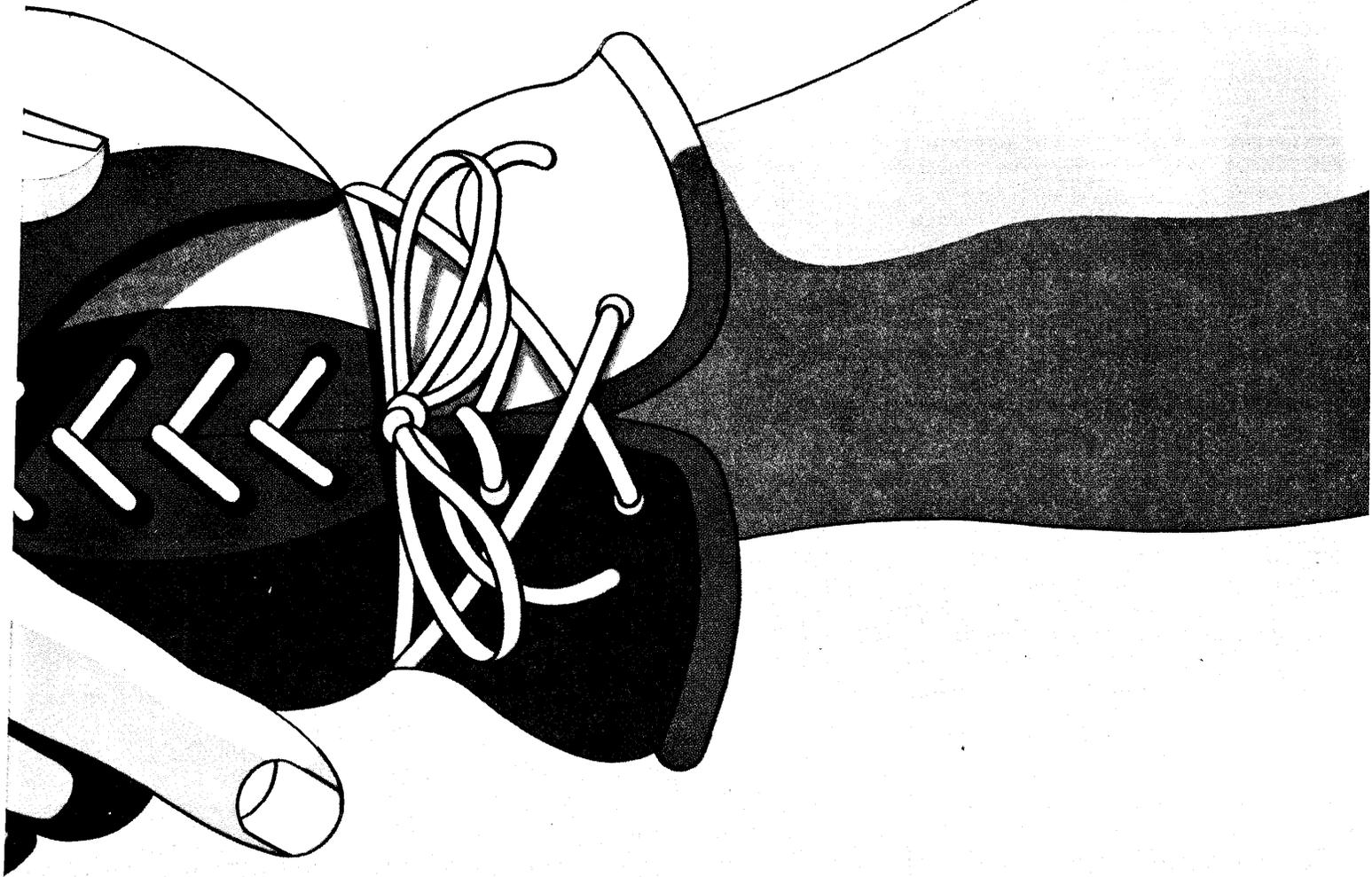
IMS: New Releases Are "Desirable"

The great debate over data base management systems is growing, with IBM's Information Management System Version 2 (IMS) continuing to occupy a position akin to that of a boat sailing in the eye of a hurricane. As IBM intensifies its IMS marketing effort and as more and more customers show interest in IMS, the data base management system is surrounded by an ongoing exchange involving users, user groups, and standards groups.

While many users have found IMS to be well suited to their needs, and while others have gone to competitive data base management systems, the main body of potential users — and of current IMS users — appears to be sitting on the edge of its proverbial chair, wait-



**Why are so many of our competitors
also our customers?**



We make terminals for the data processing and communications industries.

So do a lot of other manufacturers who specialize in computer and communications equipment. (Over 400—according to latest industry figures.)

The irony of this is that a lot of our competitors use the Teletype® teleprinter as the backbone of many of their systems.

Which says a lot about Teletype equipment. Because who could be a more critical, discerning judge than your competition?

Why do they specify Teletype machines for sub-components? For three good reasons.

Reliability. Nobody has moved more information before or since the information explosion—with greater reliability.

Flexibility. We build our terminals to meet your particular needs. That's why we offer you a choice in arrangements, features, configurations and speed. Interface capabilities? Teletype equipment is compatible with practically any computer-based communications system.

Economy. From initial cost to operation to maintenance, nobody can deliver higher performance at a lower cost. Nobody.

Tough, demanding criteria. But what else would you expect from your competition?

This unusual situation is a good thing for everyone in the data processing industry.

But you benefit most. Because the terminal equipment you buy meets exacting standards for reliability, flexibility and economy.

We know. Because we set those standards.

It takes more than manufacturing facilities to build the machines Teletype Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.

That's why we invented a new name for who we are and what we make. The computer-communications people.

For more information about any Teletype product, write or call TERMINAL CENTRAL: Teletype Corporation, Dept. 81E, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-2500



Teletype is a trademark registered in the United States Patent Office.

ing for IBM's moves.

Given IBM's self-appointed role of sphinx as far as future product announcements are concerned, speculation about precisely how IBM will enhance IMS runs the gamut from improved front-end capability to a whole new approach to data base management systems. However, some of IBM's moves are becoming apparent.

"We recognize that many large customers have a big stake in IMS," says R. J. Marini, IBM's product administrator for IMS in the Data Processing Div. "The IBM company has identified IMS as a primary data base product and we have a major stake in it, too." Marini added that IBM has placed an intensive marketing push behind IMS and, further, that the product has been selling well.

Just how well is well? Marini declined to say, but there are more than 80 IMS users in GUIDE and SHARE, and knowledgeable observers estimate that there are more than 200 IMS 2 users and, if IMS 1 is included, perhaps about 300 users. Virtually all of IBM's current sales are of IMS 2.

Education to be improved

Many users have been vocal about what they regard as inadequate IMS education programs, and Marini indicated that IBM will be making improvements. "The curriculum deserves expansion," he said. "And we're currently addressing ourselves to that requirement."

Many IMS users have found to their chagrin that their IMS systems use up much more core and central processor time than they had anticipated. For many, running out of core has become a way of life with IMS. This experience, however, appears to be occurring less frequently as users gain more experience with IMS, which they in turn share with others through user groups.

"When viewed from the conventional standpoint," says Marini, "the overhead may appear to be on the high side. The first program may be high, but later there's a tremendous payout, particularly where both short- and long-term planning are involved." One independent specialist in IMS, Paul J. Crowley, vice president of operations at Keane Associates in Wellesley Hills, Mass., says users have learned that the design stages of IMS are particularly crucial. He feels that many early users of IMS jumped into the program too quickly

without carefully weighing how it would be used.

"After we went through the implementation stage, we realized just how important the design stage was," says Crowley. "We found that many users really weren't sure why they were going into IMS." There is a growing feeling in the industry that many computer users are considering data base management systems who only need a file management system.

Keane Associates and other software consulting firms have found that IMS and other data base management systems that use a procedural type language and operate on IBM equipment — particularly Cincom Systems' TOTAL and MRI Systems Corp.'s System 2000 — are becoming a windfall in the way of new business. There is even something of a software peripherals market developing around some data base management systems. For instance, the Cullinane Corp. of Boston has been successfully marketing a report generator for both IMS and TOTAL.

Studied 20 systems

One potential user who has recently evaluated data base management systems is Bernard M. Slotnick, chief, Administrative/Financial Systems Support Group at the Northrop Corp. in Hawthorne, Calif. Slotnick stresses the importance of users doing a feasibility study before buying any data base management system. When Slotnick first examined data base management systems, he started with some 20 systems and then eliminated most of those until the final evaluation consisted of four systems. "It's particularly important that you define your scope in the evaluation stage," says Slotnick. "If the parameters are carefully set down first and evaluated properly, then you seldom get into much trouble."

One who is pleased with IMS is Charles R. Perkett, director of computer systems and services at the Norton Co. in Worcester, Mass. Perkett said he was aware that hardware costs related to IMS would be high when his company decided to go with IMS. But he feels its offered other advantages and, in addition, he noted that the long-term trend of hardware costs is down.

"We felt IMS was the best long-run decision for us," said Perkett. "For one thing, we're looking for improvements in IMS in the future." He said that of his

firm's 20 data centers, just five are in North America. The ability of IBM to provide worldwide support was an important factor in picking IMS. Norton did its own planning and evaluation. The firm has designated one "key man" called the data base administrator through whom all the separate data centers must go when using IMS.

New releases anticipated

Virtually everyone is looking for IBM to do something additional with IMS in the data communications-teleprocessing area. The general feeling is that the teleprocessing portion uses up too much memory and that some new IBM releases will be out before long to alleviate this problem. IBM's Marini concedes that his company and many users feel it is "desirable" to do something about it, but he stops short of saying when, whether, or what. Many think IBM's recently announced 3705 programmable communications controller will be the key product here.

One continuing subject of debate is IBM's stance vis-a-vis the CODASYL Data Base Task Group (DBTG), which, among other things, has been urging all vendors, including IBM, to introduce a new data manipulation language and a single data definition language. While IBM has generally cooperated with the DBTG, the firm has not implemented all key elements of the COBOL standards group quickly, and at least some members of the CODASYL group believe IBM is seeking to defeat the recommendations of the DBTG. Some even speculate that IBM is preparing a dramatic new data base management system announcement that would involve more memory at cheaper prices — which could make the whole CODASYL debate academic. At this point, however, most observers still chalk up this possibility as pure speculation.

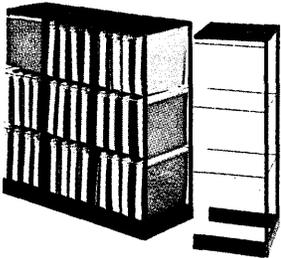
TOTAL takes off

Other data base management systems are selling well, too. David L. Andrews, New York-New England area manager of Cincom Systems, says sales of his firm's TOTAL began to "take off" in mid-1971, and the Cincinnati-based company now has more than 225 installations. Cincom's associated data communications system, ENVIRON 1, which they began marketing in April, is being installed at the rate of one a week.

"One of the keys is that TOTAL is easy to use," says Andrews. "It can be installed in five minutes, and all the customer needs is a two-day class to get

Wilson Jones gives
you low cost printout filing
that doubles as work space.

Introducing Data Center II



New New Data Center II comes in two convenient sizes. The larger unit holds up to 37,000 printouts in 6 sq. ft. Includes suspension bars and slide channels for 36 nylon post binders.

Two compact units. No. 24-49, \$195.00 per unit.*

Handsome woodgrain work top. The smaller unit holds up to 24,600 printouts in 4½ sq. ft. Fully equipped for 24 binders. No. 24-33, \$130.00 per unit.*

Unique 3-way retrieval. As your needs expand, Data Center II can expand with them. Simply add on the add-on. Parallel or at right angles.

Expansion modules for added printout volume. Each unit adds 12,300 printouts. No. 24-17, \$70.00 per unit.*

To find out how to turn filing space into work space, just fill in the coupon.

*Suggested retail price.



Wilson Jones

A Division of Swingline
Dept. D-6, 6148 Touhy Ave.,
Chicago, Ill. 60648

Please send me further information on
Wilson Jones Data Center II.

Name _____

Company _____

Address _____

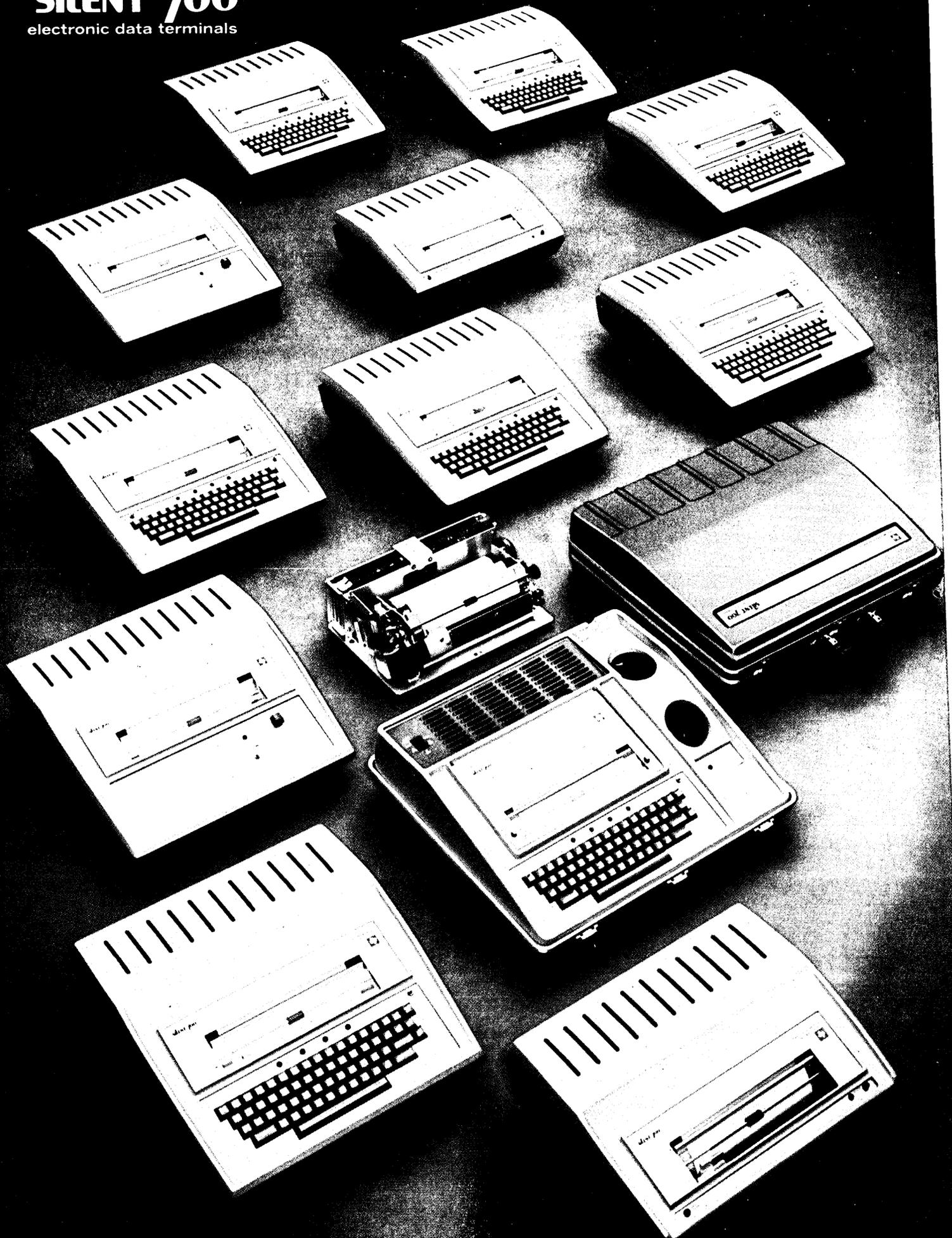
City _____

State _____ Zip _____

CIRCLE 5 ON READER CARD

Silent 700

electronic data terminals



30 characters-per-second "Silent 700" terminals

faster, quieter and more reliable than conventional teletypewriters ...and they reduce your communications line costs.

*Silent 700** data terminals print at speeds up to three times that of conventional terminals. In typical time-sharing applications, this means less computer connect time and reduced direct distance dial charges compared to 10 characters-per-second terminals.

The reliability of *Silent 700* terminals means further improvements in the efficiency of your system. No preventive maintenance is required. Under normal usage, they will operate

a year with only one or two remedial service calls. And they have a useful life expectancy several times that of mechanical teletypewriters.

Silent 700 terminals operate as their name implies. They are virtually silent . . . quiet enough to be used in business offices, banks and hospitals without distraction.

Call the nearest TI office listed below to find out which of 14 *Silent 700* terminals is designed for your job.

Models are available in keyboard teleprinters, hard copy printers, and portable timesharing terminals, with a choice of standard interfaces, options and built-in data sets to tailor a *Silent 700* to your requirement.

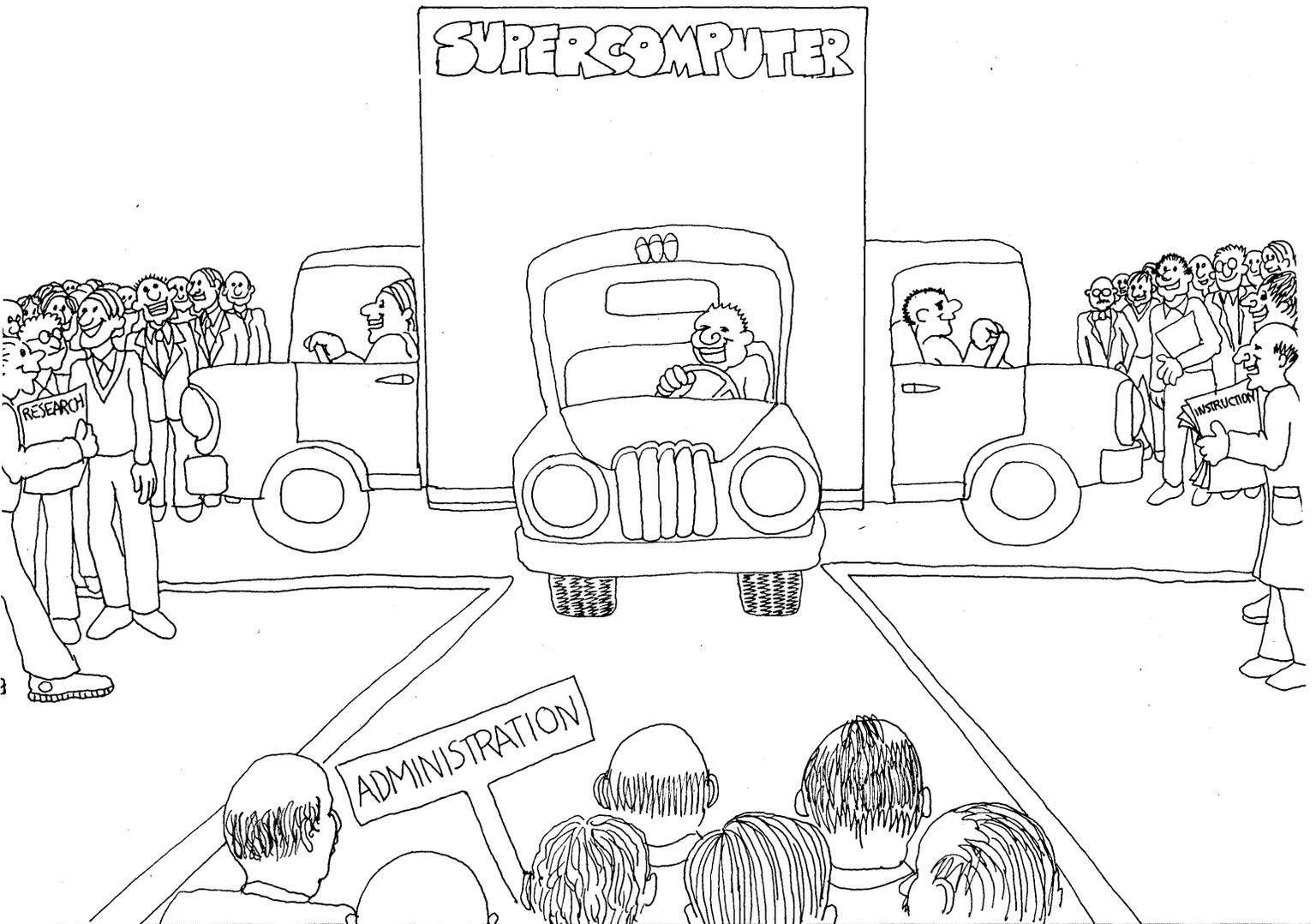
All are backed by an established leader in industrial electronics . . . Texas Instruments Incorporated, P.O. Box 1444, Houston, Texas 77001. Telephone (713) 494-5115, ext. 2126.



*Trademark of Texas Instruments Incorporated

Springfield, N.J. (201) 467-2670 Arlington, Va. (703) 525-1444 Waltham, Mass. (617) 890-7400 Ft. Washington, Pa. (215) 643-6450 Atlanta, Georgia (404) 237-8666
 Orlando, Fla. (305) 644-3535 Arlington Heights, Ill. (312) 593-2340 Minneapolis, Minnesota (612) 831-5094 Southfield, Mich. (313) 352-5720 Cleveland, Ohio (216) 464-1192 St. Louis, Mo. (314) 993-4546 Denver, Colo. (303) 758-5536 Orange, Calif. (714) 547-9221 Inglewood, Calif. (213) 645-1032 Sunnyvale, Calif. (408) 732-1840 Dallas, Tex. (214) 238-3881 Bedford, England 58701 Clamart, France 6450707 Frankfurt, Germany 726441 Bad Godesberg, Germany 65534

TEXAS INSTRUMENTS
INCORPORATED



Supercomputer can go in three directions at once.

Some computers do a great job on administrative work. Others are just fine for instruction. Still others come into their own on research.

But one computer can do all three at once. In a batch mode. Timesharing. And real time. All at the same time.

Supercomputer.

Our DECsystem-10.

Supercomputer has all the power and flexibility you need to keep everybody happy.

And everybody gets their favorite languages: Interactive COBOL. FORTRAN IV. Extended BASIC. ALGOL. TECO. AID. SCHOLAR/TEACH. You name it.

A lot of schools are looking to replace two or three existing systems with a DECsystem-10. But you should take a look at one even if you don't have that many.

Because any way you slice it—

lease or buy—DECsystem-10 costs half as much as equivalent systems.

Get the literature that describes DECsystem-10 and some of the 60-plus schools that have one. It reads like a Who's Who. Write Digital Equipment Corporation, 146 Main Street, Maynard, Massachusetts 01754. (617) 897-5111.

digital

CIRCLE 32 ON READER CARD

the system going." In addition, TOTAL uses low amounts of memory and central processor time, and this has attracted many users, Andrews said. On the other hand, many feel that TOTAL is now as comprehensive a system as IMS.

One Blue Cross installation picked TOTAL over IMS for several reasons, including ease of use, fast terminal response time, and substantial savings in equipment cost. However, another Blue Cross installation picked IMS largely because the customer wanted the support that IBM can offer.

"With well over 200 systems out there, we feel we don't have to prove TOTAL anymore," says another Cincom executive. "We have 22 out of the top 50 Fortune companies as customers. We're not interested in benchmarking. We feel users don't need to spend the money benchmarking a proven product."

One company that wants users to benchmark its systems against IMS is MRI Systems Corp. of Austin, Texas, which has more than 50 installations of its System 2000 data base management system. "One of our major jobs is to get users to benchmark IMS against System 2000 in some kind of benchmark application," says Kent A. Ochel, staff specialist at MRI.

MRI stresses simplicity, and, in addition, users are able to access data directly anywhere in the hierarchial system at any time — a feature that cuts down on memory and cpu overhead. In effect, Ochel sees IBM serving somewhat in its classical role as missionary in the data base management system area. "IMS seems to be catching on," says Ochel. "And that means there's a windfall for us, because many users will look at System 2000, too."

—W. David Gardner

Bromberg Exits Standards Scene

Standards efforts veteran Howard Bromberg resigned last month from the chairmanship of the ANS X3.54 COBOL Standards Committee with a plea for broader involvement in standardization activities by both manufacturers and users and a recommendation that full-time professionals be given the job of doing the footwork involved in production of a standard.

Bromberg, president of Information

Management, Inc., said he resigned because of pressures of IMI business "which became so great that I was really unable to devote the kind of time required to manage such an effort."

Bromberg's interest in standards started in 1959 when he participated on the original CODASYL committee which ultimately came up with the first design of COBOL. His active participation began in 1962 when the X3.54 group was formed. He sees as significant accomplishments of the group the fact that it did produce a standard, published as the X3.23 1968 COBOL standard, and that this was accepted by the international standards community.

He feels full-time professionals doing the "tedious, cumbersome kinds of work" in standards production still would allow manufacturers to call the final signal by having the ultimate veto. He suggested users who might not be able to participate directly in a standards program could participate through a language interrogation program in which, over a given year, they would take a thousand of their COBOL programs and run them through some pre-processor that would indicate to the standardization body the actual usage of various language elements.

Companies

Annual Meetings: Good Bad News

Even the bad news becomes good news at annual meeting time.

At RCA's gathering, held on the West Coast this year for the first time since 1964, the "good news" was that RCA is out of the general-purpose computer business. At an IBM annual meeting in Dallas, chairman T. Vincent Learson let stockholders in on the good news that "in a company-wide economy program, IBM, through limited hiring and normal attrition, had managed to cut domestic employment by about 12,000 people last year." And in St. Paul, Control Data president William Norris told shareholders his company's "overall technical effort in 1972 will be cut to about \$162 million," about 7% below last year's total and obviously good news to a company whose computer business has been dragging down gains by its Commercial Credit Co. subsidiary. "In 1971," said Norris, "a substantial gain

in Commercial Credit's earnings more than offset a loss in computer operations and enabled Control Data to report sharply higher earnings for the year."

IBM president Frank Cary told stockholders that System/370 installations in 15 months have surpassed the record first 20 months of System/360 installations but neglected to note that a good chunk of the 370 installations were 360 replacements, not additions to the IBM customer base.



IBM chairman T. Vincent Learson and Mrs. Learson enjoy a pause in the IBM annual meeting in Dallas.

RCA's chairman and chief executive officer, Robert Sarnoff, probably was most candid in his bad-news-good-news report. "Perhaps the best thing that can be said of 1971 is that it is behind us," he told the 400-plus shareholders assembled in an NBC studio in beautiful downtown Burbank. "Last



RCA chairman Robert Sarnoff (left) and president Anthony L. Conrad prepare to face shareholders in California's beautiful downtown Burbank.

year," he said, "we lived through international economic crises, dollar devaluation, the first peacetime wage and price freeze, and finally, through



SOLID STATE

 ULTRONIC[®] Videomaster 7000



The only change in your system is the lower cost.

Compatibility.

True plug-for-plug compatibility with your IBM Systems 360 and 370. No software change. No need to replace any other part of your system.

GTE Information Systems' Ultronic Videomaster® compatibility doesn't stop there. All Videomaster equipment transmits USASCII code. The serial I/O interface conforms to EIA Standard RS-232C. Which means compatibility with just about any computer system out there.

The Videomaster comes as a stand-alone terminal, or as a cluster display system, local or remote, with as many as 24 terminals connected to one master control unit. Display format varies from 240 to 1920 alphanumeric characters on a sharp, clear 12-inch screen. Transmission ranges from 1200 to 9600 baud (depending on your system's capacity and the type Videomaster you need) over telephone lines in a start/stop half-duplex mode. There are two hard copy printers available, thermal or impact, that work at 30 characters per second to give permanent copies directly from the terminal or computer.

So you can plug a single Videomaster terminal, or

even a whole cluster, with optional printers, into your system and no one will even notice the change.

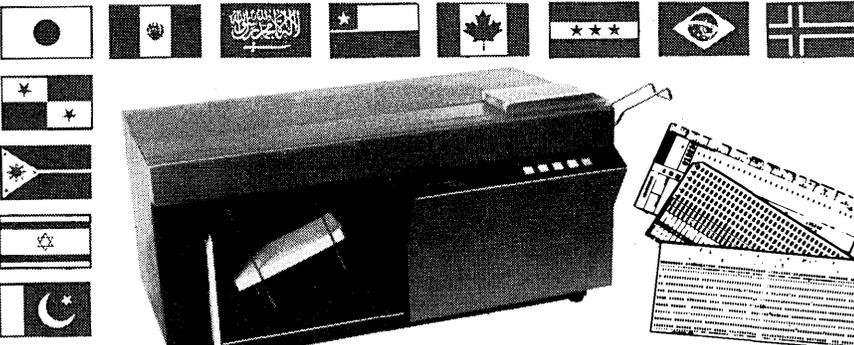
Until bill time rolls around. And then you'll discover that you've saved from 20 to 50% of the cost of comparable equipment. Without losing any of that big-name dependability or security. Because GTE Information Systems is a major supplier of total data communications systems. And we have our own nationwide service organization. With trained technicians in 72 cities. So we never have to run very far if you run into trouble.

Compatibility, performance, service and cost. Those are pretty strong reasons for changing to an Ultronic Videomaster. Especially when you remember that we can supply most of your data communication needs. Time division multiplexers, frequency division multiplexers, data sets, video and hard copy terminals, communication processors. Just about anything you need.

Ultronic is the kind of change your system could use.

For further information write: GTE Information Systems, East Park Drive, Mt. Laurel, N.J. 08057.

GTE INFORMATION SYSTEMS



our international interpreter

(it reads and writes any language)

ASCII
BCDIC
EBCDIC
HOLLERITH

OEM 64, programmable card terminal, can read and write anything you can mark, punch or edge notch. In any code. Or many codes on the same card. You can change its internally stored program. In 5-10 seconds. Edit data before entry. And, it is designed for easy interface. Talk to us about OEM 64 in any language.

日本
volare
parlez vous
buenas días

We also have a full line of readers, punches and printers.

For more information
call Frank Misiewicz
OEM Products
(201) 935-2200



LITTON ABS

Automated Business Systems
600 Washington Avenue, Carlstadt, N. J. 07072

CIRCLE 36 ON READER CARD

*This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities.
The offer is made only by the Prospectus.*

May 4, 1972

494,550 Shares



STORAGE TECHNOLOGY CORPORATION

Common Stock
(\$10 Par Value)

Price \$19.75 per Share

Copies of the Prospectus may be obtained from the undersigned only in states where the undersigned may legally offer these securities in compliance with the securities laws thereof.

C. E. UNTERBERG, TOWBIN CO.

DREXEL FIRESTONE <small>Incorporated</small>	duPONT GLORE FORGAN <small>Incorporated</small>	LAZARD FRERES & CO.
LOEB, RHOADES & CO.	WERTHEIM & CO., INC. <small>Incorporated</small>	WHITE, WELD & CO. BACHE & CO. <small>Incorporated</small>
E. F. HUTTON & COMPANY INC.	SHEARSON, HAMMILL & CO. <small>Incorporated</small>	
CBWL-HAYDEN, STONE INC.	F. EBERSTADT & CO., INC. <small>Incorporated</small>	
FAULKNER, DAWKINS & SULLIVAN <small>Securities Inc.</small>	ROBERT FLEMING <small>Incorporated</small>	HARRIS, UPHAM & CO. <small>Incorporated</small>
HILL SAMUEL SECURITIES CORPORATION	W. E. HUTTON & CO.	
KLEINWORT, BENSON <small>Incorporated</small>	LADENBURG, THALMANN & CO.	F. S. MOSELEY & CO.
R. W. PRESSPRICH & CO. <small>Incorporated</small>	SHIELDS & COMPANY <small>Incorporated</small>	F. S. SMITHERS & CO., INC.
THOMSON & McKINNON AUCHINCLOSS INC.	G. H. WALKER & CO. <small>Incorporated</small>	

CIRCLE 100 ON READER CARD

news in perspective

RCA's withdrawal from the general-purpose computer business."

"Little to add"

It was the first time Sarnoff had talked publicly of the computer withdrawal since September of last year, and his main point seemed to be: "There's little I can add to what I said on Sept. 17." And he didn't.

Stockholders weren't overly curious or seemingly upset about the withdrawal. A few questions were asked, but they took a back seat to such social implications questions as why there are no women or blacks on the RCA board and whether there is bias in NBC's presentation of news. Annual-meeting-figure Lewis D. Gilbert was concerned as to how recoveries from sale of the computer customer base to Univac would be treated in an audit and seemed satisfied with Sarnoff's answer — "against reserves."

Mrs. Wilma Soss, president of the Federation of Women Shareholders in American Business, and another familiar figure at many an annual meeting, was worried about the corporation's internal controls. "After the problem we had with computers, what about internal controls," she asked a representative of Arthur Young and Co., RCA's auditors. "Do you go in and look at forecasting procedures to prevent overoptimistic forecasts."

"No," she was told, "we work from historical records and, as regards the computer division, although these were untidy in spots, we felt their statement was fairly presented." He went on to say they did look into the computer division's forecasting procedures just before the withdrawal, "at the request of the chairman, and we recommended changes." Mrs. Soss seemed satisfied. To another Soss question on the computer decision, one on the time involved, which indicated she was on the side of the decision, Stephen M. DuBrul, Jr., chairman of the board's audit and retirement benefits committee, said: "Mrs. Soss, I love you. We spent an exhausting amount of time on the question of the computer division."

Said Mrs. Soss: "The shareholders are exhausted too."

Questionable returns

Exhausted maybe, but evidently satisfied if Gilbert is representative. In another computer division question direct-

How to keep a thousand terminals from driving your computer crazy.

Get a computer for your computer.

We mean a Tempo front end processor, from GTE Information Systems. This Tempo unit is a communications computer with a memory of 4K to 64K words. It organizes and reformats inputs from all kinds of terminals. Feeds them to the CPU in the form it likes best. Then sends the results back in the language each terminal used to begin with.

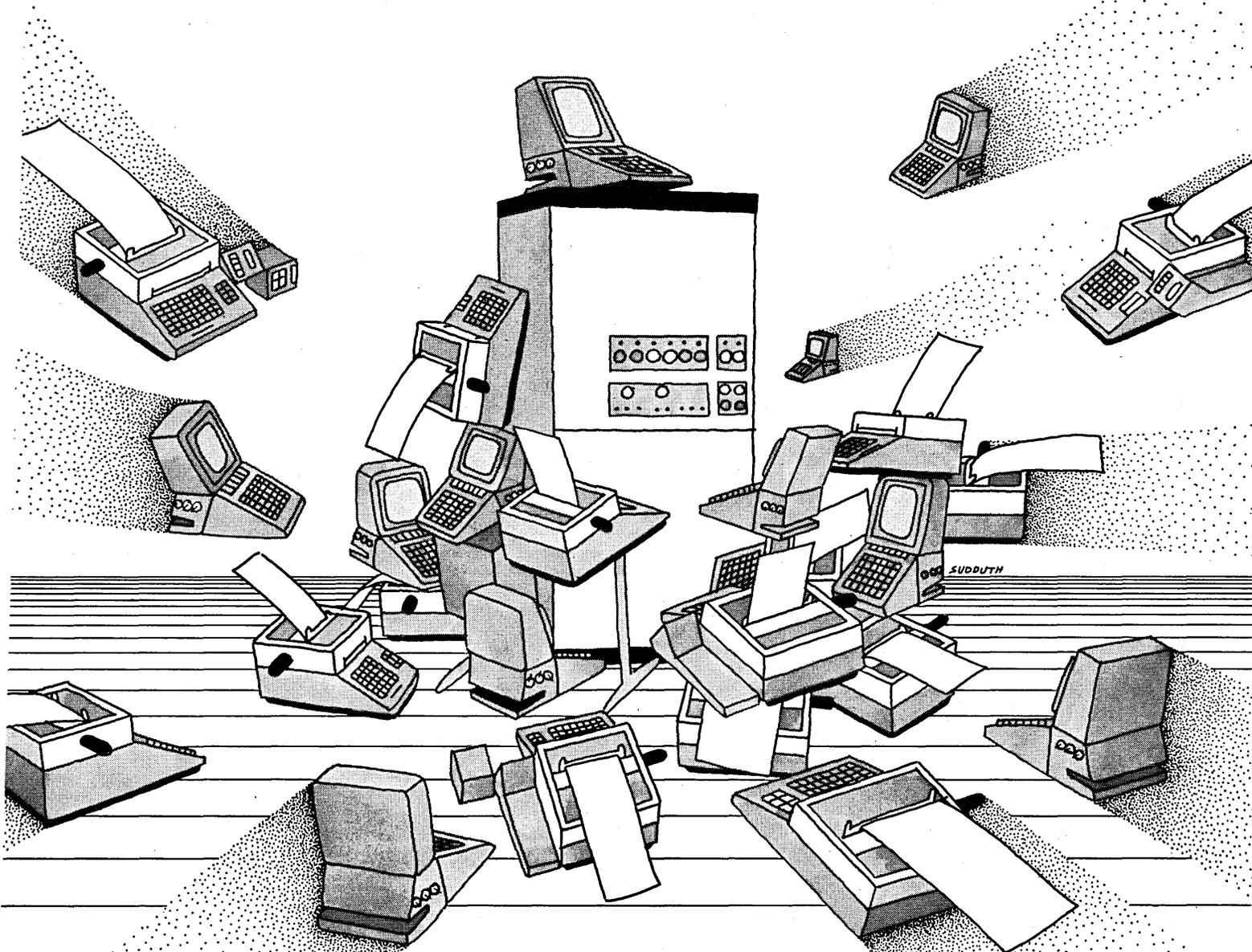
The central processor now has more memory available and fewer interruptions. So it can process data more quickly, letting you avoid trading up to a larger model.

Actually, the front end is only one place our very adaptable products can help you control your data. We've also got them configured and programmed as controllers, intelligent terminals and concentrators.

GTE Information Systems' Tempo has the hardware, the software and the support services to work with you from terminal to central processor, because GTE Information Systems is a major supplier of total data communications systems.

And we've got the man to talk to: Gary Cadwallader, at 714-523-9440. Or write GTE Information Systems, 4005 West Artesia Avenue, Fullerton, California 92633.

GTE INFORMATION SYSTEMS



CIRCLE 29 ON READER CARD

The mother instinct.

Once upon a time, you bought all your memory products from that *one* company. It may have been the most costly way to go. But there was that warm feeling of security, of being taken care of. Ever since you started to buy memory products from other sources, you've missed that feeling.

Suppliers sprout like mushrooms after a rain. Here today. Gone tomorrow. One outfit makes the product. Another one peddles it. A third one's responsible for service. And the regional office that was around the corner last week has now been

moved three thousand miles away.

At Electronic Memories & Magnetics Corporation, we fight that insecure feeling in several important ways:

First, because we design, test and manufacture all of our own products from scratch. For over a decade, we've supplied thousands of memory products to virtually every major computer manufacturer.

Second, because we're using these same techniques to offer an ever-growing line of computer memory products. The Caelus line of disk cartridges and disk packs. And our line of core storage memories, plug-to-plug compatible with your system 360.

But most important is our attitude toward full responsibility. We not only make and sell our products. We install. And we take full responsibility for

continuing service and replacement.

And to do that job we've put together a group of the best people in the computer business. With what we have at stake in the "end user" business, you'd hardly expect anything less.

So, once you accept the fact that Mother can't do everything, remember us. We have that same instinct. Computer Products Division **EMM**
1880 Century Park East
Los Angeles, CA 90067 • (213) 556-2323

**electronic
memories
& magnetics**



news in perspective

ed at Sarnoff, Gilbert called the move "an intelligent decision" and wondered why it was so long in coming. Sarnoff's explanation: "It required a great deal of time and thought and experience. We reluctantly came to the conclusion that, based on what we saw happening to the industry itself and to our financial requirements over the next five years, and to the questionable returns we saw at the end of that period, that it would be more fruitful to put our resources into other areas of greater concern."

Gilbert wondered why RCA "didn't take the Mohawk offer which we heard was better (than Sperry Rand's)."

"We do not believe it was a better offer," Sarnoff answered. "We were concerned about our obligations to our customer base. We felt Univac, with its experience and an organization in the field, was in a better position to continue to carry out our obligations to our customers." He added that RCA expects the returns on the sale to Sperry Rand "will be greater than we first expected." Another shareholder was concerned about how close to the decision the out-

side directors were. "I'm not really questioning the management decision to withdraw from the general-purpose computer business," said F. W. Hansien, "but three to six months before the public announcement was made, shareholders were advised of RCA's intention to become a strong number two in the field and I'm wondering how many times during that period outside members of the board were given an opportunity to protect stockholders' interests. Were they constantly advised and given figures?" Sarnoff assured that they were. Hansien then raised the question of the possibility and probability of a class action suit as a result of the computer withdrawal. Sarnoff admitted to the possibility, but as to the probability he said, "I don't know."

Not all the way out

RCA's new president, Anthony Conrad, directed most of his remarks to noncomputer activities and their prospects for the future but he did note: "We remain active in advanced computer technology in spite of RCA's withdrawal

from the general-purpose field. Government Systems introduced two new special-purpose computers in the first quarter, primarily for aerospace and defense use."

RCA's evident relief at being out of the general-purpose computer field might seem justified to some shareholders of Xerox Corp. and Control Data who saw their companies reporting profitable first quarters "in spite of" lagging contributions from computer operations. But IBM's Learson had an observation which could hearten those still in the edp business. He told his stockholders he saw "encouraging signs from the recent pace of data processing machine installation activity, the rate of incoming data processing equipment orders for the first quarter of 1972, and our general business outlook."

CDC's Norris told shareholders his company may initiate stock dividends later this year "if business conditions continue to improve." He said the company's computer business "is ahead of budget (this year) and the goal for the year of a small profit appears achievable." But it will be a new kind of Control Data from that which came up with the Star, for Norris said the company "is



Working with shady characters can cost you money.

Lear Siegler's new LSI 7700 is the only Interactive Display Terminal that eliminates costly mistakes from shady characters. Its 12-inch glare-free screen with large, easy-to-read characters avoids mistakes caused by misreading displayed input.

The 7700 is available in 1,000 or 2,000 character versions. Both are self-contained—equipped with keyboard, control and editing logic, character generator, refresh memory, interface and split screen.

The versatile 7700 offers a wide range of interfaces, which include EIA standard RS 232, parallel transfer rate up to 15,750 characters per second, and optional serial rates up to 120,000 bps.

For more information on how to avoid shady characters, write today to:

LEAR SIEGLER, INC.
714 No. Brookhurst Street
Anaheim, Calif. 92803
(714) 774-1010



news in perspective

placing increased emphasis on the application of computers to business and industrial use rather than on developing new and more powerful units." Whether or not that is good or bad news for Control Data stockholders remains to be seen.

IBM's Learson acquitted himself well his first time out on the annual meeting podium. The first non-Watson in this spot, he opened the meeting by saluting Thomas J. Watson, Jr., who acknowl-

edged the tribute by briefly, stating that the achievements of IBM during his tenure as chairman "really had been a management team effort." He drew a standing ovation.

Learson had done his homework. Questioned about IBM's business in South Africa in light of the U.S. government's denunciation of South Africa's racial policies, he answered that he found racial discrimination "repugnant" but said "we do not believe the answer

is for IBM to withdraw from South Africa. We think our withdrawal would be a step backward."

He even managed to handle Mrs. Soss, who began badgering him early in the meeting. At one point, following persistent questioning from her on his own personal dealings in IBM stock, he told her to "sit down."

Mrs. Soss replied: "You don't tell me to sit down." But Learson had the upper hand. Mrs. Soss was more jeered than cheered.

People

George Forsythe: A Lesson for Leaders

A slender, soft-spoken, kind and gentle man with white hair who stood exceptionally tall in the world of numerical analysis and computer science died this spring. Prof. George E. Forsythe, who founded, built and served as chairman of the Computer Science Dept. at Stanford Univ., was in apparent good



GEORGE E. FORSYTHE

health as recently as a month before his untimely death from cancer at 55.

"His contributions to numerical analysis were significant but not major. His contributions to computer science education were enormous," says the department's Prof. Edward A. Feigenbaum. Prof. John Herriot adds, "The establishment of computer science as a discipline probably owes more to Forsythe than to anyone else."

It was Herriot who in 1957 headed a search committee in the Mathematics Dept., seeking someone to strengthen the department in numerical analysis and what might now be called computational mathematics. They picked Forsythe, who was then associated with the Institute for Numerical Analysis at UCLA and who was one of the early users of the SWAC computer there. In

This announcement appears as a matter of record only.

May 9, 1972

We are pleased to announce
the formation of

First Century Partnership

First Century Partnership is a limited partnership established to make special situation and venture capital investments. The assets of the partnership will be managed by Smith, Barney Capital Corporation, a wholly owned subsidiary of the undersigned.

Smith, Barney & Co.
Incorporated

This announcement appears as a matter of record only.

May 9, 1972

\$15,000,000

First Century Partnership

Limited Partnership Interests

The undersigned arranged the private placement of the above securities with institutional investors.

Smith, Barney & Co.
Incorporated

1961, a computer science division was formed within the math department, and full departmental status given in '65 under George Forsythe. If it wasn't the first, it was one of the first such department.

In quick order, Forsythe attracted the members with whom he built what is now one of the leading computer science departments in the U.S. As a numerical analyst, his first focus was on that discipline as an important subset of the department. He also gave early recognition to the key role of artificial intelligence. He then turned his attention to the allied subjects of programming languages, theory, and systems. For the hardware end, the computer science and the electrical engineering departments jointly formed the Digital Systems Laboratory, which gets into such studies as hardware architecture, hardware-software interfaces, and microprogramming.

Holding prima donnas

George Forsythe had what Feigenbaum calls "a unique sense of excellence," the ability to find it in an individual and, having done so, to bring such a person to Stanford. But he also had the strength to hold together a "depart-

ment full of prima donnas who purport to be the best in their respective disciplines." Behind all this was his personality, best described by Feigenbaum at Forsythe's memorial service.

"It was a principle of his life that people were not instruments to be manipulated toward some end," Feigenbaum said. "There lived in him an unequalled sense of fairness and generosity. We, his friends, rarely spoke of these dimensions of his goodness and his humanity, but we all felt it as feelings of trust and openness of the spirit. Perhaps this was George's greatest gift to us, the one which will live the longest with us, because it goes so deep . . ."

Of course, Forsythe was close to his faculty members. But he also took an intense interest in his students, caring for them individually and counseling them. Thus, when he said last September that he was going to resign his chairmanship, that he wanted to spend the next 10 years doing his own thing, the faculty met and decided the best thing they could do was to talk George into staying "for another term." How long is a term? "Oh, three to five years," Feigenbaum responds. "George thought of it as three; we had in mind five." The students had a big

vote, the faculty talked to the dean, everyone agreeing they wanted George to continue. Earlier this year, he agreed.

"You'd think with all the prima donnas, someone would be after his job, some would grumble about the way he did things or think they could do it better. But not a word."

It was not a new experience for Forsythe. Following his completion of a term as president of the Assn. for Computing Machinery (ACM), the nominating committee asked him to stay for an additional term. Should he agree to do so, they told him, they would not nominate anyone else. This one he turned down.

He planned to write

Had he been granted his wish to be freed of the time he spent administering the department, Forsythe was planning a sabbatical. "He probably would've wanted time to do more research and writing," Herriot conjectures. "I think George Forsythe, himself, would say that his contributions (to numerical analysis) from research probably had less impact than his contributions by writing books. The books he wrote in numerical analysis, in particular his *Finite-Difference Methods for Partial Dif-*

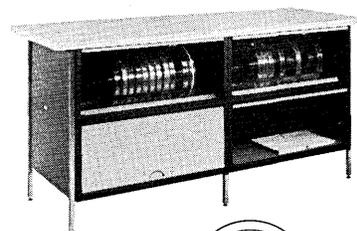
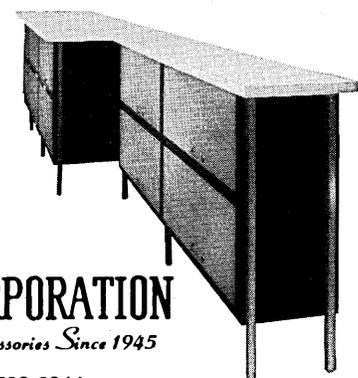


We individually
SYSTEMatize for you!
"HI-STYLE 400"®
cabinets

CUSTOM-MADE to fit YOUR requirements!

We believe Accessories should ASSIST!
Why not contact us when "ADEQUATE"
is not the answer you're looking for . . .

We invite you to find out what
"customized" accessory equipment can
do for your installation. Write today for our
FREE catalog to see this full line of
accessory equipment that restricts you
only to your imagination.

SYSTEMS MANUFACTURING CORPORATION
Finest Quality Data Processing Accessories Since 1945

13 Broad Street, Binghamton, New York 13904 • Phone: 607-723-6344



... A SIGHT FOR SORE EYES.

SELF COPY multi-original carbonless paper relieves eye strain for you and your OCR scanner with up to 12 sharp, legible copies, and the first copies are actually sharper than the original.

SELF COPY is faster and cleaner with no carbon mess or disposal problems. If extra people need copies, images can be duplicated clearly on any office copier. Tired of sore eyes? Write or telephone for technical data and **SELF COPY** samples.



COMPUTER COPIES CORP
145 East 32nd Street,
New York, N.Y. 10016
telephone: (212) 686-5400

CIRCLE 92 ON READER CARD

news in perspective

ferential Equations, which he wrote with Wolfgang Waslow, were very widely used. And he was thinking of bringing out an updated version of it, taking into account the advances of the last 10 years . . . I think he felt those books had an impact on numerical analysis by an order of magnitude greater than his research papers."

In the early '60s, during an interview with Bob Forest, who was to become the editor of *Datamation*, Forsythe described the use of the computer to arrange the card stunts at Stanford football games. He termed it a complex problem "in an informal setting." After describing the mathematics involved and telling of how the students rebelled at the automation — because it wiped out their Friday night beer busts (solved by letting them have the beer busts to arrange the cards) — Forsythé talked about how they were still at the mercy of the students in the card section at game time. He paused, and his eyes lit up. "Now, if we could only have about 3,000 leads from the computer directly to the stadium . . ."

—E.K.Y.

International

Geoffrey Crosses to Hudson

Thomas Hudson, the U.S.-trained chairman and chief executive of Britain's ICL, turned to the U.S. for his second-in-command. His selection as managing director of the U.K. computer company is Geoffrey L. Cross, 38-year-



GEOFFREY CROSS: Three-second decision.

old former vp and general manager for Univac's marketing and services in North and South America.

That Hudson, an ex-IBMer who only recently took over the top job himself

(see April, p. 90), would soon make a management change was not unexpected. But the choice on May 11 was — especially to Univac, who was in the midst of planning a three-day sales rally May 22 in San Diego, with Cross as a headliner. His successor at Univac is Joseph J. Kroger, former vp of Central Operations in Chicago.

Cross' new role as managing director provides a salary of \$65,000 plus stock options. And between them, Hudson and Cross have the job of turning the government-supported ICL, the biggest single European computer manufacturer, into a match for the American competition. In preparation for the next round of battle, ICL has a new range of computers under wraps to do the seemingly impossible job of bridging the incompatibilities between its own kit and that of the major opponents.

Launching of the new range is contingent upon further cash aid from the British government of some \$100 million over the next three years. This addition to the millions already poured into the creation of ICL led government advisers and other main big industry stockholders to demand a management overhaul first. So the question is whether Cross, the English-born American, who quit Britain for the States at the age of 24, can produce the magic that has been lacking.

He certainly gives an impression of thinking like an American. He reckons it only took him three seconds to accept the job, and he has since questioned why ICL didn't make an offer for RCA's computers when on the market. Cross has no doubts that he would have considered making a bid if in ICL's position. Of course he may be in a better position to make that judgment having seen what his former master Univac acquired.

Nevertheless, the proposition has its irony since little more than seven years ago RCA had considered taking over ICL to establish a European base. It reconsidered because it could not comprehend the ramifications of the ICL structure and found it would take too high an investment to sort out. Curiously, ICL made exactly the same judgment three years later of Philips, the Netherlands computer maker, at the early stages of negotiations for a multinational European venture. Everyone else seems to have understood each other well enough since to at least try



Featherweight.

Our new Dynapunch lets you pack a lot of punch.

Picture it: a card punch that weighs less than a pound! A punch you can take *anywhere!* That's the Dynapunch from Data Devices. A self-contained, maintenance-free marvel that lets you capture data anywhere, anytime.

It's made of rugged plastic. Simply load the hopper with a stack of 80/80 col. or 80/40 col. cards. Slide one onto the register tray, where sleeve brackets will hold it securely. Remove the stylus from its slot, and record your data. The stylus is a part of the Dyna-

punch, and cannot be misplaced. A plastic base plate guides the stylus point, and captures all the chad.

When you're finished, slide the card into the storage stacker beneath the hopper. Slide in a new card, and presto! . . . you're ready to work again.

Best of all, the data is ready to go directly into the computer system. Which makes the Dynapunch a must for *anyone* who has to capture data in a remote location. The low price alone is worth a phone call. Or a visit to us in Booth 227 at the DPMA show.

DATA
PRODUCTS

data devices inc

Data Devices Inc: 18360 Oxnard St., Tarzana, Ca. 91356 (213) 345-7013; **Marketing offices:** Chicago (312) 654-0997; Dallas (214) 231-8511; Los Angeles (213) 474-9581; New York (212) 532-9511; San Francisco (415) 989-4191; Washington, D.C. (301) 652-8120.

Power pangs goofed this check--

\$10,000,000

Not your computer

Without a UPS system, spikes, dips, transients, lightning surges, and other power pangs in your normal power supply can cause all sorts of computer mistakes, equipment shut-down, and even drum, disk, and electronic component damage.

UPS (Uninterruptible Power Supply) systems also assure accurate and uninterrupted print-out even in the event of brown-out or complete black-out.

Contact Cyberex, Inc., 4399 Industrial Pky., Willoughby, Ohio 44094, Phone 216-946-1784.

CYBEREX

CIRCLE 21 ON READER CARD

news in perspective

the Franco-German-Dutch merger of computer interests of CII-Siemens-Philips—without ICL.

Be that as it may, C.oss takes on the competition just as his public enemy Number One has realigned to divide the operations of IBM World Trade Corp. into IBM Europe and IBM Far East/Americas. Two existing World Trade executives take the top job in each of the groups. Frank Cumiskey becomes president IBM Europe, with Kaspar Cassani named vice-president. Gordon Williamson is group executive for IBM Far East/Americas. Cumiskey is a vice-president and group executive of IBM World Trade. Cassani was formerly general manager North-West Europe area. Williamson, vp of IBM World Trade, was formerly president of IBM Europe.

—Pearce Wright

Financial

Automation at Amex: Hurdles Are Many

“Ballyhoo” might be an appropriate substitute for AMCODE — that new trading floor automation program the American Stock Exchange began explaining to prospects this spring.

Amex considers it “significant progress toward developing capabilities that could be expanded in implementing a proposed national market system.” A single nationwide automated “trading

floor,” which probably would supplant existing exchange floors, apparently has the blessing of the Securities and Exchange Commission, and Amex is hoping to lead the way. But this plan must surmount an infinite number of financial, technical, political, and competitive hurdles before it can ever become reality.

To discuss it requires as much space as banking’s once-vaunted “checkless society.” So without discussion, here’s what’s happening.

Today AMCODE helps automate a number of round-lot and odd-lot trading procedures but doesn’t eliminate all the manual work or the trading floor, of course. It includes three projects. One is Market Odd-Lot Execution System (MOLE), a “computerized execution of all investors’ odd-lot (less than 100 shares) orders in all 1,300 Amex-listed securities.” MOLE permits odd-lot orders to go directly from the broker’s computer through the Amex system to the terminals at the trading post for manual execution or to computer files for automatic execution after the next round-lot transaction in that issue. It also produces numerous reports for the specialist or odd-lot dealer in that issue. This removes almost half of the 6,500 (minimum) daily odd-lot transactions from the trading floor.

Specialist’s book to go

The second project is the Limit Order Switching system (LOS), which takes round-lot limit orders (100-share lots with a specified price) from the broker’s



TO EXECUTE OR FILE: Round-lot limit orders, usually carried to specialists’ trading posts by clerks, would come on a teleprinter in proposed Amex system.



Record breaker.

Our new printer gives you an 1800-lpm run for your money.

It's our Model 2470. The latest member of our 2000 Series family. And it's a real sprinter. 1800 lines per minute for 132 columns. Up to 2400 lpm using a restricted character set. A high-volume EDP operation will sure get some fast runs for the money with this high-speed model.

It'll get OCR and letter-writing print quality, too. In upper and lower case. Other conveniences include quick-change drum, simplified format control, and whisper-quiet operation. And, of course, our own unique one-piece Mark IV print hammer drive.

Reliability and quality like this means less maintenance costs in the long run. The 2470 represents 100% improvement in price-performance ratios. It's 80% faster . . . and 30% lower in price . . . than our best seller was three years ago. If you have one of our printers now, you can upgrade to the 2470's speed without new interface costs.

The largest independent manufacturer of printers. That's us. With 10 years experience behind us. Our 2470 is our best. It captains our 2000 Series of 250 to 1800 lpm printers. Call today.

DATA
PRODUCTS

OEM National Marketing: Boston (617) 237-1950; Bethesda, Md. (301) 652-8120; Cherry Hill, N.J. (609) 667-7555; Dallas (214) 231-2240; Detroit (313) 354-5858; Los Altos, Ca. (415) 941-5485; Los Angeles (213) 474-1596; Minneapolis (612) 927-8747. U.S. Representatives: Burlingame, Ca., W. J. Purdy Co. (415) 347-7701; Chicago, L.T.E.C. Inc. (312) 286-1500; Orlando, Gentry Assoc., Inc. (305) 894-4401. OEM International Marketing: Amsterdam 020-452-457; Tokyo 493-6451; London 01-579-2917; Munich 08-106-5766; Vienna 34 53 61, 34 44 16. International Representative: Tokyo, Marubeni 501-7421. Home Office: 6219 De Soto Avenue, Woodland Hills, Calif. 91364 (213) 887-8000.

news in perspective

computer, validates them, and transmits them directly to the teleprinter at the specialist's trading post. This eliminates the need for a clerk to carry the order to the post. The specialist either executes or files the order in his book until the quotations are the same as the order price. LOS allows "member organizations to establish their own tolerances to identify away-from-the-market limit orders which should logically be switched electronically direct to the specialist's book." And a crt terminal

rather than a book is in the plans.

Amex's third project is use of a split-screen Bunker Ramo Telequote 70 display at the trading floor booth. Shearson, Hammill is testing this now. One side of the display will show an issue's current prices and the other side will show a round-lot limit order in that issue. Via the keyboard, the broker will either have the order executed at the trading post or printed out for personal handling.

The next steps planned: by late 1972,

Amex will have automated floor input by card readers to replace the keyboard system and will implement a market data system for price and volume information. Presumably the latter is intended as a competitor for stock quote services like that of Bunker Ramo.

By 1973, Amex plans crt replacements for the hand-written specialists' books, allowing automatic execution and reporting on round-lot and odd-lot limit orders. By 1974, the booth split-screen display is to be adopted for the entire floor.

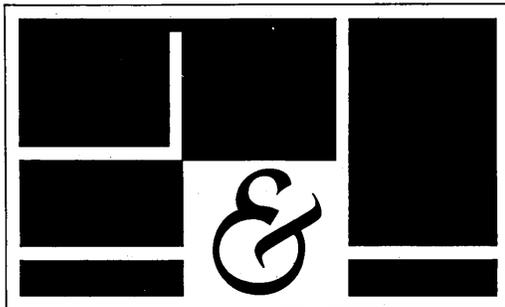
—Angeline Pantages

WHY DO IT THE HARD WAY?!

A lot of organizations have already discovered an easy, yet *powerful*, way to handle their information processing requests, with Inquiry and Reporting System—IRS. And there's good reason.

IRS is the fast, efficient and easy-to-use software product for retrieving information from your computer files, performing standard data processing operations, and producing output to fit your exact requirements. It operates on the IBM 360/370 DOS or OS, small system or large, and can be installed immediately. Among the many fine organizations which have IRS are a major New York mutual insurance company, one of the nation's five largest banks, the world's foremost health institution, and the agency that took us to the moon.

If you manage a programming, systems or MIS function, find out about IRS. You'll be in good company.



INQUIRY & REPORTING SYSTEM

sigma[®]
data
COMPUTING CORP.

4720 Montgomery Lane
Bethesda, Maryland 20014
Phone (301) 657-4455

Communications

The EDS Fight for Private Lines

The future market for on-line information services probably will be dominated by dp service firms — and not the common carriers. At the moment, at least, this seems likely, if a dispute between Electronic Data Systems of Dallas and AT&T turns out as expected.

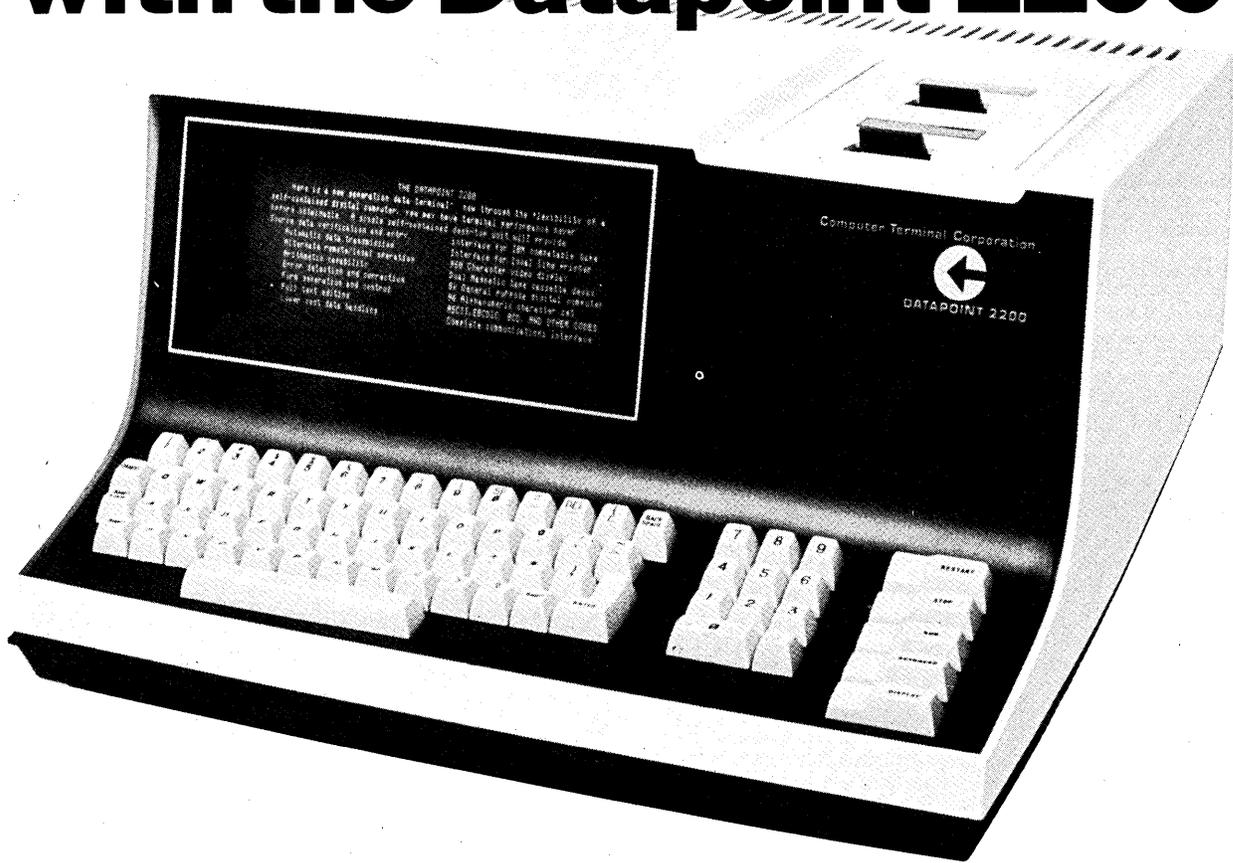
The dispute is over the interpretation of last year's Federal Communications Commission decision in the computer/communications inquiry. One part of that decision says that nonregulated firms can offer "hybrid" data processing communications services if the communications portion is only incidental to the dp service performed. The exact wording is that it be "offered as an integral part of, and as an incidental feature of a package offering that is primarily data processing."

But EDS is having trouble with the telephone company over the way this is interpreted.

Last December it complained to the commission that it wanted to offer hybrid services meeting the commission's criteria but couldn't get private lines from AT&T.

The proposed services are designed for the health, stock brokerage, trucking, and insurance industries. In each case, the customer gets on-line access to a central computer which maintains his files, does his bookkeeping, and performs assorted other dp jobs. This same computer is also used as a communications switch to route administrative messages among the customer's main and branch offices. The latter function, EDS emphasized, is incidental to the former, and accounts for no more than 10% of total message traffic.

Slash your data entry costs with the Datapoint 2200



With the Datapoint 2200, you can get your data conversion and entry operation into fighting trim in a hurry. The Datapoint 2200, a unique terminal/computer system, provides:

- Error-free on-site data entry into a central computer
- Fully programmable general purpose computer with up to 16K of fast memory
- Complete operating software, including six versions of DATABUS, a powerful but easy to use high level language
- Fast, economical "plug-in" communications with auto-dial and auto-answer
- Dual digital cassettes for bulk data storage
- Typewriter-style alpha numeric keyboard
- 960-character display screen, upper and lower case
- Full line of optional peripherals, including printers, 7- and 9-track tape drives and discs

Every Datapoint user enjoys complete field service and system support, and access to as much training as he needs. Hundreds of Datapoint 2200's are now up and running. For more information on how you can reduce costs and boost productivity in your data entry operation, and a copy of our new systems booklet, "The Datapoint 2200: The Business Mini Computer," contact the nearest Datapoint sales office, or write or call:

Datapoint 2200

THE BUSINESS MINI COMPUTER SYSTEM

Computer Terminal Corporation

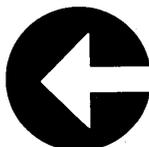
Home Office:
9725 Datapoint Drive/San Antonio, Texas 78284/(512) 696-4520

Field Office:
Boston/(617) 359-4296
Chicago/(312) 671-5310
Cleveland/(216) 831-1777
Dallas/(214) 637-4166

Denver/(303) 244-2451
Detroit/(313) 557-6092
Houston/(713) 626-0010
Los Angeles/(213) 645-5400

Minneapolis/(612) 771-4926
New York/(212) 759-4656
Portland/(503) 289-9655
San Francisco/(408) 732-9953
Washington, D. C./(301) 587-3910

International Representatives:
TRW Communications/Toronto, Ontario, Canada/(416) 481-7288
TRW Communications/Lyss/Berne, Switzerland/Telex: 34446
TRW Electronics-International/Los Angeles, California/Telex: 674593



news in perspective

But AT&T vp T. W. Scandlyn has replied to the commission that "the sole purpose of including the administrative message switching function . . . is to accommodate the communications or message switching needs of (EDS) customers, and such inclusion is unnecessary to the data processing function." Scandlyn argued, in other words, that EDS was providing a communications service separate from a dp service. If AT&T provided private lines under these conditions, it would be violating a section of Tariff 260 (Paragraph 2.2.3) which prohibits users of these facilities from performing communications for others, he said.

The Business Equipment Manufacturers Association has entered the dispute. In a letter to the commission BEMA tries to destroy this objection, pointing out that "in the light of EDS' overall system descriptions," the administrative message switching functions contemplated clearly appear to satisfy the "integral" and "incidental" criteria laid down in last year's FCC decision.

A source says EDS "hopes the (FCC) common carrier bureau will set-

tle this thing on their own motion" — i.e. call in AT&T and persuade them to lease the facilities desired by EDS. An FCC source indicates this isn't likely to happen. He believes EDS, if it wants satisfaction, will have to file a formal complaint, asking the commission to order a change in AT&T's private line tariff. And it is the feeling of this FCC

Benchmarks

Key-to-Unprofitability: The two leading key-to-disc manufacturers, Computer Machinery Corp. and Inforex, reported first-quarter losses but remained optimistic. CMC's losses were \$1,277,000 on revenues on \$3,185,000. It was pointed out that the loss would have been \$659,000 under the old accounting method that allowed long-term leases to be reported as sales. It expects to be "profitable in the final months of 1972." Inforex, reporting a \$193,901 loss on consolidated revenues of \$4,256,371, indicated that it was encouraged by its backlog of 1,393 keystations (worth \$8.3 million) at the end of March and new highs of \$2.3

source that if EDS does seek relief that way, there's "a good chance" it will be granted.

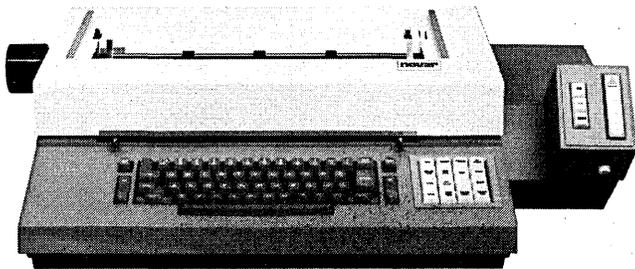
Shortly after the commission issued its final decision in the computer/communications inquiry last year, the carriers asked the U.S. Court of Appeals in New York City to overturn the verdict. That case is still pending; a decision is likely before fall. Probably, EDS won't make a move until then.

—Phil Hirsch

million in direct sales and \$1.6 million in recurring rental and service revenues in the first quarter.

Encore: Dashew Business Machines, having fought its way back from Chapter X in 1965, is at the brink once more. The Santa Monica-based manufacturer of credit cards and embossers is closing its Chicago, Atlanta, and El Segundo facilities after reporting operating losses of \$375,000 for the first six months of FY'72 in addition to other debts totaling over \$1 million.

Sticks and Stones: Maybe it was the Honeywell name and maybe not, but



Novar 5-50 and 5-60 terminals record a full day's typing on tape—up to 73,000 characters on a single cartridge—ready for batch transmission at high speeds via telephone line. When transmission is to a Novar 7-70 data collector, the terminals and 7-70 together provide a complete telecommunication system.

Novar Corporation • 2370 Charleston Road
Mountain View, Calif. 94040 • (415) 966-2272
Offices in Principal Cities

GTE INFORMATION SYSTEMS
INCORPORATED
CIRCLE 42 ON READER CARD

SYSTEM TRANSFORMATION PROGRAM TRANSLATION

GUARANTEED

PERFECT CONVERSIONS

ALL LANGUAGES: 1410, 7010, 7070/74, 705/7080, 1401 and SPECTRA 70 to 360/370 ANS COBOL, PL/1, or FORTRAN. Program/Systems Translations and Resystematization of batch and on-line systems to take full advantage of target hardware capabilities. All work done on fixed-price fixed-time basis.

FOR FURTHER INFORMATION CONTACT:

RAND TELEPROCESSING CORP.
3210 Geary Blvd.
San Francisco, Ca. 94118
(415) 387-6005

CIRCLE 102 ON READER CARD

the Honeywell Institute of Information Sciences, a dp school in Fullerton, Calif., was vandalized in the early morning of May 11 by an unknown person or persons armed with combat flares. Richard Soucie, manager, said a couple of computer-room windows were broken, a couple of tapes burned, there were ashes all over, and a lot of smoke damage. The school's two series 2000 computer systems were down for a couple of days. Soucie said he had no idea who was responsible, and when asked if he thought it was part of the current anti-Honeywell antiwar protest movement, he responded: "We're not making any munitions here." The school is across the street from the Cal State Fullerton campus, scene of a number of antiwar demonstrations. The college's computer room is on the first floor and was not touched.

Under Control: The control computer segment of the industrial automation industry is expected to realize revenues of \$424 million in 1976, a compound annual growth rate of 19% over a five-year period, according to Creative Strategies, Inc., Palo Alto. The research firm also predicted that 70% of numerically controlled machine tools

are expected to use some form of computer control by 1976. Losing no time was Milwaukee machine tool manufacturer Kearney & Trecker, which signed a long-term oem agreement with Interdata for Series Model 70 minicomputers to be incorporated into System Gemini, a hardware/software combination for direct numerical control of up to 30 machine tools. Kearney & Trecker sells System Gemini on a turnkey basis.

Big Top: "What the world needs now ... is another computer show (?)," the announcement read. Most would agree with the question mark, and indeed some are pushing AFIPS to cut down to one Joint Computer Conference a year. But Don Cruzen, ex-director of AFIPS exhibits, is forging ahead to organize a show called NEDPAC (National Electronics and Data Processing Annual Conference) for both the electronics and computer industries. It competes head on with WESCON and Fall Joint, sandwiched in between them in November in San Francisco. The kicker is this: NEDPAC will allow sales on the floor — something the societies cannot do because of their nonprofit status. And Cruzen claims the vendors are interested. Cruzen, who was shuffled out

by the recent AFIPS reorganization, also says that he has the backers to make a go of it and has approached the American Management Assn. about staging the program to supplement the exhibits. NEDPAC's address: P.O. Box 197, River Edge, N.J. 07661.

Adding and Subtracting: In what must be a move toward its recently articulated "commitment to services," Control Data Corp. has agreed to purchase Syntonic Technology, a maintenance services company headquartered in Pennsauken, N.J. On the minus side, University Computing Co. has sold its digitizer product line to A.E. Trolio & Assoc., Broomall, Pa. UCC will provide the maintenance.

A.K.A.: As a result of its recent acquisition by a group of private investors, Clasco Systems Inc., the Chevy Chase, Md., performance measurement company that developed the CASE simulator, will heretofore be known as Tesdata Systems Corp. Very appropriate. Sure beats some of those incomprehensible new names given to companies "to more accurately reflect the activities of the corporation." □

Data Communications Programming

PLACE—Dartmouth College
Kiewit Computation Center
Hanover, New Hampshire
WHEN—Monday through Wednesday 17, 18, 19
July 1972

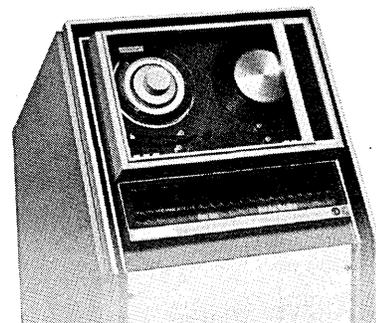
- FEATURES**—
1. Transmitting techniques
 2. Modems
 3. Terminals
 4. Interfaces
 5. State diagrams
 6. Process synchronization
 7. Performance monitoring
 8. Buffering techniques
 9. Polling

LECTURES—
DR. THOMAS E. KURTZ, Director, Kiewit
DR. ROBT. F. HARGRAVES, Assoc. Dir., Kiewit
DR. PAUL SHANNON, Pres., Digital Systems
MR. ROBT. F. BREWSTER, VP, Digital Systems
MR. THOMAS E. BYRNE, Assist. Dir., Kiewit
MR. EUGENE A. FUCCI, Assist. Dir., Kiewit
MR. STANLEY DUNTEN, Senior Programmer, Kiewit

FEES—
Tuition, food and lodging \$250. Vacation plan for families available. Registration July 17th, 8:30-9:30 a.m. in Kiewit Computation Center. Registration fee \$25 due July 1st, non-returnable but counted toward seminar tuition. Mail registration fee or requests for additional information to Mr. Robert MacMillen, Summer Programs Office, Dartmouth College, Box 582, Hanover, N.H. 03755. (603-646-2895).



CIRCLE 97 ON READER CARD



The Novar 7-70 data collector allows any batch computer system with tapes to immediately operate with teleprocessing. No expensive communications adapters—no telecommunications package required in your computer—no extra core—no computer processing time lost just to handle phone lines. And you can save up to \$2,000 a month.

**Novar Corporation • 2370 Charleston Road
Mountain View, Calif. 94040 • (415) 966-2272
Offices in Principal Cities**

GTE INFORMATION SYSTEMS
INCORPORATED

CIRCLE 43 ON READER CARD

Hardware

Hardware Notes . . .

Bell Laboratories is experimenting with a new process for making ceramic circuits. Instead of the present-day technique of drawing circuit masks and then etching away undesired portions of the ceramic, Bell mounts the metal-film-coated substrates onto a rotating drum. A modulated laser beam is then used to vaporize extraneous material from the substrate under the control of a computer. Among the advantages of the process are the reduction in production steps, and the elimination of the need for a clean room environment.

One gigabit communication rates (1000 megabits per second) have been laboratory experiments until now, but the Radiation Systems Division of Harris-Intertype Corp. recently demonstrated a modem that operates at that rate on a single data stream, or can handle two 500 megabit streams. Lockheed Research Laboratories, Palo Alto, Calif., plans to use the equipment in setting up a laser beam data link to a satellite. Other interested parties include NASA and the military. Radiation Systems has also developed a time-division multiplexor that goes up to 1 gigabit.

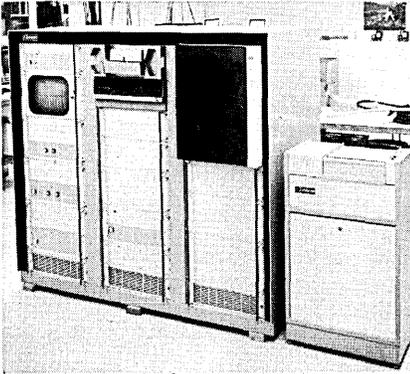
Digital Associates Corp. has set up shop in Park Ridge, Illinois, with an all-encompassing marketing strategy: interface any peripheral to any minicomputer or data communications terminal. The firm will concentrate on line printer, disc, tape drive, and card equipment.

A second "computer on several chips" (see Jan., p. 75) has been introduced by Intel Corp., Santa Clara, Calif. This one is a P-channel silicon-gate MOS circuit with an 8-bit parallel adder, six 8-bit registers, an 8-bit accumulator, two 8-bit temporary registers, four flag bits, 45 instructions, and eight 14-bit address registers, giving the 8008 cpu direct-addressing capability up to 16K bytes. All for \$90 in 100-piece quantities.

The 3600 in the model designations of Zeta Research's new plotter series (April, p. 119) is taken from the 36-inch width of the drum, and the 36-inch paper it accommodates. The effective plotting width is 34 inches.

Graphic Display

The ANAGRAPH graphic display system consists of an Interdata model 70 minicomputer, a disc memory, a tv display system, and up to 16 display monitors and keyboards. Up to 3,840 upper and lower case alphanumerics can be displayed, and graphics are displayed on a 480x640 individually ad-



dressable bit matrix. Editing and formatting capabilities are standard features. ANAGRAPH is supplied with a basic IBM 2260 emulation package, allowing immediate use of the alphanumeric capability while graphics programs are developed at the user's convenience. Software includes house-keeping routines and selected utility, applications, and support programs. The price of the system ranges between \$5K and \$10K per terminal, depending on the number of terminals and the system capabilities. DATA DISC, INC., Sunnyvale, Calif. For information:

CIRCLE 245 ON READER CARD

Small Business System

Each Nova 1200-based SIMBOL system will be custom tailored to user recommendations and requirements. To make sure it gets a solid start, the new, small vendor is restricting initial marketing to California south of Los Angeles, but larger operations are planned as soon as any and all bugs that might appear are corrected. Availability of a SIMBOL system is 120 days ARO. Specifications are included in the small business computer survey elsewhere in this issue. MARTIN, WOLFE INC., San Diego, Calif. For information:

CIRCLE 248 ON READER CARD

Dual Processor Computer

A dual processor model of the Univac 494 real-time computer system is now available. Current 494 users can have their machine upgraded in the field, with first installations scheduled for March of next year.

Each independent processor has its own operating system but shares a common portion of main and peripheral storage. Main storage for each cpu is 128-256K 30-bit words with 750-nsec. cycle time. The uppermost addresses of this memory are designated as common storage, variable from 8-32K in 2K increments.

The software will be an extension of the OMEGA operating system. Installations currently having two 494s side by side can have the machines tied together for approximately \$8K additional rental month. For typical single 494 installations, the rental on the mainframe doubles, then the \$8K charge is added to that. UNIVAC, Blue Bell, Pa. For information:

CIRCLE 251 ON READER CARD

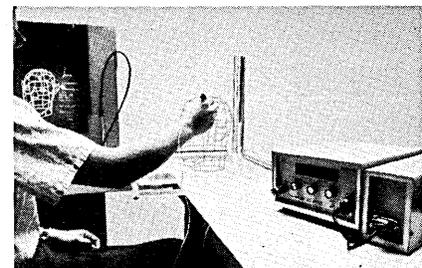
Remote Job Entry

The model 2922 programmable terminal can be used for remote job entry, data base inquiry, in teleprocessing environments, and for other applications that require extensive printouts. The terminal has 8K bytes of memory with a 3.6-usec cycle time to run 360/20 object programs. Also, there is a 500-lpm printer that accommodates 3½ to 18¾-inch wide marginally punched forms. Data for a job or series of jobs is entered through a 500-cpm card reader and transmitted at 7200 baud to 360 and 370 systems or to other IBM terminals. The 2922 is offered under the extended term plan—a basic 24-month contract and one-year extensions—for \$1390/month. The purchase price is \$43,525. First shipments are scheduled for this month. IBM CORP., White Plains, N.Y. For information:

CIRCLE 246 ON READER CARD

3-D Digitizer

Most digitizing systems are set up to handle two-dimensional drawings. But the 3-D Graf/pen generates three-position coordinates in digital form as the pen or stylus traces the exterior contours of physical objects. The control unit can provide 200 measuring pulses per second or single-shot pulses on de-





Westinghouse 2550 Satellite Processor

Both an intelligent remote-batch terminal and local-batch processor

As a remote-batch terminal, the Westinghouse 2550 Satellite Processor emulates 2780s, HASP multileaving work stations and other popular RJE terminals. No reprogramming of your host processor or front-end system is required.

In addition to this compatibility, the 2550 Satellite Processor increases performance. It improves terminal throughput with higher speed peripherals, faster data rates, data compression, and mass-memory devices for remote spooling.

Offline, the 2550 Satellite Processor provides fast, low-cost batch processing for your scientific, engineering, and business needs. Software support packages include FORTRAN, BASIC, RPG, and numerous assemblers.

Most important, the Westinghouse 2550 Satellite Processor has enthusiastic user acceptance, and is available now! Take advantage of Westinghouse experience as a supplier and as a user. You get single-source leasing, maintenance, and nationwide sales and service. For the answer to your needs, call Westinghouse Computer and Instrumentation Division, Computer Department, Orlando, Florida. 305 843-7030.

You can be sure...if it's Westinghouse



hardware

mand. Included in the \$4610 price of the unit are three sensors with 14-inch cords. Longer cord lengths are optional. SCIENCE ACCESSORIES CORP., Southport, Conn. For information: CIRCLE 247 ON READER CARD

370 Memory Replacements

Several semiconductor replacements for the main memories on IBM 370 models 155 and 165 have been announced, but Ampex has stuck with good old core for its products, reasoning that core might just be more reliable than the newer technology. ARM-3360 modules come in 512K-byte increments up to 2 megabytes for the 155 and 3 megabytes for the 165 and operate identically to the IBM main storage. So it must be the price that makes the switch worthwhile. A 512K 3360 module sells for \$225K and leases for \$5K/month on a two-year contract, including 24-hour maintenance. There are no extra-use charges. AMPEX CORP., Marina del Rey, Calif. For information: CIRCLE 250 ON READER CARD

Display Terminal

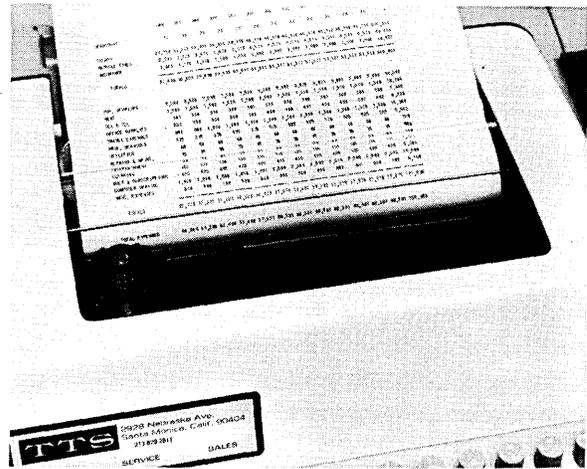
The TD 700 is the latest Burroughs product to use the SELF-SCAN technique—more commonly known as plasma display technology. (Plasma displays contain hundreds of thin wires that criss-cross through an inert gas contained in a panel. Characters are displayed when the computer addresses those wire combinations that form



specific characters on selected portions of the screen.)

The TD 700 comprises a 14½ x 9.4 x 2.2-inch panel display, a keyboard, and a control unit. The basic character display is 256 characters, expandable to 1K. The keyboard is available in

product spotlight



TTY Modification Kit

That typically American trait of never leaving well enough alone displays itself once again with the announcement of modification kit that ups the character-per-line count of the ASR-33 Teletype from 72 to 132 positions. An entirely new print cylinder with smaller characters has been engineered, and the designers took the opportunity to change the print face to sans serif to improve legibility. The resulting print-out is said to be at least as easy to read as the regular tty's, thanks also in part to a new carbon ribbon that comes in the kit.

There are thought to be a large number of businesses doing applica-

tions requiring numeric tabulation, such as sales analysis and accounting information, that will find the wider print line of benefit. Another, perhaps smaller, group that might be interested in obtaining the TMK-132 kit would be programmers developing software for 132-column equipment. In single quantities the kit is priced at \$125 and is said to be easily installable in approximately 30 minutes. It's claimed that the modification does not affect normal function of the terminal in any way. Delivery is immediate. TTS DIV., REMOTE DATA TERMINALS, INC., Santa Monica, Calif. For information: CIRCLE 244 ON READER CARD

standard alphanumeric typewriter layout, as a data entry keyboard, or as a 10-key numeric keyboard. Depending on options, the TD 700 sells from \$3325 to \$4490 or rents for \$85 to \$115 per month. Deliveries begin in October. BURROUGHS CORP., Detroit, Mich. For information: CIRCLE 249 ON READER CARD

Interactive Graphics

The Graphics System/370 is specifically tailored to operate with IBM 360 and 370 computers but is powerful enough for use as a self-contained system since it is based on a 30-bit-word computer that can be expanded up to 32K. Included in the basic system price of \$185,700 is 16K of 1-usec core, a 40.5-megabyte disc, vector generator, character generator, 2x2 coordinate transformation display, operator console with 21-inch crt, light pen, function switches and lights, alphanumeric keyboard, 50 KC 370 channel interface, and a Data Phone interface to the same computer. The system can emulate the IBM 2250 model 1, or in a stand-alone mode can be equipped with its own monitor to control a

FORTRAN IV compiler, a flowchart generator, a text editing system, a picture processor package, and others. ADAGE INC., Boston, Mass. For information: CIRCLE 254 ON READER CARD

Disc Unit

The vendor, a leader in the minicomputer industry, has not announced this large capacity fixed-head disc unit solely for use with its own machines, but is using it as its entree into the oem small disc market with the thought that oem customers will design their own interfaces for it.

Emphasis on the product—which uses an IBM 2311-type disc pack—has been placed on reliability and modularity. Called the Novadisc, the unit comes in capacities of 128K to 768K 16-bit words. The manufacturer's pitch on reliability stems from utilization of an air bearing that exerts two pounds of force on the read-write heads—a technique the vendor claims makes the discs “virtually immune to damage or data loss from typical bumps or vibrations.” Another reliability feature is that the read-write heads can be mechanically retracted outside the radius

of the disc.

The Novadiscs are hardware and software compatible with the company's Nova line of minicomputers and operate under either of the firm's disc operating systems—the single-task DOS, or a new real-time, multitask RDOS. Two minis can share a single disc.

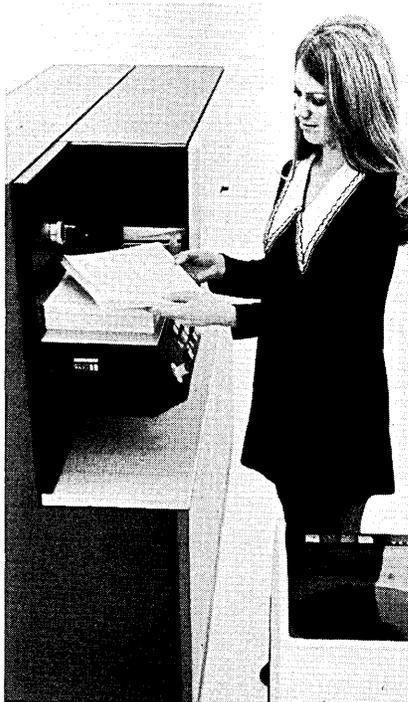
The number of signal reversals required for entering data on the disc is reduced by using three-frequency recording in place of the traditional two-frequency recording. Average latency time is 8.4 msec, and the data transfer rate is 2 MHz.

Deliveries are scheduled to begin in July. A Novadisc with 128K words of storage is priced at \$5200; 256K words is \$6750; 512K, \$9250; and 768K, \$12,560. DATA GENERAL CORP., Southboro, Mass. For information:

CIRCLE 255 ON READER CARD

Optical Mark Reader

The latest IBM product is the model 3881 optical mark sense reader. It accommodates documents ranging in size from 3x3 inches to 9x12 inches. Alphanumeric information is then transmitted to 370 model 135s and 145s, or to a model 3410 magnetic tape drive. Up to six different types of documents can be processed in a single operation



as long as they are the same size. The 3881 is priced at \$51K and rents for \$1050/month on IBM's recently announced extended term plan. Delivery is scheduled for the first quarter of next year. IBM CORP., White Plains, N.Y. For information:

CIRCLE 252 ON READER CARD

Tape Subsystems

Tape drive subsystems based on the Ampex TMA drives and TC-38 controller are designed to replace various combinations of IBM 2401, 2420, and 3420 drives and 2803 and 3803 controllers for 360/370 computers. Two TM-345s and a TC-38—an alternate configuration to IBM's \$1507-a-month 3803 controller with two 3420-V drives—rents for \$1360/month, including maintenance, on a two year contract.

The TC-38 uses microprogramming to correct up to six data errors before reverting to dead-track operation; other controllers are said to make only two attempts. The drive cabling arrangement and interface design permit individual drives to be taken off-line for maintenance without interrupting remaining drives. AMPEX CORP., Marina del Rey, Calif. For information:

CIRCLE 258 ON READER CARD

Disc Storage

All models of the XDS Sigma computers can use this removable pack disc storage subsystem. There are two versions, differing only in storage capacity. The smaller set-up stores from 90 to 675 megabytes; the larger, up to 1.365 billion bytes. The average access time and transfer rates are 30 msec and 512

SPEED PROCESSING with "ON-SITE" PUNCHING of SOURCE DATA



MODEL 2600-00

Instead of using hand written source data which must go to keypunching before entry,



you can punch source data into cards at any remote location using the Wright Punch. These cards can then go directly to data entry.



Find out how this remarkable, inexpensive yet reliable precision portable card punch can help you to speed data flow, reduce keypunch bottlenecks and save money. Circle readers service number or write to Electromechanics Department, Wright Line, A Division of Barry Wright Corporation, 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

Other models available (manual and electric) for punching Hollerith type holes into plastic tabulating, credit, ID and badge cards. Special versions available. OEM and Dealer inquiries invited.



CIRCLE 83 ON READER CARD

CANBERRA MODEL 2020 Cassette Tape Mass Storage System



Complete hardware and software support for three of today's most popular mini's.

CANBERRA INDUSTRIES, INC.
45 Gracey Avenue
Meriden, Connecticut 06450
Tel: (203) 238-2351



CIRCLE 14 ON READER CARD

hardware

KB/second. Dual access to the systems is offered as an option. A typical configuration of the smaller version, with 180-megabyte capacity, rents for \$2780/month on a one-year contract and will be available in the fourth quarter. A 728-megabyte configuration of the larger system rents for \$4125/month, also on a one-year lease. Deliveries begin early next year. XEROX CORP., El Segundo, Calif. For information:

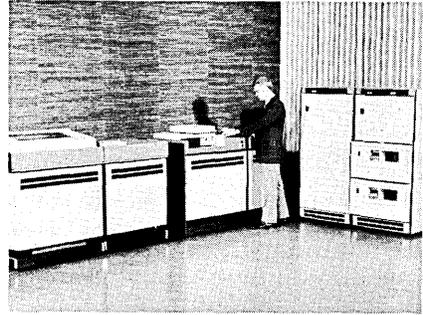
CIRCLE 260 ON READER CARD

Fifth Century Computer

NCR felt there was too large a performance gap between its Century 100 and 200 series computers and went back to the original designs for the 100 to see what could be done to beef up its performance. The result, the Century 101, is quite different from the Model 100.

The cycle time of 1.2 usec is the same for the processor, but that time now applies to two bytes instead of one as on the 100. And the memory size is expandable from a basic 16K up to 32K in 8K increments, and from there to 64K bytes in 16K increments—double the 100's capacity. The instruction

set has been broadened, and the 101 can handle higher performance peripherals, including 1200-lpm line printers and such disc units as the 655 (8.4 megabytes per unit) and 657 (59.6 megabytes per unit) previously offered only to Century 200 and 300 users. Synchronous and asynchronous com-



munications capability is also available on the 101.

A typical system, consisting of a cpu with 32K of memory, an 8.4-megabyte disc, 300-cpm reader, and 450/900-lpm printer, is priced at \$128,200 and rents for \$2750/month. Deliveries begin in the fall. THE NATIONAL CASH REGISTER CO., Dayton, Ohio. For information:

CIRCLE 253 ON READER CARD

Electrostatic Printers

Versatec engineers provide some interesting figures to explain the dramatic price drop in its latest product line. "The circuits that cost us \$1 merely six months ago are costing us 30¢ now." They also state that 80% of the cost of producing an electrostatic printer is tied up in circuitry, with the remainder in precision mechanical components. Those figures are reversed for mechanical line printers.

The LP-860 is an 80-column unit that prints a 64- or 96-character ASCII set at 600 lpm using 5x7 dot-matrix characters. It sells for \$3950. (This model is a direct replacement for the model 600, introduced just over two years ago, that was priced at \$6700!)

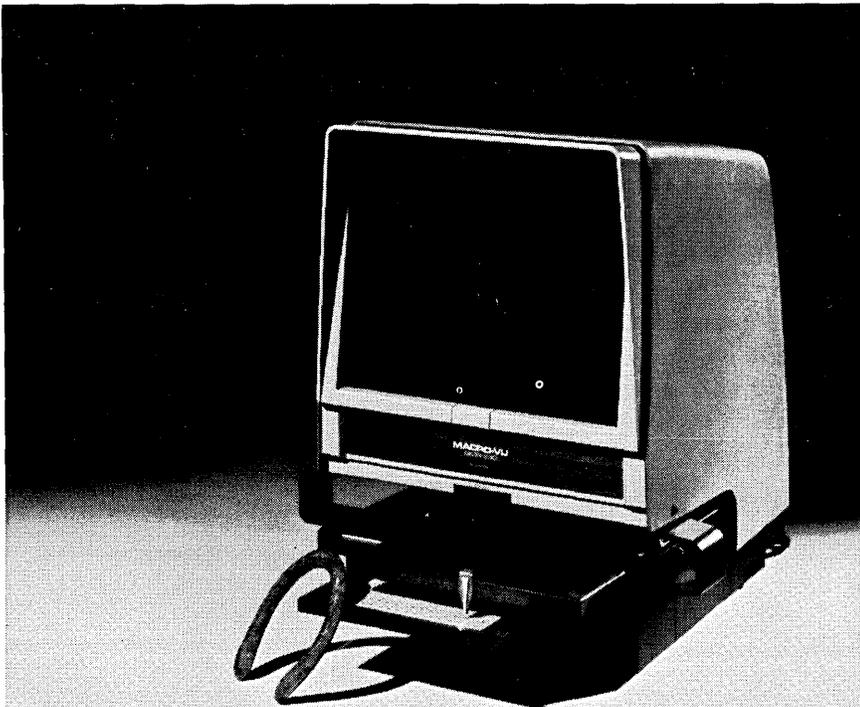
The LP-1150 is a 132-column model that prints 7x9 dot-matrix characters at 500 lpm. It's priced at \$4300.

There are 23 models of controllers available for interface to just about any minicomputer you can name. Prices start at \$900 for Hewlett-Packard 2100 minis and go as high as \$4500 for the Xerox Sigma series. Software support for these computers is included in the controller price. VERSATEC, INC., Cupertino, Calif. For information:

CIRCLE 259 ON READER CARD

Dual Processor Mini

Applications that require higher than average I/O throughput capacity, such as communications processing, data



If you can buy a better microfiche reader for less, good luck!

The GMR 230 is a sure thing! The lowest priced, most versatile, high resolution reader yet available. It reads all flat film and card sizes... with bright, sharp magnifications up to 48X. One GMR 230 does the work

of a cluster of less versatile units. For low price, easy maintenance, fast delivery and factory service, bet on the GMR 230...you can't lose. Send today for complete information and our winning price.

THE GMR 230 by *gakken* Corporation of America
17831 Sky Park Circle / Irvine, California 92664 / (714) 557-1080

Please send me complete information on the GMR 230 Microfiche Reader.

NAME _____

FIRM _____

ADDRESS _____

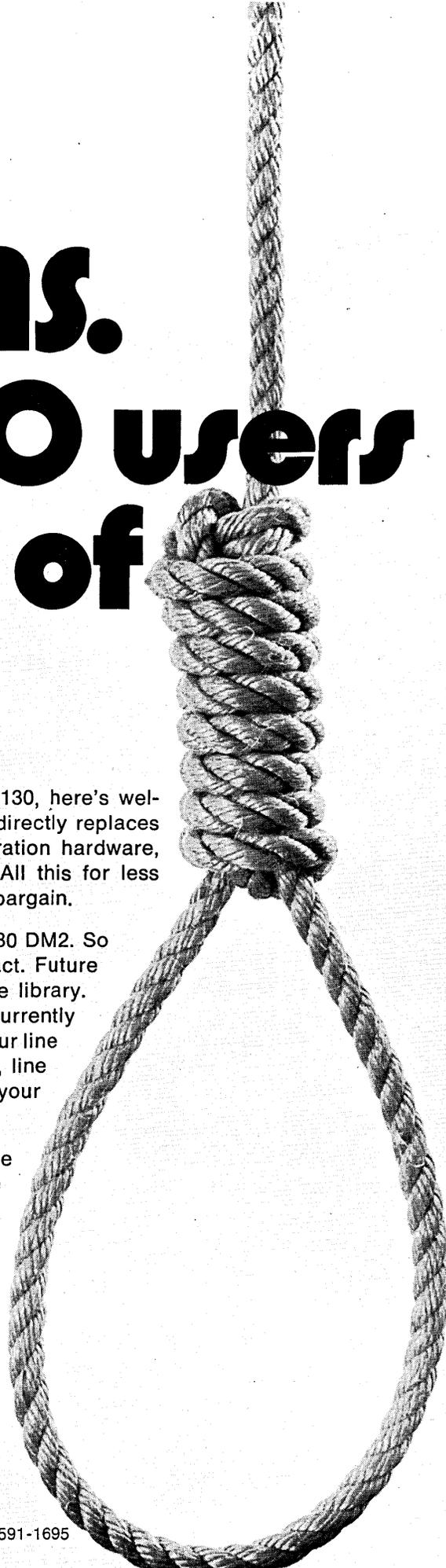
CITY/STATE _____

ZIP _____

Inquiries are invited for national sales representation and dealerships.

CIRCLE 39 ON READER CARD

The GA DMS. For IBM 1130 users at the end of their rope.



If you're at the end of your rope with a throughput-bound IBM 1130, here's welcome news: General Automation's 18/30 Disk Monitor System directly replaces the 1130. With increased throughput, faster memory, 4th generation hardware, expandability, even real-time and communications capabilities. All this for less than you're paying for your 1130. It's a true price/performance bargain.

GA's 18/30 DMS operates directly with programs written for 1130 DM2. So all of your existing software and programming effort is left intact. Future programs are probably already waiting for you in our extensive library. And you'll probably get at least five times the throughput you are currently getting on your 1130. What's more, you'll be able to choose from our line of faster peripherals — like mag tapes, big disks, card readers, line printers and plotters. It all adds up to a system designed to suit your needs for years to come.

The 18/30's role as a superior, economical replacement for the 1130 is a field-proven fact. A General Automation representative will be glad to show you why dozens of customers have already switched to the 18/30 DMS, and what it can do for you. To find out, give him a call. We maintain offices with complete field service and technical support in principal cities in the United States and Europe. And we're growing by leaps and bounds.

For more information on the 18/30 Disk Monitor System, write us today. We'll also send you your very own length of rope and a book, "Knots and Splices." All very handy for people at the end of their rope.



GENERAL AUTOMATION, INC.

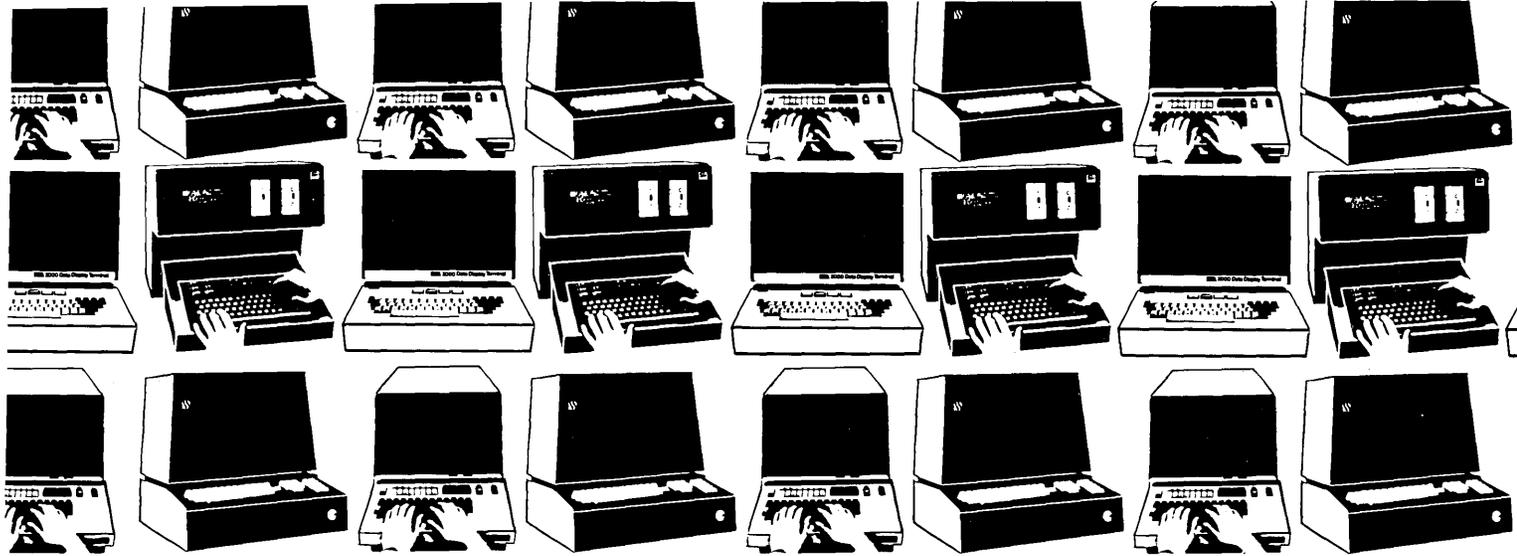
1055 So. East Street, Anaheim, Ca. 92805 (714) 778-4800 TWX 910-591-1695

'Discover The Value Of Power'

CIRCLE 52 ON READER CARD



**Computer
manufacturers know
all there is to know about
data entry. Right?**



Computer manufacturers know computers. But nobody knows data entry like data entry specialists. And Inforex is Number One.

Our key-to-disc systems are way ahead of keypunch. And key-to-tape. And other key-to-disc systems. Take our CRT key-station display. It's an Inforex first. Displays the full user-record at every keystation. Plus helpful system-generated messages that guide operators every step of the way.

Wrong. Nothing like it for accuracy.

And Inforex shared-processor systems give you a broad range of functions to meet data entry needs. Like balance totalling. Calculating and comparing check digits. Automatic pooling on 7- or 9-track compatible tape. Plus attractive optional features. Like On and Off Line Communications. Line Printing. 1600 BPI Tape Drives. Reformatting. Blocking.

It's modern data entry at its best. The kind of data entry you get only from Inforex. Which is one reason we have more shared-processor keystations on the job than anybody else.

Let Inforex upgrade your data preparation — and discover why we call it "a different world." Contact your Inforex Representative. We have offices in major cities throughout the United States, Canada, and Europe. Or write, Inforex, Inc., 21 North Avenue, Burlington, Mass. 01803.

 **INFOREX**

hardware

concentration, and message switching, are thought to be typical uses for the 1600D. The D stands for "dual," and the 1600D comprises two of Microdata's previously announced 1600 minicomputers. Up to 4K 16-bit words of control memory are available for each cpu, cycling at 200 nsec. The byte-oriented core memory, which is shared by each cpu, may be expanded up to 64K of 1-usec bytes. Each cpu performs 73 basic machine instructions.

The arithmetic is binary, with add and subtract operations built in.

Options for the 1600D include a number of peripheral subsystems, an alterable control memory, and I/O expansion chassis, and utility and communication interfaces. There are a number of software packages available, including assemblers and cross assemblers for both macro-level and micro-level programming, and a simulator for micro-level programming. A typical system, consisting of 64K of core, 4K of control memory per processor, and provision for 64 high-speed asynchronous

or synchronous lines, is priced at approximately \$30K. MICRODATA CORP., Santa Ana, Calif. For information: CIRCLE 257 ON READER CARD

COM Peripheral

The model 2100 alphanumeric COM system is offered as a direct replacement for the ubiquitous IBM 1403 line printer. Available in either on-line or off-line versions, the 2100 prints at 12,000-15,000 lpm rates on-line and approaches 10,000 lpm in off-line operation for standard 132-column, 66 lines-per-page format with forms overlay capability. Reduction ratios offered



are 24X, 42X, and 48X for either 16mm or 105mm cameras. Push-button controls select the fiche format, which may be in COSATI, NMA, DOD, or custom formats. In addition to the standard 64-character EBCDIC 1403 array, a Katakana character set is available. Prices start at \$31,600 (\$888/month unlimited usage) for the on-line model, including prime-shift maintenance. Delivery is 90 days. CALIFORNIA COMPUTER PRODUCTS INC., Anaheim, Calif. For information:

CIRCLE 256 ON READER CARD

PC Artwork Drawing

Since Gerber has been in the plotter business for some time, it seems logical that it would start packaging plotters and supporting hardware and software for specific vertical applications. The PC-740 artwork generation system is such a product, aimed at the growing number of companies wanting to draw their own circuitry masks. The PC-740 consists of a digitizer that is connected to a customer-supplied card punch, a controller, a card reader, and a 15 x 20-inch plotting surface. Absolute positional accuracy is $\pm .001$ inch with repeatability of $\pm .005$ inch at speeds up to 2.5 ips. Software includes a scaling subroutine, a calibration routine, mirror image rotation, and others. Prices start at \$75K, and delivery is approximately 120 days. THE GERBER SCIENTIFIC INSTRUMENT CO., Hartford, Conn. For information:

CIRCLE 261 ON READER CARD

(Continued on page 116)

She comes from a 170-million dollar corporation.

Just to keypunch for you!



She comes from Victor. She's the best temporary keypunch operator you can find, because she's bonded, insured, skill-trained, tested and thoroughly checked out in actual job situations. She's as bright as a butterfly.

With the business Victor does in office figuring machines, it's only natural that we'd also provide the best in temporary office help. Call on Victor for experienced systems conversion teams. For all your temporary office help: typists, statistical typists, 10-key and Comptometer operators, keypunch and switchboard operators. All assured to meet your satisfaction. That's a promise.



**VICTOR
TEMPORARIES**

Bright as a Butterfly

Division of Victor Comptometer Corporation. Chicago, Ill. 60618

CIRCLE 96 ON READER CARD



A new family- exclusively for OEMs

- P850M 1/2k - 4k with 3.2 μ sec cycle time
- P855M 4k - 32k with 1.2 μ sec cycle time
- P860M 4k - 32k with 840 nanosec cycle time

OEM Discounts up to 41%

The P850M is an easy to interface, low cost mini computer.

The P855M, with the possibility of DMA, Multiplex and MIDB channels, high speed arithmetic, memory protect and other options previously available only on the P860, is now one of the world's price/performance leaders.

The P860M, with all these features and its lower cycle time, plus the comprehensive software available with this family, is one of the most powerful mini computers on the market today.

The P850M comes with 15 interrupts; the P855M and the P860M have up to 63 hardware interrupt signals on 48 levels plus 14 software priority levels.

This new family represents quality and performance at interesting prices.

For full details, write or call OEM marketing:

Philips-Electrologica NV
P.O. Box 245, Apeldoorn, The Netherlands
05760-30123 Ext. 2709

Trust in Philips is world-wide.

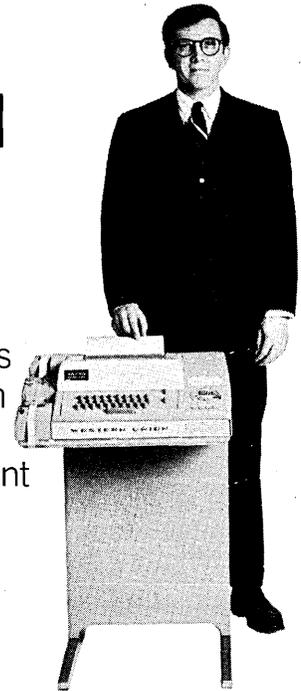
PHILIPS

Important news for computer

1. Your computer can now reach 100,000 TELEX and TWX subscribers.

Through the combined Telex and TWX networks, your computer or business machine can now communicate directly with over 40,000 TWX and 60,000 Telex subscribers in North America. The list includes every major company on the continent.

The interconnection is possible with interface equipment that Western Union installs in your office. It doesn't matter whether your company uses Telex, TWX or both. We can make the necessary installation to put your data processing equipment on the line.



2. Your computer can now automatically dial, send and receive messages.

Once Western Union has installed the interface equipment, your pre-programmed computer can automatically dial connections, transmit or receive messages. It will also disconnect and reset the circuit. The teleprinter associated with the interface can either be used in conjunction with the computer or separately when you choose to have the computer "blinded."

With the proper interface installation and appropriate programming, your computer can take over a wide variety of different tasks that call for up-dating and access from remote locations.

You can also use your computer to interconnect your own private wire system with Telex or TWX.

owners from Western Union.

3. Your computer can now transmit data and respond to inquiries.

A Western Union interface installation will enable your computer or business machine to automatically transmit and receive data to and from factories, warehouses, field offices, distributors, customers or suppliers and to handle routine inquiries from these and other Telex or TWX equipped locations.

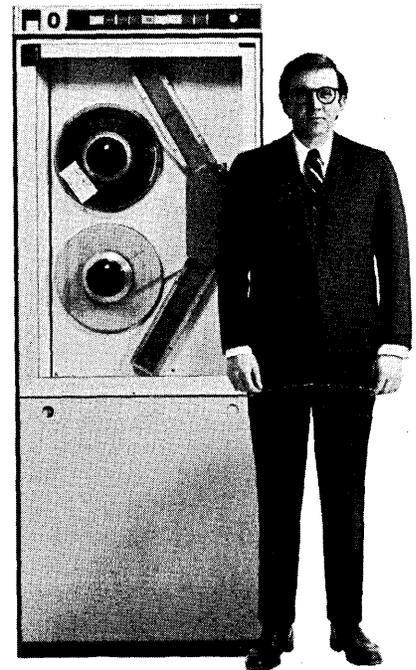
Western Union Interfaces can be used with virtually any general-purpose digital computer that has a "communications" front-end.

4. Your computer can now perform many different on-line activities.

Many companies are already utilizing the Telex/TWX network for automatic data communications. With Western Union interface installations, their data processing systems perform many different functions. A brokerage house uses it to locate lost securities. Railroads use it to locate freight cars across the country. Insurance companies use it to check out risk data on applications. Others use it for handling vendor inventory, processing orders for remote sales offices, and providing time-shared data facilities for many locations.

If you would like to put your computer in touch with the outside world, we'll be happy to tell you more about how it can be done for a modest monthly rental cost.

Contact your nearest Western Union office or write, call or wire Kendall J. Mau, Western Union Telegraph Company, 60 Hudson Street, New York, N.Y. 10013. Telex: 127251, TWX: 710-581-2159, Phone: 212-577-3898.



Western Union's TELEX/TWX Network.

Nationwide electronic data communications.

Binder Storage

Smaller than the well of a desk, able to be stacked up, down, or sideways, and capable of holding up to 3600 pages of listings, the Mini-Rack provides programmer-side storage space for nylon post binders. Priced at \$39.95, it offers convenient side or top access, and comes on casters. WILSON JONES CO., Chicago, Ill.
CIRCLE 272 ON READER CARD

Acoustic Enclosure

A sandwich of lead and foam is used in the walls of the 900 Series Silent Type acoustic enclosures. This reportedly reduces teleprinter noise by more than 90%. Model 910, for KSR teleprinters, runs \$139. Model 920, for ASR units, sells for \$179 and includes a fan. DATA TERMINALS AND COMMUNICATIONS, San Jose, Calif.
CIRCLE 273 ON READER CARD

3330-Equivalent for 65s

As of the fourth quarter of this year, IBM 360/65s can be configured with 3½th generation disc subsystems. Features announced for the 3670 make it possible to use it on Mod 65s and up, and to share that subsystem between several cpu's, including 360s and 370s. MEMOREX CORP., Santa Clara, Calif.
CIRCLE 270 ON READER CARD

Minier Minis

The giant of the minicomputer industry has announced a smaller version of one its bigger selling small machines. Called the PDP-16/M, the system comes in oem quantities for as little as \$895, uses read-only and random access solid state memory, and an assembler with only five instructions. Also announced was an end-user version of its most popular oem machine, called the PDP-8/F and priced at \$3990 with 4K. DIGITAL EQUIPMENT CORP., Maynard, Mass.
CIRCLE 271 ON READER CARD

MOS Memory Modules

MOS N-channel circuitry, as used in these 1K and 2K bit memory modules, will take over from P-channel circuits, according to this vendor. The 80 nsec access times quoted for these memory modules seem to back up the assertion, as that speed is sufficient to displace bipolar devices in many applications. COGAR CORP., Wappingers Falls, N.Y.
CIRCLE 275 ON READER CARD

TDM Multiplexor

Handling any data rate from 75 bps to the mega bps numbers used in infrared transmissions, the Multitran 1100 is transparent to the user, its maker claims. The machine offers remote loopback and on-line fault isolation in its base configuration at \$3550 plus sort charges. COMPUTER TRANSMISSION CORP., Los Angeles, Calif.
CIRCLE 276 ON READER CARD

Line Printer

Double print heads, operating in unison and printing in both directions, make this 132-character line printer capable of speeds to 125 lpm for full-width lines of 9x7 dot matrix characters. Offered for \$5390 on a onesies basis, the 102B will also likely see a good deal of oem use, just as its predecessors have. CENTRONICS DATA COMPUTER CORP., Hudson, N.H.
CIRCLE 274 ON READER CARD

360 Peripherals for 1108

A special interface-cable and peripheral-driving software modifications have been demonstrated which allow a Univac 1108 to talk to IBM peripherals, such as the 1403 printer. Peripherals are attached through the 1108's Multiple Subsystem Adapter. UNITED SOFTWARE CORP., Minneapolis, Minn.
CIRCLE 277 ON READER CARD

Smarter Intelligent Terminal

The Datapoint 2200 Version I was popular with an 8K processor and access time up to 500 usec. Version II offers from 4K to 16K of 500 nsec access memory, a second set of registers, and an interrupt facility. Those, with its peripherals, assembler, and DATABUS higher level language, put the \$185/month and up machine in a grey area between terminals and small-scale computers. COMPUTER TERMINAL CORP., San Antonio, Texas.
CIRCLE 278 ON READER CARD

Datum's Hassle-Remover

for any NOVA minicomputer that needs a magnetic tape system

Some benefits of adding tape to a minicomputer for economical bulk data storage can often be offset by the system engineering hassle. But DATUM's Model 5901 Magnetic Tape System is plug-in simple, economical and efficient.

Controls up to four NRZ and/or phase-encoded tape drives. All speeds from 12.5 ips to 75 ips, or a mix of any two. IBM-compatible, 7- and 9-track formats.

Basic system consists of a single tape drive, a formatter capable of controlling up to four drives, all interconnecting hardware and comprehensive software, including input/output subroutines, diagnostic and maintenance routines.

Prices start under \$8000. The know-how from building nearly 400 minicomputer-tape interfaces we throw in free. Delivery: 30 days. Save yourself a hassle. Call us.

(714) 879-3070

DATUM PERIPHERAL EQUIPMENT DIVISION

170 East Liberty Avenue, Anaheim, California 92801.

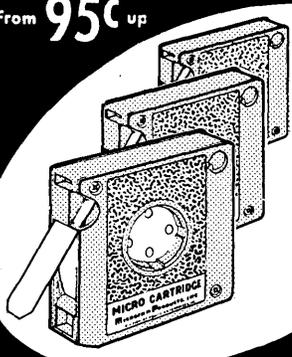
CIRCLE 76 ON READER CARD

MICRO-CARTRIDGES

PRICED LOWER

THAN ANY COMPETITION

From **95¢** up



THESE MICRO-CARTRIDGES OPERATE IN MOST MICROFILM READERS

3M — MicroReader — Dietzgen — Microscan — Ednalite — Northstar.

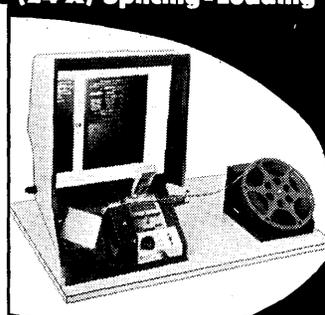
Supplies For Cartridges
LEADERS—TRAILERS—SPICING TABS—LABELS

Inquire for Prices & Literature on our
READERS—LOADERS—EDITORS

Motorized

Micro Editor-Loader

Large Screen Editing
(24 X) Splicing-Loading



Magnifies 24 times on 15 x 15 Screen.
Operates at either very high speed or continuous variable low speed range.
Will cut, splice and load 16 mm film INTO 3M or Recordak Cartridges.
Same for 16 mm or 35 mm film ONTO reels.
Instant braking of large supply reel prevents "piling up" of film when stopped.
Holds 1000 foot reel.
Winds 100 feet of film per 15 seconds.
Suction feet assures firm foundation.

Write for Brochures. Dealers Invited.

MICROFILM
Division of Equity Enterprises, Inc.

PRODUCTS, INC.

40 West 15th St., New York 10011
212-243-3443

CIRCLE 93 ON READER CARD

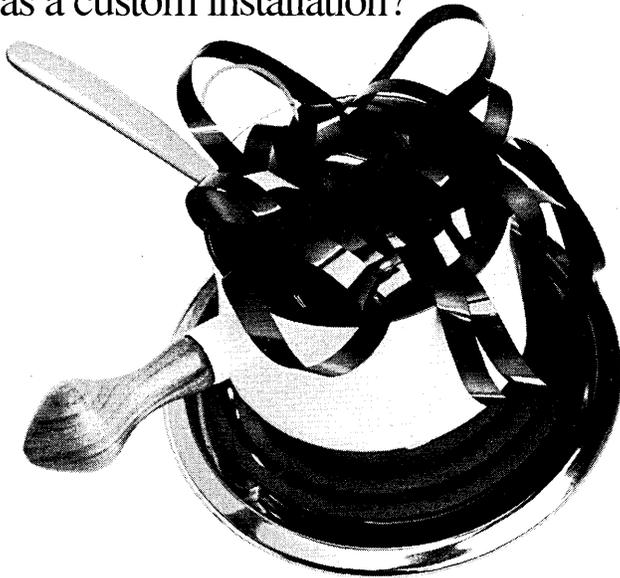
Is canned software as good as home-made?

When you buy Cybermatics' Tin Can,¹ you get a data communications system that's on line in a few months instead of the usual year or two.

You avoid the risks that go with designing from scratch.

And you pay a lot less than you would for custom-designed.

But the question still remains: Is this faster, cheaper, lower-risk system as good as a custom installation?



Stir well and simmer 18 months.



Just heat and serve.

The answer is yes. Tin Can software was developed by people who've built systems for giants like CBS and Western Union.

So you don't have to worry about speed, capacity,² or flexibility.³

Or about system overhead. We have specifically minimized system overhead in the Tin Can.

Tin Can software is also the most modularized ever designed. You can buy ready-mixed sets of modules for just about any kind of data communications.⁴ Or we'll mix modules to your order.

Oh, yes. One other nice thing about the Tin Can being a stock item: We can demonstrate it for you right now. Call us, Cybermatics Inc., at (201) 871-1300.

1. Modularized software and hardware in one package. The "can" is DEC's PDP 11 series of minicomputers with all the peripherals you need and Cybermatics' Real-Time Executive Operating System.

2. The basic Tin Can systems handle 64 circuits. Deluxe models up to 300. The basic model switches messages (for example) at 2500 characters per second.

3. We know of no common carrier service or terminal arrangement that Tin Can systems can't work with. They interface with public and private networks and handle all transmission languages, at whatever speed they're spoken.

4. The basic systems are Message Switching, Front End, Concentrator, On-Line Inquiry and Data Distribution and Collection.

Tin Can

Cybermatics' software/hardware package.

Software & Services

Software Notes . . .

The market for computerized hospital information services is currently about \$200 million annually and will increase to between \$800 million and \$1 billion by the end of the decade, says R. James Macaleer, president of Shared Medical Systems, King of Prussia, Pa. His firm currently operates in 12 states using a 370/155 to support its 80 hospital clients.

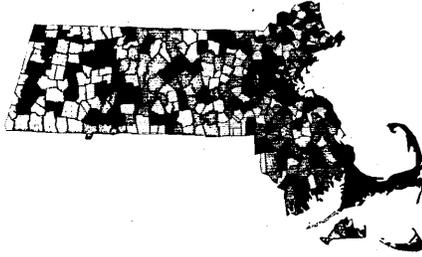
Last month's announcement that the position of a new planet in the solar system had been calculated culminated research that has spanned much of the computer age. "We were running programs on 7090s, on STRETCH, later on 6600s, and finally on a 7600," said Dr. J. L. Brady. Brady, a supervisor in numerical techniques at California's famed Lawrence Livermore Labs, headed a team that wrote programs to calculate where, and what mass, a body would have to be in order to explain deviations in the orbit of Halley's comet. The computer results subsequently explained the erratic paths of two other lesser known comets. Astronomers are now searching the region of the sky thought to contain the still-nameless planet.

Software supermarkets still have a way to go in establishing credibility, as the experience of one Southern California firm shows. Having successfully placed a number of its COBOL payroll package by direct sales efforts at just under \$10K each, attempts to sell it as a canned product for \$1500 have failed. And the firm claims that the only difference in the two products is that for \$9700 one gets a salesman to lean on while making the product work for the first time.

One software house that isn't having any problems selling its product is Pansophic Systems, Inc., of Oak Brook, Ill. The 500th installation of its PANVALET direct access library system to GTE Data Services, Tampa, has just been announced by Pansophic president Joseph A. Piscopo. PANVALET is used for storage, retrieval, maintenance, control, and protection of all data files, and JCL, source, and object decks on IBM 360 cpu's.

Map Plotting

Political campaign strategists could make good use of this FORTRAN IV CalComp plotter package. Called CALFORM, the program is described as producing "conformant and outline maps of spatially variable data," which means you could assign vertical cross-hatching to Wallace territory, horizontal cross-hatching to McGovern's, for instance, and black out those areas of Wallace's which might be expected to go to McGovern (reserving the time-consuming high-density plotting for



unlikely situations). Up to 12 levels of shading can be used to draw areas with up to 100 sides. An extra 130K of core is required, plus \$575. (Government agencies and universities get a discount to \$360.) LABORATORY FOR COMPUTER GRAPHICS AND SPATIAL ANALYSIS, HARVARD UNIV., Cambridge, Mass. For information:

CIRCLE 221 ON READER CARD

Statistical Analysis

Fifteen years of development work can be purchased for \$100 in the form of the extended statistical package called STATPACX. A competitor for UCLA's Biomedical series, the routines perform analysis of variance, regression and correlation, questionnaire evaluation, and discriminant function analysis. Claimed to be faster than the UCLA version, STATPACX also offers extra features in least squares analysis. Written in FORTRAN IV, it requires a 100K partition on IBM gear plus one disc, and comes with a money-back guarantee. UNIVERSITY SOFTWARE INC., Aliquippa, Pa. For information:

CIRCLE 222 ON READER CARD

IBM 7070/7074 Simulator

New software is still being written to support the rather old second-generation IBM systems. This package makes it possible to run 7070 or 7040 code under OS with no conversion. The old programs will run under OS right alongside newer programs; all that is required is that the operator load the simulator and key in the command for bootstrapping. Written in BAL, the simulator requires about 140K. The package sells for \$24,500 and leases for

\$1000/month after the vendor leaves it in the potential customer's shop for 30 days of benchmarking. Wonder if any of the 7040 jobs being run are 704 simulations? A. O. SMITH CORP., Milwaukee, Wis. For information:

CIRCLE 223 ON READER CARD

System/7 Program Generator

APG/7, Application Program Generator for System/7, has been introduced for use in creating programs for the 7 on IBM 360s and 370s. To use it, an engineer fills in the blanks on forms specially tailored for his application in monitoring or control. The program product, built on a subset of PL/1, not only creates a program for him, but also a list of reminders if steps in the control process have been overlooked. The resulting program can have segments coded in System/7 FORTRAN and assembler as well as the PL/1 subset.

APG/7, which will license for \$150/month, requires a bundled program library called Modular Systems Programs for the host computer. A simultaneous announcement allows for transmitting the resultant code directly to a System/7. Called System/370 Distributed System Program, the free support package is for attaching one or more 7s to a 360 or 370. IBM CORP., White Plains, N.Y. For information:

CIRCLE 225 ON READER CARD

Check Security

Numeric values are converted into their English equivalents by CHECKSAF to provide better security for check-generating applications. Using packed or unpacked data, CHECKSAF can be accessed through COBOL, PL/1, or assembly code on an IBM 360 or 370. Several versions of the written "translation" can be chosen, and it will be an unusual shop that pushes the program past its \$9,999,999.99 limit. An assembly language source is priced at Thirty-Three Dollars and No Cents. COMPUTER SERVICES CORP., Southfield, Mich. For information:

CIRCLE 228 ON READER CARD

Nova Disc Operating System

Hard on the heels of Data General's own real-time disc operating system (RDOS) announcement in April comes ALICE, a disc-oriented time-sharing system for Nova, from an independent. Requiring at least 8K of core and almost any kind of disc, ALICE offers extended BASIC as its principal language and supplements it with PRINT USING format controls from COBOL. The latter provide report generation,

**Our new 200
nanosecond RAM.
It's gonna
make the other minis look
a little sheepish.**



Introducing our new D-112H/SC 12-bit minicomputer. Using its semiconductor random access memory, it operates at a speed of 200 nanoseconds. Which makes it the fastest, most powerful general purpose minicomputer you can buy. Anywhere. At any price.

Speed is not the only card up our sleeve. Not by a long shot.

Take our flexibility. You can intermix both the super-fast semiconductor RAM and the 900 nanosecond core memory in the same D-112H/SC.

Special "look ahead" circuits recognize in which memory the next instruction is located, and then automatically switch the processor to the required time mode.

As we said. Impressive. Fast and slow memory cycles can be mixed in the performance of the same instruction.

But there's more. You get wider software capability like more I/O transfer instructions and more data manipulation instructions. The multiply/quotient 12-bit register is standard and can also be used as a second accumulator. You can decrement besides increment (memory stack handling) with 16 of the 24 available autoindex registers. The D-112H/SC is compatible with "8" software and you can hang on any I/O peripheral with ease.

And that puts all our cards on the table.

Why not send for all the information?

Digital Computer Controls Inc., 12 Industrial Road, Fairfield, New Jersey 07006, Phone (201) 227-4861.



**DIGITAL COMPUTER
CONTROLS INC**

Coming up fast.

Northeast: P.O. Box 209, Wakefield, Mass. (617) 245-6240; Southwest: 777 S. Central Expressway, Richardson, Texas (214) 234-3222; Northwest & No. California: No. 1 First St., Los Altos, Calif. (415) 941-0630; So. California: 16661 Ventura Blvd., Encino, Calif. (213) 990-1550.

software & services

string processing, and matrix operations. User accounting and security controls are built in. With Extended BASIC and a file management system, the package sells for \$5500, but other utility programs, CAI packages, editors, and translators can bring the price to nearly \$9000. EDUCATIONAL DATA SYSTEMS, Newport Beach, Calif. For information:

CIRCLE 229 ON READER CARD

IBM 1130 Spooling

Plotters and other slow output peripherals like card punches and paper tape punches can degrade the performance of an IBM 1130 unless some kind of spooling is used. This package in effect creates a multiprogramming environment by storing output records on disc to be called off under operator control. Written in FORTRAN and 1130 Assembler, it requires an 8K 1130 operating under Disk Monitor Version 2 and is available on a minimum six-month lease at \$375/month or for purchase at \$3750. TECHNOLOGY ENTERPRISES INC., Encino, Calif. For information:

CIRCLE 230 ON READER CARD

CICS Utility

Although it is mostly peddled as a tool for checking the status of direct access storage devices under IBM's CICS teleprocessing monitor, this utility can also be used in maintaining data files and for on-line allocations. It enables the operator or terminal user to display the status of the direct access devices currently on-line, the VTOC of a device, or the VTOC entry for just one data set. The user can allocate, scratch, or rename any data set and keep a log of his requests. It works under OS with two restrictions: It does not allocate ISAM files, nor can it handle IBM's Datacell. Satisfaction is guaranteed for \$500. A. B. BUTLER, Olympia, Wash. For information:

CIRCLE 233 ON READER CARD

DP Courses

A course called "Data Processing Forms—Design and Specification" and another called "Evaluation and Use of Software Packages" are available on standard 4-track audio cassettes with back-up workbooks and textual material at \$69.95 and \$49.95, respectively. The first covers input forms, output forms, control forms, and buying and stocking. The second goes into methods of approaching software packages, evaluation techniques, installation, and use. A V PRODUCTS, INC., Wakefield, Mass. For information:

CIRCLE 234 ON READER CARD

SBC Direct Access Feature
CALL/370 now provides capabilities for accessing disc files directly or sequentially with the addition of a Direct Access Feature that includes a MINIMIS indexed sequential package and some new BASIC statements. Programs are included for creating and maintaining indexed sequential files in a manner a la ISAM, and for retrieving, analyzing, and reporting information from the files. Part of a move to attract large-

scale data base customers, the feature was added at the same time that the time-sharing network was expanded to 43 metropolitan areas, 31 of which can access the national center in Cleveland. Both the Cleveland center and the one in Palo Alto offer 370/155 time at rates from \$11 per connect hour plus 15¢ per cpu unit (about a cpu second). SERVICE BUREAU CORP., New York, N.Y. For information:
CIRCLE 231 ON READER CARD

software spotlight

Data Base Management

ADABAS is an attempt by a German software firm to "take the 'blindens' off the American Data Processing Community." Though priced at \$120,000, the vendor claims that it has been successfully competing with IBM's IMS in Europe where IMS is free.

Other claims for it include that it can integrate existing files without reprogramming, has no restrictions regarding structure or sorting or data formats, can operate on-line or batch,

allows for dynamic field or record changes or growth, provides for check-point/restart (a *big* consideration), and has a multilevel security provision that makes even dumps unreadable. The BAL system does all of this, using sequential or random files, supported by only 110K on byte machines.

The Pentagon, which might be expected to like the security provisions, has reportedly requested a demo, but the Russians have already seen one.

Maintenance will be supported by importing one of the vendor's German staff members, but bugs are considered unlikely since the package has been operating successfully in Germany for a year. SOFTWARE AG, Reston, Va. For information:

CIRCLE 220 ON READER CARD

This is the time of year when many areas start getting hit with brownouts. It's also the time of year when you can see which systems use Topaz Line Regulators. The ones that do will ignore line fluctuations and function normally. The ones that don't might not. Will yours?

Available from stock.

**Brownout
doesn't have to be
a dirty word.**

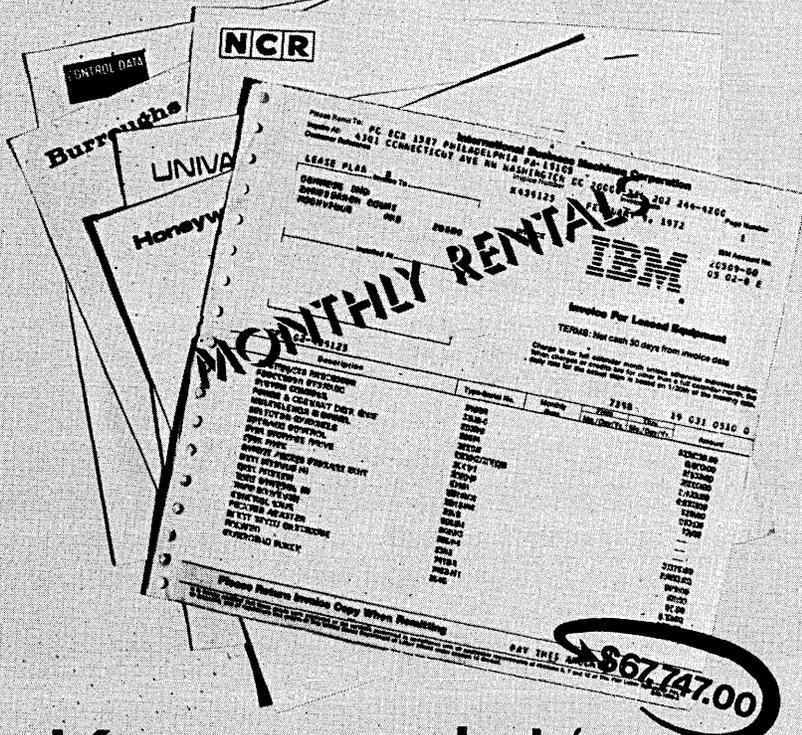
TOPAZ

TOPAZ ELECTRONICS
3855 Ruffin Rd. San Diego, Calif. 92123
Ph. (714) 279-0111 TWX (910) 335-1526

POWER CONVERSION EQUIPMENT • ULTRA-ISOLATION TRANSFORMERS • UNINTERRUPTIBLE POWER SYSTEMS

CIRCLE 28 ON READER CARD

For those who think computer simulation and monitoring are too complicated—



Keep payin' 'em.

The cost of data processing is not likely to go down. Hardware manufacturers will go on selling you as many high-speed widgets as they can turn out. And your firm will find more and more applications to computerize. That's as it should be.

So what do you do?

Your computer workload is double what it was five years ago, right? You've got a bigger system than you had last year, right? You'll need bigger and faster widgets next year, right?

Wrong.

You don't always need better widgets. Many users aren't running their systems at 50% capacity. You don't need more *hardware* . . . you need better *utilization*.

COMRESS is in the business of saving computer users from computer waste. We call it *computer performance evaluation*. We have tools which allow you to find out how efficiently your installation is running . . . how to predict configuration requirements based on projected workloads . . . how to "tune" your system for optimum thruput . . . how to design your applications to fit your system.

You've probably heard about two of these tools: **SCERT** (a computer simulation technique used for feasibility analysis, systems design, and hardware/software selection); and **DYNAPROBE** (a hardware monitor systems measurement device used to extract utilization data from the host system by means of electronic sensors).

If you'd like to beat the "faster widget" cycle, there is an alternative: *throughput optimization*. Hundreds of installations throughout the world are using **SCERT** and **DYNAPROBE** to do just that. (Space won't permit examples, but we honestly saved one client \$3 million in one RFP evaluation simply by proving, via **SCERT**, that the configuration requirements, as forecast by the manufacturers, were overstated. *Sound familiar?*)

Do our clients know what they're doing? Are simulation and systems measurement really worth the investment? Do they save that much money? Ask some of the real computer-usage pro's . . . people like Bell Labs, Marine Midland, Banker's Trust, Ford Motor Co., INA, Sun Oil, Dept. of Defense, State of California. Ask 'em about **SCERT** and "the Probe". *Before you upgrade again.*

Then call us. We'll be here. As long as the widgets, anyway.

For further information, contact:



COMRESS
Product Information Dept.
Two Research Court
Rockville, Md. 20850/(301) 948-8000

software & services

Disc Updating

All card-based data files, such as program libraries, JCL statements, and pure text, can be maintained on disc using the Source Program Update Disk System. A parameter card-driven system, SPUDS can add new books to the library, replace or delete statements, resequence, list program changes, transfer to other libraries, produce job streams, or produce output streams. SPUDS library files are organized as Private Source Statement Libraries, enabling the user to get to IBM's LIBRARIAN to perform other updating functions like deleting, condensing, and renaming. For IBM 360s or 370s under OS or DOS, the COBOL package sells for \$800 and needs 32K. COMPUTER GUIDANCE CORP., Downey, Calif. For information:

CIRCLE 232 ON READER CARD

Programming Courses

A 25- to 35-hour course on programming efficiencies is being offered for \$975. It uses 4 videotapes (for whatever videoplayer you have), 10 audio tapes, a student guide, and a minireel of case histories to lead the student to better COBOL coding. The course cov-

ers "efficiency" as based on six interacting and sometimes conflicting considerations: execution speed, module size, coding speed, maintainability, debugging speed, and compilation speed. Portions of the eight-unit course can be skipped by managers or systems programmers who don't need them.

A companion course in OS System Service Programs is also offered. Designed in three units, it covers: (1) the data set, system, and independent utilities; (2) sort/merge; and (3) linkage editor and loader. It runs 21 to 30 hours and sells for \$800. ADVANCED SYSTEMS INC., Elk Grove Village, Ill. For information:

CIRCLE 224 ON READER CARD

Table-Driven Payroll

There must now be more than one payroll program per adult American employed, and all different. This one accommodates the differences written into the others by being table-driven. The processing performed, deductions taken, and report formats all can be altered. A master file record is kept for each employee, but smaller subfiles are also kept for faster processing. The IBM 360 COBOL the package, called PAYMASTER, typically requires 90K but can run in a 53K partition. Priced at \$20,000 plus \$1500 installation for OS shops (no charge for DOS installations

except travel expenses), PAYMASTER can be augmented with a Personnel Information System for \$4K, a Labor Distribution Accounting System for \$3K, and a Mass Change Program—to handle changes in state laws, etc.—for \$1K. GENERATED SYSTEMS, INC., Wheaton, Ill. For information:

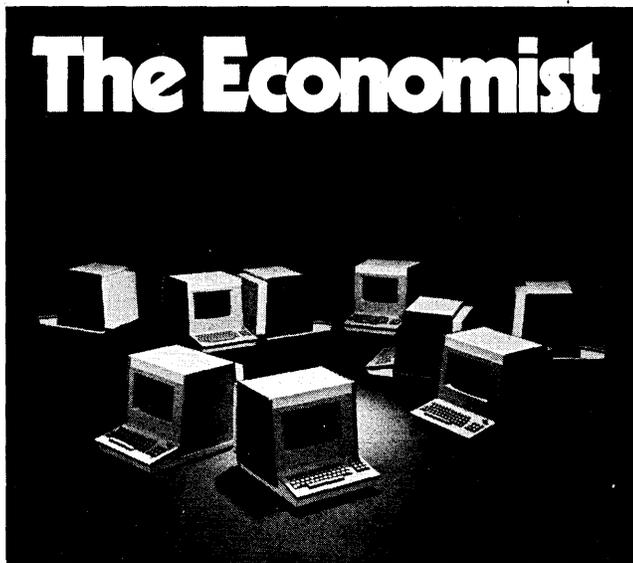
CIRCLE 226 ON READER CARD

Simulation and Forecasting

PROFILE is a three-module product that performs file building, risk analysis, and report generation to help in decision-making projects with a number of unknowns. Especially well suited for handling statistical summaries, the program employs Monte Carlo analysis methods and reports in graph or tabular formats. Its input and command language make BASIC look a little tough.

The package operates on a time-sharing basis on a DECsystem 10 at present, but 95% of its code is said to be in FORTRAN. (Several years of work were required to get FORTRAN to handle strings efficiently.) On the Digital Equipment machine it uses from 11K to about 30K. Priced at \$12,000 plus time and materials for installation, it will be maintained by mail. CORE & CODE, INC., Cambridge, Mass. For information:

CIRCLE 227 ON READER CARD



The Economist

A 16 terminal Wyle 8000 CRT cluster costs between \$30,000 & \$40,000. An equivalent IBM 2260/2848 checks in at \$80,000 to \$100,000.

When it comes to dollars & sense, the Wyle 8000 beats the 2260/2848 hands down.

First we introduced the "Bookie", New York City's off-track-betting-terminal. Now, the Economist, the do-more, cost-less cluster.

For expertise in CRT displays & terminals, look to Wyle Computer Products.

WYLE COMPUTER PRODUCTS, INC.

A Subsidiary of Wyle Laboratories
128 Maryland St., El Segundo, Ca. 90245 (213) 678-4251

CIRCLE 90 ON READER CARD

ARE YOU A MAN ON THE M-O-V-E?

FREE 28 PAGE ILLUSTRATED CATALOG

THEN SCHEDULIZE WITH MAGNETIC CONTROLS

MAGNETS MOVE FASTEST—AND EASIEST—OF ALL!

- YOUR LIVELY IMAGINATION
- +** OUR KNOW HOW
- =** A SYSTEM TO SUIT YOUR NEEDS

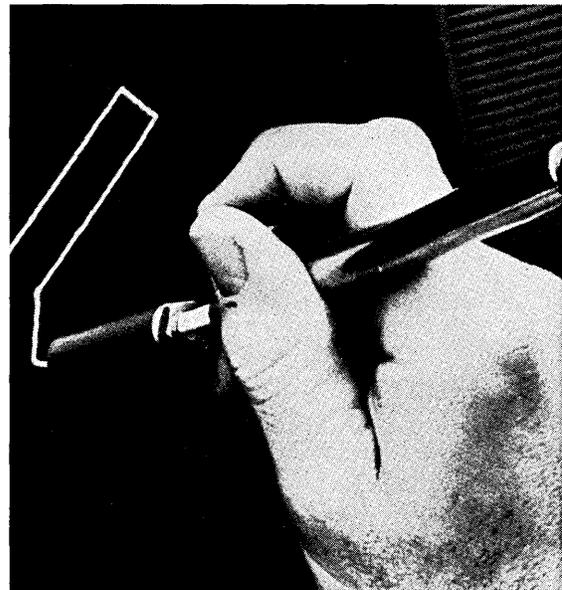
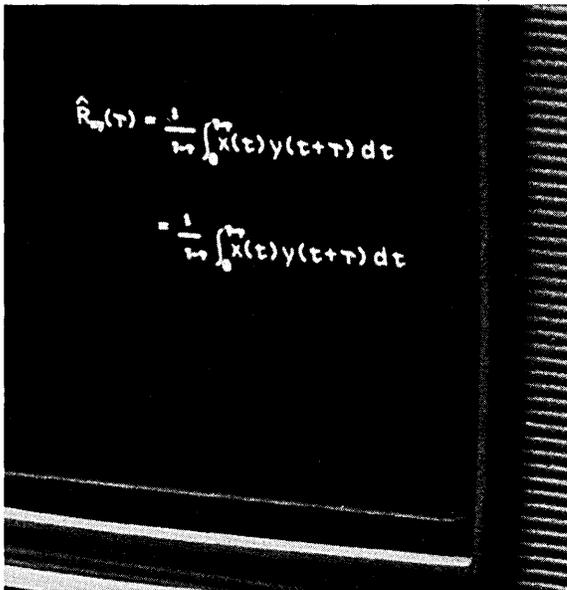
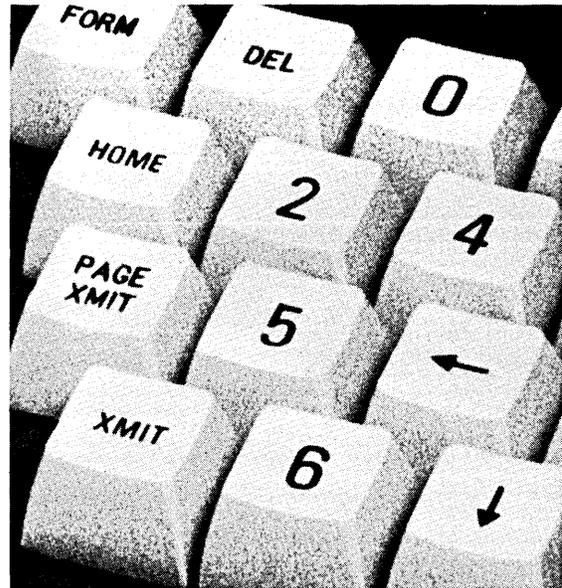
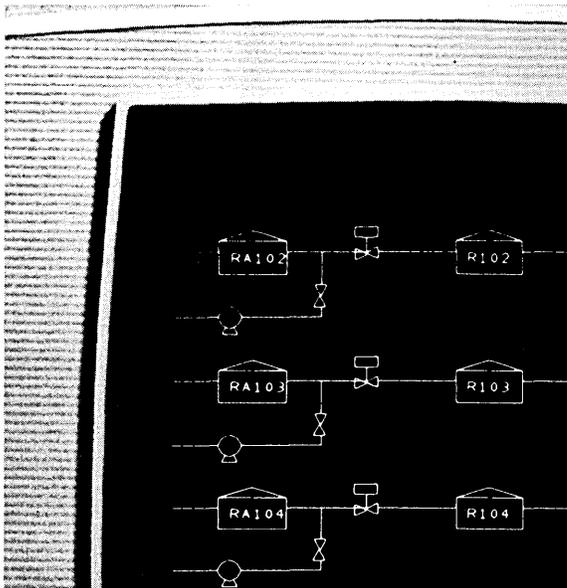
For Scheduling • Programming • Personnel • Sales • Shipping • Inventory • Maintenance • Production • Quotations • Computer • Special Situations

TELEPHONE 212-442-4900

METHODS RESEARCH

70 WILLOW AVE., STATEN ISLAND, N.Y. 10305

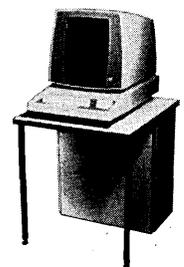
CIRCLE 62 ON READER CARD



The Refreshed, Interactive Graphics Display Computer PDS-1D (\$10,000)

- Refreshed CRT Monitor and Keyboard
- 16-Bit, 4096 Word General Purpose Mini-Computer
- Stored Program Display Processor
- Serial-Asynchronous Communications Interface
- Text and Graphics Editing Program
- Fortran Data Plotting Package for Host Computer

and—its memory is expandable to 32K □ it functions Stand-Alone or on-line with minimum burden on the host CPU □ optional peripherals include: Disk, Magnetic Tape, Cassette, Paper Tape □ it can be supplied with Light Pen, Mouse, Tablet or Joystick. A lot for a little. And, without obligation, IMLAC will perform an Applications Analysis to test the effectiveness of PDS-1D in your application. Call (617) 449-4600 or write IMLAC Corporation, 150 A Street, New England Industrial Center, Needham, Massachusetts 02194.



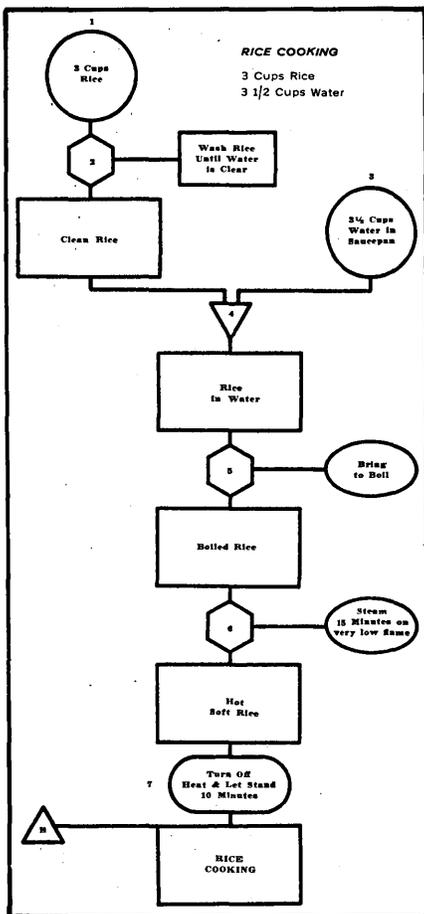
i IMLAC

INTERACTIVE INTELLIGENCE

Literature

Logic Cooking Japanese

A cookbook in flowchart form features 18 Japanese recipes—from rice to unagi donburi. It is designed to show the interrelationships involved in preparing a specific meal. The developer



explains that the logical-step approach makes it easier to understand exactly what ingredients and utensils to use at the appropriate time. It's an interesting and, well, logical alternative to the paragraphs that explain most recipes. All terms and symbols are defined. Price: \$2.50. K. KANDA & ASSOC., P.O. Box 490, Kent, Wash. 98031.

Dragon Tamer

"Mr. Datafella's Dilemma and How the Man from Tran Tamed the Trunk Dragon" is a 14-page brochure chronicling the misadventures of a hypothetical data processing manager who finds himself thrust into the communications business by growing demands from his remote terminal users. It tells of his rescue from a cabling dragon that threatens to engulf his cpu. COMPUTER TRANSMISSION CORP., Los Angeles, Calif. For copy: CIRCLE 201 ON READER CARD

Technical Courses

A broadened technical training program offered by a vendor of computer-based remote control and telemetry equipment is described in a bulletin which covers courses in basic electronics and data transmission; theory, operation, and maintenance of a solid-state supervisory control system; introduction to computers; and computer programming and maintenance. QUINDAR ELECTRONICS, INC., Springfield, N.J. For copy: CIRCLE 202 ON READER CARD

Obsolescence and Education

A talk on "Avoiding Obsolescence in Data Processing Through Training and Education," delivered to the Central YMCA Community Colleges Evolution of Data Processing series, has been taped, and cassettes are available for \$10 with a text of exhibits which accompanied the presentation. Topics covered include: the relationship between hardware and software complexity and education; custom-made education; available resources and their drawbacks; and a look into the future. INTERNATIONAL COMPUTER EDUCATION CORP., P.O. Box 674, Chicago Heights, Ill. 60411.

Spring Book List

Spring '72 publisher's catalog features 22 new books on data processing and management sciences. Topics include automatic photocomposition, digital plotters and image digitizers, computer output microfilm, microfilm readers/printers, data collection systems, information processing management, product planning, operations research, a PL/1 approach to computer programming, and the best computer papers of 1971. AUERBACH PUBLISHERS INC., Philadelphia, Pa. For copy: CIRCLE 203 ON READER CARD

Basic Systems Course

"Your Career in Systems Analysis" is an eight-page brochure describing a VA-approved, 122-hour home study program covering management process, systems survey, analysis and design, systems documentation, data and forms, and management use of edp. SYSTEMATION, INC., Colorado Springs, Colo. For copy: CIRCLE 204 ON READER CARD

Large Core Store

Eight-page brochure describes an extended core memory system for use

with IBM System/360 models 50 and up which replaces or augments the IBM 2360 large core store unit, has a cycle time as low as 1.8 usec, and is available with storage capacities from one-half million to 2 million bytes. DATA PRODUCTS, Woodland Hills, Calif. For copy:

CIRCLE 205 ON READER CARD

Data Conversion

A full line of data conversion products and systems, including computer-compatible data converter instruments assembled from standard modules, a range of modular packaged ADC's and DAC's, and a sample-and-hold module, is covered in a brochure which lists specifications and prices. XINCOM CORP., Chatsworth, Calif. For copy: CIRCLE 206 ON READER CARD

Card Reader

Brochure describes a card reader it says provides virtually error-free read rates of up to 600 cards per minute. It covers operation, performance, and specifications of the reader, which incorporates a proprietary assembly using only one moving part to handle such traditionally error-prone functions as picking a single card, transporting the card past a read station, and stacking. TRUE DATA CORP., Newport Beach, Calif. For copy: CIRCLE 207 ON READER CARD

Language Translation

A 22-page booklet called the DUAL (Dynamic Universal Assembly Language) Digest gives an introduction to the applications of meta processing. The cross assembly, source-to-source translation, macro processing, and higher level language generation capabilities of DUAL are covered; and more than 75 meta processing directives and functions are described. INTERNATIONAL COMPUTER SYSTEMS INC. For copy:

CIRCLE 208 ON READER CARD

Guinea Pig Report

In an application note titled "Dedicated Time-Sharing Fills Multitude of Management Needs," a manufacturer of computers describes how it has been its own guinea pig, using its systems in-house for a variety of applications. HEWLETT-PACKARD, Cupertino, Calif. For copy:

CIRCLE 209 ON READER CARD

It's a matter of Bits, Bytes, & Bucks.

Our subsidiary, Marshall Data Systems, started something with the 2900 Disc System.

Twice the storage capacity for the money. Plug-in compatibility with both 360 and 370, of course.

But then that's got to be the way when a company makes peripherals its first business, which MDS does.

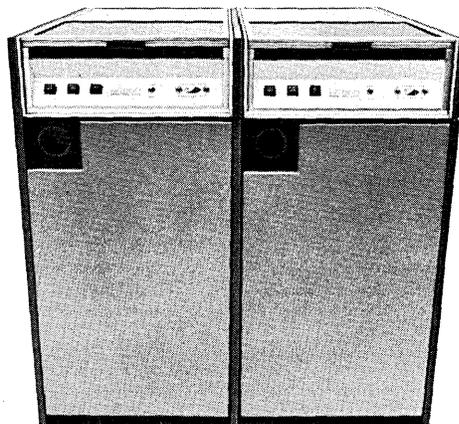
So while the rest of the industry plays catch-up, we invite you to consider our line of disc drives. The same goes for tape drives and printers.

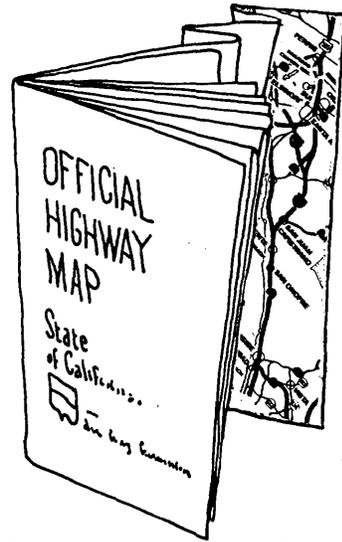
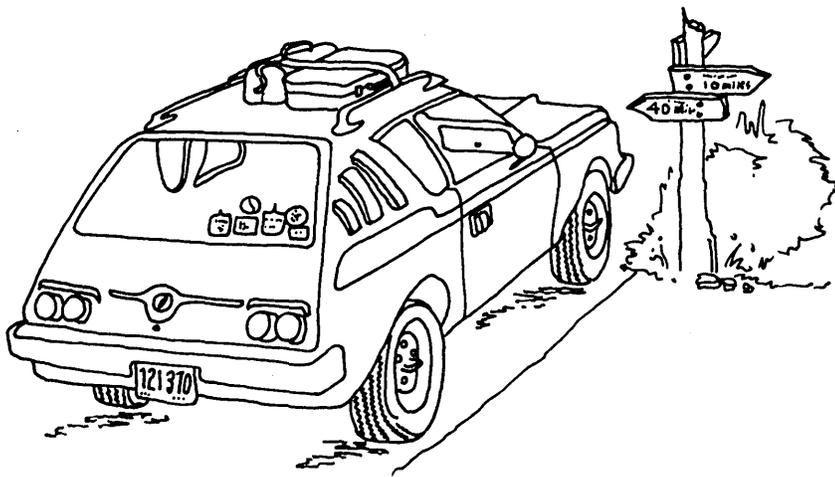
You ask, we'll come and get specific in terms of your operations. In fact, our man will bring a disc system worksheet to detail and analyze true comparative costs of disc systems available to you. Just write or phone our nearest office collect.

In seven years, we've come on to be the largest independent maker of peripherals, and we're out to earn your business.

Mohawk Data Sciences Corp.,
Palisade Street,
Herkimer, N. Y. 13350. **MDS**
Phone (315) 867-6610.

MDS is moving in plug-to-plug.





If you want
to save time
on a trip...

You need
the right
road map.

If you want to save time selecting
computer products and services...

You need the new 1972 EDP Industry
Directory from Datamation.[®]

It's even easier with the new edition of Datamation's directory to find just the product or service you want. We've changed the product groups, based on user experience with the first edition... added states to the consultant and service bureau entries, so you can see quickly if your area is covered... and put product page references for each vendor in the company index.

Most important, the new edition gives you over 20,000 products and services... 2,500 vendors to choose from. All of them are sorted, arranged, and indexed for convenience... in the form of compact listings that show clearly the vital information — prices, maintenance cost, compatibility features, languages. And cross-checking with a company index makes it simple to find

out about the seller's facilities and services.

To get your own copy of the directory, send a check or company purchase order for \$25,* along with your name, title, and mailing address, to 1972 EDP Industry Directory, Technical Publishing Co., 1301 S. Grove Ave., Barrington, Illinois 60010.

**In the U.S. and Canada; \$35 elsewhere.*

Introducing the electronic hardcopier, ... a revolutionary

Infomax takes the optics out of CRT image reproduction. The new desktop Model 76 Electronic Hardcopier creates 8½" x 11" copies directly from standard RS-170 video signals. The copies are clean and clear, with none of the fuzziness or distortion inherent in photo/optical reproduction of images from CRT tube displays. And, just a single wire connects your CRT terminals to our Electronic Hardcopier, ... no interface electronics or "controller" required.

non-optical CRT image reproduction system.

The Model 76 is one of a new family of OEM electrostatic reproducers from Infomax. These new plotters and printers combine high performance with very low cost through a patented image reproduction technology developed over three years of research.

Contact Barry Gottlieb at 408-738-3140 (or, by mail, at 757 N. Pastoria Avenue, Sunnyvale, California 94086) for a detailed technical brochure.



LEASE complete computer systems, peripheral equipment and software

Scientific Leasing Inc. (SciLease) offers both standard systems and specialized configurations of large-scale installations and mini-computers to meet your specific EDP requirements. Individual units or groups of peripheral, terminal, data preparation and communications gear—and appropriate software — are also included within the comprehensive Scientific Leasing plans. ALL new equipment, with warranty in force, offered by ANY manufacturer, may be leased.

By using our long-term flexible lease plans considerable savings can be realized over manufacturer's own rental plans. By working with Scientific Leasing you profit from the resources and experience only to be found within a professional organization which specializes in technical equipment leasing.

For further details, we invite your inquiry.



scilease

SCIENTIFIC LEASING INC.

FOUNDERS TOWER, FOUNDERS PLAZA, EAST HARTFORD, CONN. 06108

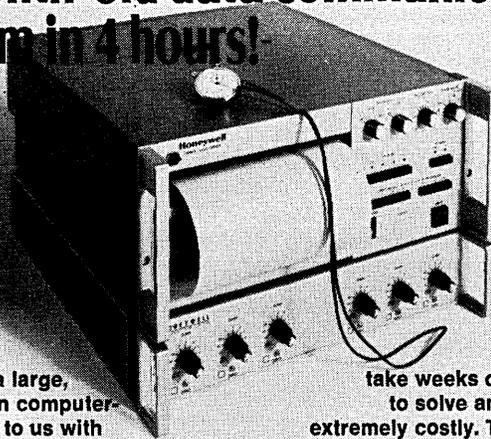
TELEPHONE (203) 528-3400

CIRCLE 75 ON READER CARD

This Honeywell System solved a 6-month-old data communications problem in 4 hours!

Recently, a large, Midwestern computer-user came to us with a data transmission problem which had been plaguing him for six months and had cost him thousands of dollars. We solved the problem in 4 hours. While only a small percentage of all data transmission problems involving message integrity are this major, these are the ones that

take weeks or months to solve and can be extremely costly. These are the kind of problems we can isolate . . . in minutes. And save you money in the bargain. Let us prove what we say. Call Robert L. Shipman 303-771-4700 or write MS-218, Honeywell, Test Instruments Division, P.O. Box 5227, Denver, Colorado 80217.



Honeywell
The Automation Company

CIRCLE 53 ON READER CARD

Communications Systems

A 30-page general information manual on communications systems was designed to aid those faced with the task of implementing a data communications system. It begins with an introduction to data communications terms and techniques, then covers methods of integrating computer hardware and software into a total communications system. EMR COMPUTER, Minneapolis, Minn. For copy:

CIRCLE 210 ON READER CARD

S/3 Card Readers

Eight new high-speed card readers for System/3 users are covered in a five-page brochure. Included are units to read 80-column cards, stub versions of the 80-column card, 96-column cards, and the new topless 96-column cards. BRIDGE DATA PRODUCTS, INC., Philadelphia, Pa. For copy:

CIRCLE 211 ON READER CARD

Conference Proceedings

Proceedings of the International Conference on Information Science held last Aug. 29-Sept. 3 in Tel Aviv is available for \$28. Sessions covered: international and national information networks; information systems for specialized applications; information analysis; economics of information systems; evaluation of retrieval effectiveness; selection, education, and training of personnel; publishing and reprography; commercially available services; and processing for automation. THE NATIONAL CENTER OF SCIENTIFIC AND TECHNOLOGICAL INFORMATION, 84 Hachashmonaim St., Tel Aviv, Israel.

Interface Simplified

Application note provides technical data to simplify the interface design for vendor's D5000 disc drive. It suggests techniques which simplify integration of the drive into a system and provides technical specifications for the drives themselves. PERTEC CORP., Los Angeles, Calif. For copy:

CIRCLE 212 ON READER CARD

Ten CRT Terminals

Ten crt terminal models offering parallel, serial, polling, and tty replacement interfaces are described in an eight page brochure which includes prices, specifications, options, features, and details of modular design. TEC, INC., Tucson, Ariz. For copy:

CIRCLE 213 ON READER CARD

Model 236

132 columns at 200 lpm
96 columns at 300 lpm
48 columns at 600 lpm

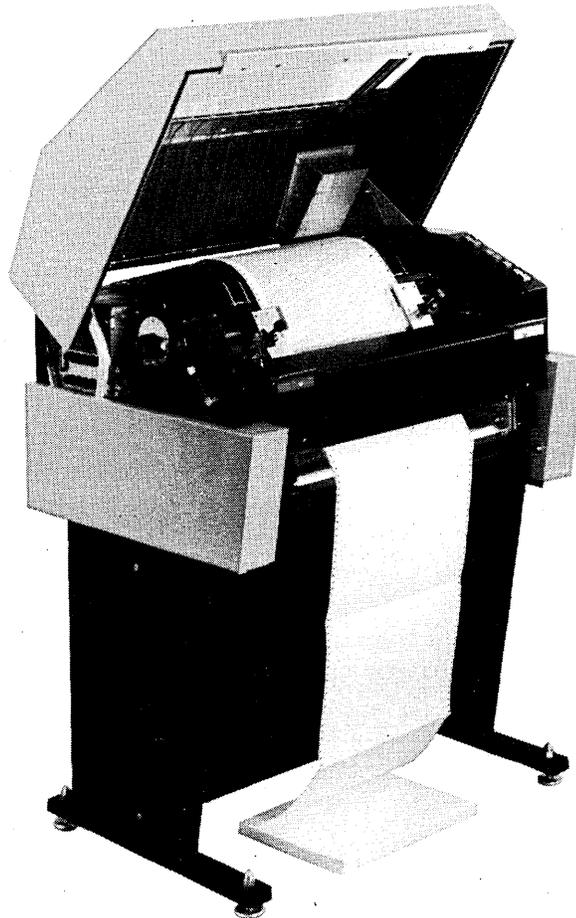
Model 306

132 columns at 300 lpm
72 columns at 600 lpm

64 characters
8 channel V.F.U.
3½" to 19½" paper width
Single line memory

**Our
newest
line
printers:
OEM priced
from \$5,500.**

Most parts, assemblies and modules used in Model 236 and 306 are from our established product line with its proven reliability. They are both plug compatible with our 600 lpm V-132-C printer.



Data Printer Corp

Executive Offices: 201 Vassar Street / Cambridge, Ma. 02139 / (617) 492-7484 / TWX 710-320-0868

Regional Office: 1110 East Ash Avenue / Fullerton, California 92631 / (714) 871-7665

Regional Office: P.O. Box 578 / Clifton, New Jersey 07012 / (201) 777-0135

United Kingdom: Core / 852 Brighton Rd. / Purley, Surrey CR 2 2BH / England

Europe: Core-Computer Related Equipment Limited / 6000 Frankfurt (Main) / Korberstrasse 12

The Thorson Company / Sales representatives in the following cities:

Albuquerque / Dallas / Denver / Houston / Palo Alto / Phoenix / Seattle

People



Jacob C. Rabinow

JACOB C. RABINOW joined the National Bureau of Standards recently and LEW BRANSCOMB left it, partly for the same reason: each wanted a change.

Branscomb, the Bureau's director since 1969, was named vp and chief scientist of IBM, succeeding DR. EMANUEL PIORE, who is retiring.

Among "curiosities" Branscomb hopes to explore in his new job: How can automation be made more acceptable? He suspects the answer may be a new system design approach which gives the operator more decision-making power, and increases his motivation in the process. Microcircuitry is another. The low cost of LSI, he says, makes it technically possible to build control devices with complex internal logic. One question is whether the circuits can be made reliable enough for applications where even an occasional failure would be serious. One such application is air cushion protection systems for cars, where LSI could be used in the trigger mechanism.



Lewis M. Branscomb

Jake Rabinow was appointed chief engineer in the NBS Institute of Applied Technology. He had been a Control Data vp and research director of the company's OCR division. Shortly before he left, CDC closed its OCR lab, reduced the engineering staff, and made Rabinow an assistant to VINCE TAUBER, who was brought in from IBM to head CDC's OCR division. Rabinow, who initiated this reorganization, emphasized he "remains on the friendliest terms with the Norris gang." But if there is no enmity, there isn't much opportunity. As Rabinow puts it: "The economics of the OCR business no longer permit much basic research."

Lightning may never strike twice in the same spot, but sometimes it comes close. Insiders at Raytheon Data Systems (RDS) in Norwood, Mass., say that operation was looking more and more like a microcosm of what was happening a year or so ago nearby at RCA's computer division in Marlboro, Mass. Many felt RDS president MAXWELL O. PALEY, an ex-IBMer, was trying to remake RDS into a mini-IBM just like Ed Donegan tried to do so unsuccessfully at RCA. At Raytheon, however, the ship was saved and the captain lost. Paley has resigned. The company reports, though, that most of the ex-IBMers he hired remain. During the brief 14-month Paley reign, the company lost two key old-line executives—ANDREW HUSON and SIDNEY TOPOL—who were credited with nearly bringing the sprawling conglomerate's computer operation into the profit column. DR. JOSEPH D. SHEA, a senior vp of the parent Raytheon Company, remains as board chairman; and the new president is J. THOMAS MARKLEY, who was most recently with Raytheon's Equipment Div. and who had spent 13 years before that with NASA.

FILM is the thing for data processing

Columbia's new SF-100 reusable film ribbons are made in a variety of writing intensities for all computer and computer related applications. SF-100 ribbons give the closest approach to the wear of a fabric ribbon ever achieved in a film ribbon. There's even a ribbon that will give two color printout with one pass through. Use coupon for more information.

Columbia DATA PROCESSING RIBBONS



MYLAR—A Registered Du Pont Trademark

Columbia Ribbon & Carbon Mfg. Co., Inc.

Herbhill Road, Glen Cove, N.Y. 11542

Please send more information about

- All data processing ribbons
- SF-100 red and black computer ribbon

NAME _____

COMPANY _____

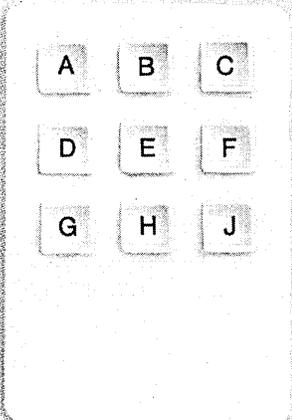
ADDRESS _____

CITY _____

STATE _____

ZIP _____

CIRCLE 16 ON READER CARD



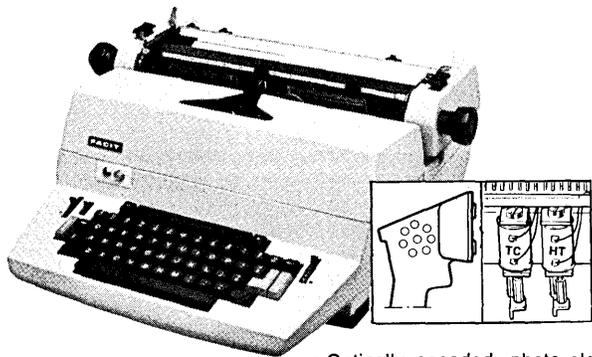
With this cardkey and code, a thief could get into San Quentin.

Our Memori-Lock™ is the catch. First he has to steal the card, then get the code. But that's committed to memory by the rightful card holder. It's an access control system that's hard to beat. And so is its price.



P.O. Box 369, Chatsworth, Ca. 91311 • (213) 882-8111

CIRCLE 91 ON READER CARD



**FACIT 3851
INPUT/OUTPUT
TYPEWRITER**

- Optically encoded, photo-electric read-out that provides parallel binary output signals.
- Electro-mechanical decoding of parallel binary input signals.
- Remote controlled Tab set and Tab clear
- Full upper and lower case and read shift.
- ECMA 6/ US ASC II code standard. Other Codes optional.

Facit Odhner Inc.
501 Winsor Drive
Secaucus, N.J.

D-6



Gentlemen:

I am interested in receiving detailed data on your Input/Output Typewriter

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

CIRCLE 35 ON READER CARD

PAUL J. BULVER is a quiet, retiring mechanical engineer who for 12 years—most recently as vp-engineering—has provided much of the technical guidance to build Control Data Corp. into a formidable computer peripheral manufacturer. Early in January, when CDC was planning its joint venture with the National Cash Register Co., Bulver was picked to head a jointly owned firm that will make peripherals for the two firms. As head of Computer Peripherals, Inc.—the new firm's name—Bulver will have to combine diplomatic skills with his engineering know-how to bring the two firms together, a task involving the shift of some NCR Dayton workers across the state line into Pennsylvania where CDC makes tape and card readers, and into Rochester where it makes printers.

Bulver, a native of Minnesota who left Univac in 1960 to join CDC, envisions a "lot of hard work but not too many problems" in his new post as head of the firm, which will be based in Edina, a suburb of Minneapolis.

Over in Chippewa Falls, Wis., another CDC veteran—the man who designed its supercomputers—was preparing to pack and leave, sort of. SEYMOUR CRAY said he was phasing out of his full-time association with the



Seymour Cray

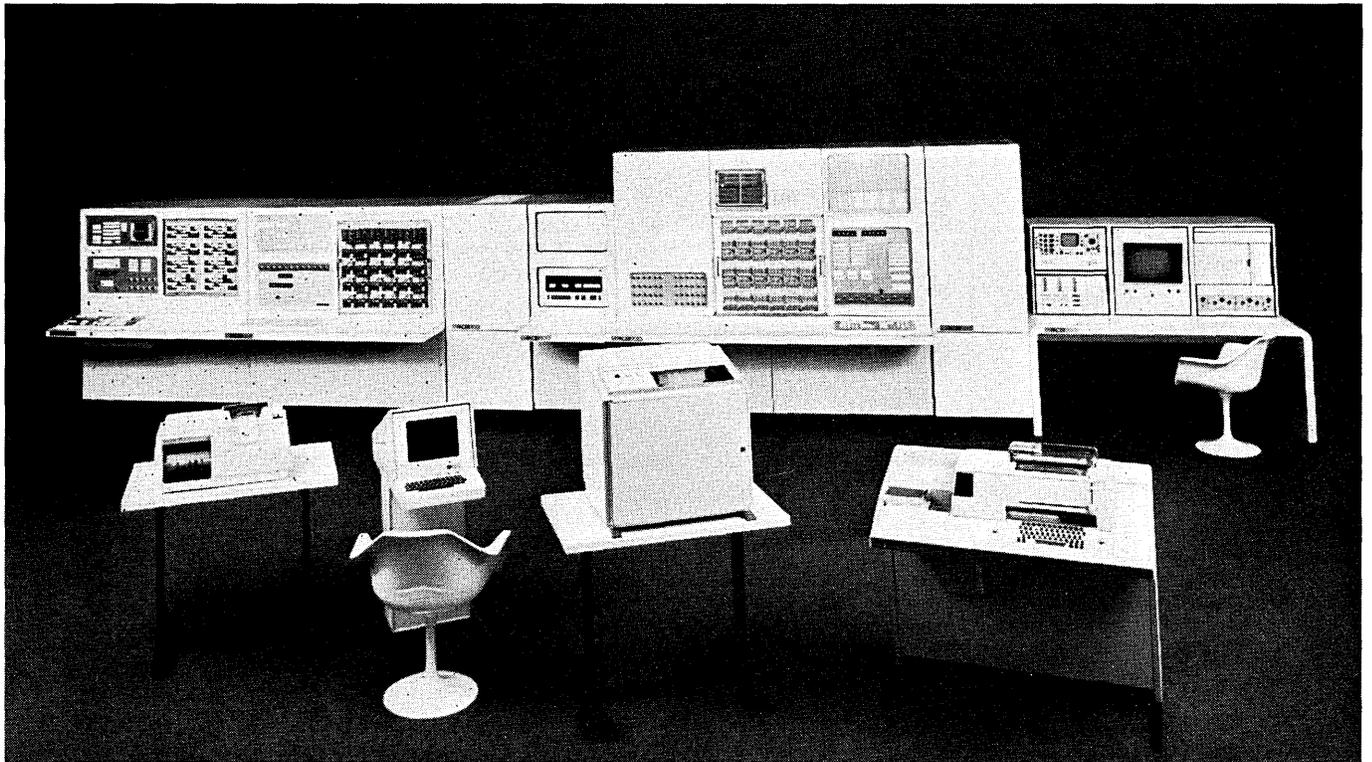
company to form a "very small" computer research laboratory in which CDC might have an interest. (It's reported Cray and ex-CDC associates have raised \$500K.) Cray said he was leaving because he felt CDC's strengths in supercomputers "are firmly established on which to build for the future." But insiders say Cray, who has operated with fierce independence for more than 10 years in the remote lab overlooking the Chippewa River, resented CDC's increased emphasis on developing immediately marketable products, the firm's reluctance to fund all of Cray's projects, and even the fact that he had to leave his secluded lab to attend quarterly board meetings in Minneapolis.

But he'll continue to serve as a consultant. That announcement and the indication that CDC might be one of his backers in the new lab led one CDC spokesman to observe that "it isn't a divorce, just separate bedrooms."

Computer industry marketing veteran JOSEPH W. ROONEY is back in the service bureau business. Rooney has been named executive vice president of the Data Processing Div. of Intel Corp. He had been president of the Data Processing Div. of RCA's Computer Systems Group—one of the ex-IBMers brought into RCA by L. Edwin Donegan, Jr. Before joining RCA Rooney was general manager of the time-sharing business of IBM's Service Bureau Corp., and he says his new job will be similar to that except he'll be dealing with commercial services instead of scientific.

Hopefully, for his new job, Rooney's executive and marketing abilities will be all he needs, and he won't have to call on that extra ability, diplomacy, demanded by his last position. While with RCA, Rooney handled a job that would tax the most seasoned diplomat, that of representing the RCA Computer Div. at a meeting of its users a month after RCA announced it was withdrawing from the computer business. One of Rooney's first major tasks will be to establish the division in the turnkey-type on-line services field. □

EAI Presents Three New Computer Systems Named PACER.



Who Needs Them?

Engineers and scientists. That's who. Because there's never been anything like the PACERS. For speed and productivity. In simulation. Optimization. Design. Control. Data reduction.

So hang in there till you've seen the PACERS.

Because PACER systems provide more engineering and scientific design problem/solutions per day or per dollar—by far—than any alternative computing system.

All three PACERS are based on a brand-new, fourth-generation, stored-program digital processor. This will help you get even more out of a slew of new, high-speed parallel processors.

And the systems are modular. With op-

tion after option. Plus all the interfaces and peripherals you'll need or want.

We could go on about features. About our library of scientific programming. It's undoubtedly the most useful there is.

The important thing is for you to see the PACERS.

Next best, of course, write or phone for our brochure.



Electronic Associates, Inc.
185 Monmouth Parkway
West Long Branch, New Jersey 07764
(201) 229-1100

DU PONT ANNOUNCES COMPUTER PRINTER RIBBON OF "MYLAR"*

With computer printer ribbons of Du Pont MYLAR® polyester film, the write starts out sharp and black and stays that way. Hour after hour, time after time.

And it's the end of messy ribbon changing. No dirty hands or clothing. No need for gloves.

There's no ink buildup on type, because the type touches only the film. No dirt to fall into the printer. That means fewer clean-ups, less downtime on your printer.

You maintain reproduction quality, reduce complaints on hard-to-read, uneven or broken letters and numbers, poor photo reduction quality.

Get more information. Like where you can buy it, right now. Send us the coupon.

*Reg. U.S. Pat. Off. Du Pont does not make computer printer ribbons, but supplies "Mylar" polyester film used by leading carbon products manufacturers for their branded products.

DU PONT COMPANY, FILM DEPARTMENT
Room 22892, Wilmington, DE 19898

Please send me information on computer printer ribbon of "Mylar".

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

 **MYLAR®**
REG. U.S. PAT. OFF.

Look Ahead

(continued from page 8)

Then, ACM's executive committee voted to protest the book and censure Gilchrist (but not Wessel). ACM president Walter Carlson, an IBM corporate marketing consultant, sat in on the vote, but disqualified himself. Later he said the book raised "constitutional problems" for ACM, whose members two years ago voted against getting deeply involved in political and social issues. Some attribute the hassle to overzealous IBMers. Others say the draft of the book should have been given closer scrutiny. Gilchrist says the book is clearly presented as the opinion of the two authors, not Afips, and drew no adverse comments when presented to the Afips board in May. "How can you get ideas out to the public to be tested if you don't publish them?"

SLOW PRINTER GAINS SPEED

A new, slow, low-cost printer is due soon from LRC, Inc., the Riverton, Wyo., company headed by peripherals pioneer Ray Larson. The firm started out a year ago to develop a 120-cps unit while shooting for 240, and ended up with a 300-cps impact machine that prints 132 5x7 dot matrix characters per line. It's supposed to print five carbons minimum and hopefully will sell in the \$700-1500 range.

CAN THIS PROBLEM BE REDUCED?

IBM has said in court it is unable to keep all its documents pertaining to data processing for possible antitrust review because this would require storage of a heap of paper taking up one million cubic feet by Christmas and costing \$2 million a year to store. A case for outside technical assistance?

We thought so, and checked with Pat Hines of Images Enterprises, a firm which, for instance, can put the Manhattan telephone directory on a 4x6-inch ultramicrofiche. The good news for IBM is that the present state of this art allows reduction ratios of about 10,000 to 1. Thus, that one million cubic feet cited by IBM could be reduced to about 100 to 200 cubic feet, depending on what kind of documents are involved. Using the higher estimate, they would need a closet five feet wide, five feet deep, and eight feet high. Better yet, this would reduce their storage costs from \$2 million a year to \$200.

RUMORS AND RAW RANDOM DATA

IBM is having so much success with its minimum two-year extended term plan for the 3705 programmable communications controller that the plan can be expected to be offered for several other products. Even the Telex suit to enjoin IBM from taking this action won't dissuade the big company's actions...The IEEE Computer Society, anxious to get Red Chinese scientists to the society's conference in September, has placed phone calls to two of them, following invitations previously sent to seven. One turned it down, citing previous commitments; the other was interested, but had to await his boss' approval. Shows they're no different from us...While IBM planned to spring for \$40 million in a computer security development project, a small IMS group that has developed a model to help users configure for the system was having trouble getting \$6000 to carry on its work...A fully computer-controlled mechanical "picking" arm, capable of lifting up to 60 lbs., has been developed by Materials Management Systems, San Jose, Calif.

Microdata gives you a new kind of minicomputer

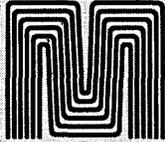
The Twin Mini doubles throughput for just a few dollars more

Put two microprogrammable CPU's with separate control memories and I/O facilities into a Micro 1600 cabinet where they share a common core memory. That's the idea behind the Twin Mini. And it works wonders. For the first time, core memory is used so efficiently that your throughput rate is more than double that of other CPU's. Applications which normally call for much larger or more expensive computers can now be handled simply and economically by this effective combination of Micro 1600 parts.

You show us your requirements. We'll show you how to build a system with unmatched processing power per dollar. Your system may fit into a single Micro 1600 cabinet or overflow into two. Either way, the performance will match our claims or your money back. Find out how easy it is to do business with Microdata. Write for details.

MicrodataTM

Microdata Corporation
644 East Young Street
Santa Ana, Calif. 92705
(714) 540-6730



TM trademark Microdata Corporation



**Robert Half
deals with
financial &
data
processing
personnel...
that's it!**

no side-lines

The Robert Half Organization does not have any side-lines . . . they are specialists. The specialist does a better job because he concentrates on a limited area of coverage. ROBERT HALF is the largest specialist in FINANCIAL & DATA PROCESSING.



Atlanta: 235 Peachtree St., N.E.	(404) 688-2300
Baltimore: The Quadrangle—Cross Keys	(301) 323-7770
Boston: 140 Federal St.	(617) 423-6440
Charlotte: 907 Baugh Bldg.	(704) 333-5173
Chicago: 333 N. Michigan Ave.	(312) 782-6930
Cincinnati: 606 Terrace Hilton	(513) 621-7711
Cleveland: 1367 E. 6th St.	(216) 621-0670
Dallas: 1170 Hartford Bldg.	(214) 742-9171
Denver: 1612 Court Place	(303) 244-2925
Detroit: 140 Honeywell Center, Southfield	(313) 354-1535
Hartford: 111 Pearl St.	(203) 278-7170
Houston: 1200 Central Nat'l. Bank Bldg.	(713) 228-0056
Indianapolis: 9 N. Illinois St.	(317) 636-5441
Kansas City, Mo.: 127 W. 10th St.	(816) 474-4583
Long Island: 585 Stewart Ave., Garden City	(516) 248-1234
Los Angeles: 3600 Wilshire Blvd.	(213) 381-7974
Memphis: 12 S. Main St.	(901) 527-7324
Miami: 1190 N.E. 163 St., North Miami Beach	(305) 947-0684
Milwaukee: The Clark Bldg.	(414) 271-9380
Minneapolis: 822 Marquette Ave.	(612) 336-8636
Newark: 1180 Raymond Blvd.	(201) 623-3661
New York: 330 Madison Ave.	(212) 986-1300
Orange, Cal.: 500 South Main	(714) 835-4103
Philadelphia: 2 Penn Center Plaza	(215) 568-4580
Phoenix: 1517 Del Webb Townhouse	(602) 279-1688
Pittsburgh: Gateway Towers	(412) 471-5946
Portland, Ore.: 610 S.W. Alder St.	(503) 222-9778
Providence: 400 Turks Head Bldg.	(401) 274-8700
St. Louis: 1015 Locust St.	(314) 231-0114
San Francisco: 111 Pine St.	(415) 434-1900
San Jose: 675 North First St.	(408) 293-9040
Stamford, Conn.: 111 Prospect St.	(203) 325-4158
Washington, D.C.: 7316 Wisconsin Ave. N.W.	(301) 654-1850

FREE!

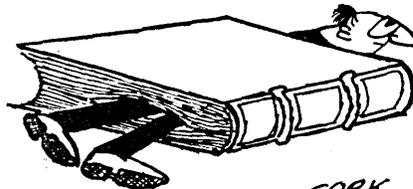
Write for your copy of the
1972 PREVAILING
STARTING SALARIES

CIRCLE 403 ON READER CARD
June, 1972

Books

Information Processing Management
by Ralph A. Szweda
Auerbach Publishers, Princeton, N.J.,
1972
632 pp. \$12.50

Originally billed by the publishers as a 320-pager, this book somehow grew to nearly twice that size. It is written for the student of data processing management, although it's claimed that the book contains enough practical information to make it a working manual for the dp manager. The nine chapters discuss the management process as it affects the dp function; the development of a dp organization; human resources; the use of internal standards; physical environment; scheduling; qualitative aspects of management control; feasibility studies; and methods for validating vendor proposals, negotiating a contract, and the approaches to conversion and implementation. Each chapter includes case studies and review questions. There are several appendixes, a glossary, and a bibliography.



Data Acquisition and Real-Time Systems

D. E. Lawrence and P. M. Fenwick, ed.
International Scholarly Book Services,
Inc., Portland, Ore., 1971
167 pp. \$3.30 (paperback)

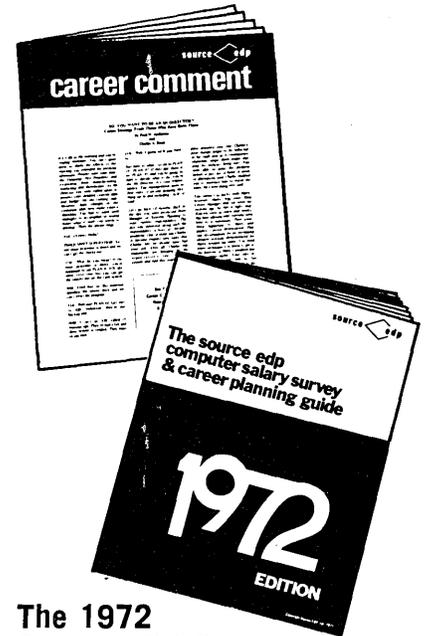
This publication is from the proceedings of a seminar on data acquisition and real-time systems held at the Australian National University in December of 1970. Thirteen papers are presented, including an overview, covering data acquisition at remote sites, programming problems, the processing of pictorial data, and control applications. Several of the papers discuss the use of high-level rather than assembler languages.

Computers and Society

by Richard W. Hamming
McGraw-Hill Book Co.,
New York, N.Y., 1972
284 pp. \$3.95 (paperback)

This book is designed for liberal arts and humanities-oriented people who wish to know about computers without learning to run them. It presents ideas involving the digital computer's relation to modern society. Rather than being organized by vertical application (medical, legal, engineering, etc.), it is arranged by abstract concept, such as modeling, feedback, randomness, and optimization. The book is based on notes used and experiences gained by the author in teaching a course. □

New-and both free.



The 1972 Source EDP Computer Salary Survey and Career Planning Guide:

the latest and most comprehensive nationwide salary survey including a look ahead to 1976, detailed position analyses and strategy in career planning and development.

Career Comment:

a continuing line on current trends and events that affect the "people" side of the computer field.

Both yours from Source EDP, the nation's largest recruiting firm specializing solely in the computer field. For your free copies, write or visit your nearest Source EDP office. Or circle the reader inquiry card.

- ATLANTA**—William G. Barnett, 11 Corporate Square 30329,
(404) 634-5127
CHICAGO—Thomas D. Walsh, 100 S. Wacker Drive 60606,
(312) 782-0857 and 903 Commerce Drive,
Oak Brook, Ill. 60521, (312) 323-8980
DALLAS—Paul E. Dittmer, 7701 Stemmons Freeway 75247,
(214) 638-4080
DETROIT—Robert T. Stevens, 24500 Northwestern Highway,
Southfield, Mich. 48075, (313) 352-6520
GREENWICH, CONN.—Edward J. Golden, 9 Benedict Place
06830, (203) 661-3344
LOS ANGELES—Wayne B. Emigh, Suite 1404,
3550 Wilshire Blvd. 90010, (213) 386-5500
MINNEAPOLIS—Fred N. Anderson, 801 Nicollet Mall 55402,
(612) 332-8735
NEW YORK—Charles T. Stern, 600 Third Avenue 10016,
(212) 682-1160
PALO ALTO—Gordon F. Best, 525 University Ave. 94301,
(415) 328-7155
PHILADELPHIA—George P. Ramming, 1700 Market Street
19103, (215) 665-1717
ST. LOUIS—Robert H. Trumbull, Suite 207, 130 S. Bemiston,
Clayton, Mo. 63105, (314) 862-3800
SAN FRANCISCO—Richard M. Clark, 111 Pine Street 94111,
(415) 434-2410
UNION, N.J.—Daniel A. Mickel, 2204 Morris Ave. 07083,
(201) 687-8700

Client companies assume our charges.



CIRCLE 405 ON READER CARD

SENIOR PROGRAMMERS
SYSTEMS DESIGNERS
SOFTWARE PROGRAMMERS

Let Compass set you in the right Direction!

Our clients have a special place for the kind of people who set high standards in their work, and high goals in their careers. Immediate openings exists for SENIOR PROGRAMMERS, SYSTEMS DESIGNERS, and SOFTWARE PROGRAMMERS. Programming positions require expertise in COBOL and OS/360. Modular programming experience would be helpful. Systems Designers should have experience in the detail design phases of large scale on-line OS projects. Software programmers should have experience modifying operating systems, database design (IMS/DL-1); OS internals or communications.

If you feel that you've reached a turning point in your career, why not investigate these outstanding opportunities. A detailed resume, including salary history, which will be held in strictest confidence should be forwarded to:

compass, inc.

945 Asylum Avenue, Hartford, Connecticut 06105 / (203) 549-4240

"Directions in your EDP Career"

CIRCLE 402 ON READER CARD

OVER 50%

of computer installations in the United States are located in a circle 500 miles wide.

The Callahan Center is in the hub of this golden circle and specializes in the placement of computer professionals in the District of Columbia and the following states: Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Michigan, Delaware, Virginia and Maryland.

We have been serving this golden circle for the past six years, and within the past several weeks, we have received literally hundreds of job openings of every description. All of our job listings are fee paid by the employer. We develop your resume at no charge, and all of our dealings are in strict confidence.

Call today: 215 563 0571, or send your resume to: Dept. DM6 c/o CALLAHAN CENTER FOR COMPUTER PROFESSIONALS, Suite 420, 1819 JFK Blvd., Phila., Pa. 19103. Check our reader service card for a free copy of current Job Openings.

CIRCLE 401 ON READER CARD

WHAT IS YOUR TRUE WORTH?

FREE JOB OPPORTUNITIES BULLETIN

Cadillac Associates represents the nation's largest and most respected professional placement service. Our close relationship with the nation's finest firms generates continuous career opportunity information and allows us to confidentially present your qualifications to those at "decision-making" levels.

Our bulletin, published quarterly, listing available opportunities in the Systems & Data Processing field is available free of charge and will be mailed to your home upon your request.

For your free bulletin, without any obligation, circle reader service card #400. Please USE HOME ADDRESS ONLY!

FREE CONFIDENTIAL PLACEMENT SERVICE

If you desire immediate assistance in locating an opportunity consistent with your objectives (professional/financial/geographic), CALL OR WRITE TODAY. A member of our staff of SYSTEMS & EDP SPECIALISTS will reach you by telephone to discuss your objectives and how we might help you satisfy them. A resume, or some details of background, will be appreciated.

Remember: Our client firms are located from coast to coast and assume all expenses (agency fee, interviewing & relocation).



E. W. MOORE
Executive Vice President
CADILLAC ASSOCIATES, INC.*
32 West Randolph St. Chicago, Ill. 60601

(312) 346-9400

*"Where More Executives Find Their Positions Than Anywhere Else in The World."

CIRCLE 400 ON READER CARD

FREE EMPLOYMENT SERVICE FOR PROGRAMMERS AND ANALYSTS

NY/NJ/PA/DEL/CONN and other
eastern and national locations



RSVP will provide free employment counselling and develop and selectively distribute your resume.

Typical openings (not necessarily current) include systems programming (SYSGEN, maintenance) and applications for IBM 360 OS/DOS and Univac 1108 Exec 8/Exec 2; telecommunications / teleprocessing / on-line systems; BTAM/QTAM; BOMP/PICS/IMS; ABM/orbital analysis/radar systems; urban/social/transportation; OR/simulation/modeling; minicomputer software and applications; data base design; operating systems/compilers/data management; customer engineering; computer and peripheral marketing/sales; COBOL/FORTRAN/PL-1/Assemblers; manufacturing / insurance / banking / brokerage/hospital/distribution/military.

Call or send resume or rough notes of objectives, salary, location restrictions, education and experience to either of our offices. Or check the reader service card for a free sample resume and sample job descriptions. We will answer all correspondence from U.S. citizens and permanent residents.

• Howard Levin, Director, RSVP SERVICES, Dept. M, One Cherry Hill Mall, Suite 714, Cherry Hill, New Jersey 08034, (609) 667-4488

• Charlie Cooke, Manager, RSVP SERVICES, Dept. M, Suite 104, Towle Building, 1777 Walton Road, Blue Bell, Penna. 19422, (215) 643-5550

RSVP SERVICES

employment agency for computer professionals

CIRCLE 404 ON READER CARD

Advertisers' Index

American Telephone and Telegraph Company	58	Forms Inc., An American-Standard Company	4	Topaz Electronics	120
Amp Incorporated	74	Gakken Corporation of America	108	United Air Lines	37
Blazer Corporation	76	Gates Acoustinet, Inc.	21	C. E. Unterberg, Towbin Co.	90
Burnham Van Service, Inc.	21	General Automation, Inc.	109	USA-Japan Computer Conference	32
Burroughs	6	General Electric Company	33-36	Varian Data Machines	23, 24, 25
Cadillac Associates, Inc.	138	Gould Inc., Data Systems Division	18	Victor Temporaries, Division of Victor Computer Corp.	112
California Computer Products, Inc.	69	GTE Information Systems, Inc.	88, 89, 91	Western Union Telegraph Company	114, 115
Callahan Center for Computer Professionals	138	GTE Information Systems, Novar Terminals	102, 103	Westinghouse Computer and Instrumentation Division	105
Cambridge Memories, Inc.	5	Robert Half Personnel Agencies	137	Wilson Jones, A Division of Swingline Inc.	83
Canberra Industries, Inc.	107	Hewlett-Packard	28, 29	Wiltek, Inc.	16, 17
Card Key Systems, A Liquidonics Company	132	Honeywell	70, 71	Wright Line, A Division of Barry Wright Corporation	27, 107
Centronics Data Computer Corp.	61	Honeywell, Test Instruments Division	128	Wyle Computer Products, Inc., A Subsidiary of Wyle Laboratories	122
Collins Radio Company	60	IMLAC Corporation	123	Xebec Systems	75, 77
Columbia Ribbon & Carbon Mfg. Co., Inc.	131	Industrial Nucleonics Corporation	57	Zeta Research	13
Compass, Inc.	138	Infomax	127		
Computer Copies Corp.	96	Inforex, Inc.	110, 111		
Computer Operations, Inc.	76	Interdata	Cover 4		
Computer Terminal Corporation	101	Itel Corporation	26		
Computer Transmission Corporation	Cover 2	Lear Siegler, Inc.	93		
Comress	121	Leasco Computer, Inc.	20		
Cyberex, Inc.	98	Litton Automated Business Systems	90		
Cybermatics Inc.	117	Methods Research	122		
Dartmouth College	103	Microdata Corporation	136		
Data Devices, A Division of Data Products Corporation	97	Microfilm Products, Inc.	116		
Data General	10, 11	Mohawk Data Sciences Corp.	125		
Data 100 Corporation	38	Philips-Electrologica NV	113		
Data Printer Corp.	129	Potter Instrument Company, Inc.	14		
Data Products	99	Rand Teleprocessing Corp.	102		
Datamation Industry Directory	126, 141, 144	Raytheon Service Company	62, 63		
Datum, Peripheral Equipment Division	116	Remcon Systems, Inc.	30		
Digital Computer Controls, Inc.	119	Rixon Electronics, Inc.	31		
Digital Equipment Corporation	86, 130	RSVP Services	138		
Du Pont Company, Film Department	134	Scientific Leasing Inc.	128		
Eastman Kodak Company, Business Systems Markets Division	64	Seaelectro Corporation	59		
Electronic Associates, Inc.	133	Sigma Data Computing Corp.	100		
Electronic Memories & Magnetics	92	Smith, Barney & Co.	94		
Ex-Cell-O Corporation	Cover 3	Source EDP	137		
Fabri-Tek Inc., Memory Products Division	2	Sycor Inc.	9		
Facit-Odhner Inc.	132	Systems Manufacturing Corporation	95		
Fenwal Incorporated	12	Tally Corporation	1		
		Tele-Dynamics Division of Ambac	22		
		Teletype Corporation	72, 73, 80, 81		
		Texas Instruments Incorporated	84, 85		

Technical Publishing Company

Arthur L. Rice, Jr., President
 Gardner F. Landon, Exec. Vice President
 James B. Tafel, Exec. Vice President
 Calverd F. Jacobson, Financial Vice President
 Edwin C. Prouty, Jr., Secretary and Director of Data Processing

Advertising Offices

Sales Manager and Vice President
 John Brennan: Greenwich, Ct. 06830
 35 Mason St. (203) 661-5400

Eastern District Managers
 A. Treat Walker, Irwin L. Werfel,
 Warren A. Tibbetts: Greenwich, Ct. 06830
 35 Mason St. (203) 661-5400

New England District Manager & Vice President
 Warren A. Tibbetts: Manchester, N.H. 03104
 112 W. Haven Rd.
 (603) 625-9498

Midwest District Manager
 John M. Gleason: Chicago, Ill. 60606
 205 W. Wacker Drive
 (312) 346-1026

Western Manager and Senior Vice President
 Hamilton S. Styrone: Pasadena, Ca. 91101
 94 So. Los Robles Ave.
 (213) 681-8486

District Manager
 Alan Bolté, Jr.: Pasadena, Ca. 91101
 94 So. Los Robles Ave.
 (213) 681-8486

Western District Manager
 James E. Filiatrault: Redwood City, Ca. 94061
 61 Renato Ct.
 (415) 364-3171

England and Western Europe
 Wallace K. Ponder: Wallace K. Ponder Co.
 Pinner, Middlesex HA 5 1JU,
 England
 31 Lyncroft Avenue
 (01) 868-9289

Toward a Programming Discipline

In the February Forum, C. A. Irvine:

- a. decried the generally "shoddy" quality of software produced by our profession;
- b. proposed that the fundamental reason for this has been a critical manpower shortage—but, he implied, of lazy, status-conscious programmers;
- c. looked for the current economic slump to cause us to institute some "long overdue"—but unspecified—reforms to lead us into "responsible maturity"; and
- d. asked 16 provocative questions.

I would like to address the same subject. It is my opinion that:

a. The quality of the software produced by our profession is extremely uneven in that operating characteristics, bug content, documentation, and maintainability vary widely. In general software is unnecessarily expensive to produce.

b. The fundamental reason for this has been our failure as a profession to treat programming (as opposed to coding) as a discipline and develop the required standards, tools, and methodology to help us do consistent, efficient work.

c. This situation will not be alleviated until the problem is generally recognized by the prime movers of the industry.

What is Programming, anyway? What does Joe Coder have to do in the course of his work? He must:

1. be assigned a specific problem,
2. design a logical solution,
3. code it in some particular language,
4. debug his code, and
5. document his work so that future maintenance and modifications can be easily performed . . .

all independent of whether he is working on a CDC 7600 or a PDP-8 or whether he works in PL/I or machine language.

Generally, only (3) above is ever formally taught. Courses and books like "Programming the ABC/123 Computer" or "Programming with the ACRONYM Language" address themselves to coding rules and conventions, and ways to solve particular problems. Where and how is Joe Coder to learn the rest of his job—problem specification, logical design, debugging, and documentation—which will occupy most of his time? At the present time he learns it—let's face it—the hard way. There are no standards or accepted practices in these areas. Is it really surprising that there are few programmers adept in all five areas? Or that there may be a tenfold difference in productivity within a group of programmers?

The great majority of programmers have to work very inefficiently. For example, assemblers usually have some extremely valuable features which are seldom found in compilers: cross-reference listing, equate statement, conditional assembly, listing control (line skip, page skip, page headings), comments on the same line as code, and macro capability. No programmer should be forced to use a language processor which does not produce a symbol cross-reference listing (but have you ever heard of a Fortran compiler that did?). Is there any "high-level"

language in widespread use with a facility equivalent to the assembler EQU statement?

Why do so many programmers still cling to assembler language? It's not only the desire for more efficient code, but also because a well-equipped assembler is often a more valuable programming tool than any compiler available for that machine.

There are no standards in debugging tools, either. Those which are built into the language are usually quite inadequate, and require source changes and recompilation to modify the commands (particularly evil because it provides a great temptation to the programmer to add another bell or whistle since he is "in there anyway"). Many systems provide a debugging package which works with absolute core addresses and provides octal dumps—not very useful for high-level language debugging.¹

Why do we continue to delude ourselves by thinking that all our problems would be solved if we could only invent a magic language? When will we as a profession or an industry get to work on developing:

1. standards for program specifications,
2. recommended design practices,
3. a language-independent macroprocessor (why do we need a new macro language for every new assembler and new language?),
4. standards for compile-time facilities,
5. standards and recommended practices for coding,
6. language-independent debugging facilities (why do we have to keep reinventing these?),
7. standards for documentation?

When industry-wide standards are established, software will become less soft, and management will be able to plan more schedules and budgets more accurately. Meanwhile, programming managers can establish and enforce corporate or project standards and practices.²

Now I will close by answering a few of Mr. Irvine's questions:

Q. Name three projects which were completed on schedule.

A. Name three projects which were scheduled on any rational basis.³

Q. Name three projects which (eventually) performed to their specifications.

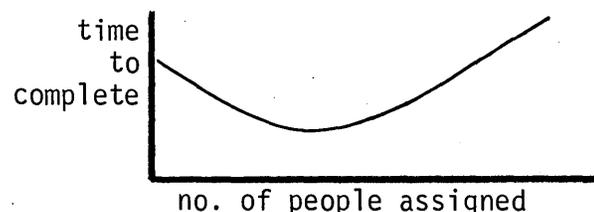
- A. Name three projects whose specifications were
- a. realistic,
 - b. stable, and
 - c. understood.

Q. How much code in any significant project is drawn from previous work? Do they let design engineers wind their own transformers?

A. How much time and money did you budget on any previous project for extracting, documenting, and cataloging code that might be of some possible future use?

—Paul D. Griem, Jr.
Mr. Griem is manager, software development, The Foxboro Co., Foxboro, Mass.

1. New languages bring new problems—have you ever seen a PL/I program debugged? The programmer spreads the listing out on a table and draws lines spanning one or more pages to make sure his DO, BEGIN, and PROCEDURE statements have matching ENDS.
2. It is true that a few people and companies have attacked these problems; my point is that as a profession we have missed the boat.
3. If you examine the manpower scheduling problem, the result for any task is a curve of the form:



XLO Computer Products' XLO 3301 Disc Memory.

**You won't find a
faster, more versatile
high-capacity
Disc Memory
at anywhere
near the price.**

You wouldn't expect Ex-Cell-O Corporation to come out with just an ordinary disc memory. And we didn't. Our 3301 will make you forget everything you've used before.

It's a high speed, high capacity Head-Per-Track System that was designed using 3330 technology.

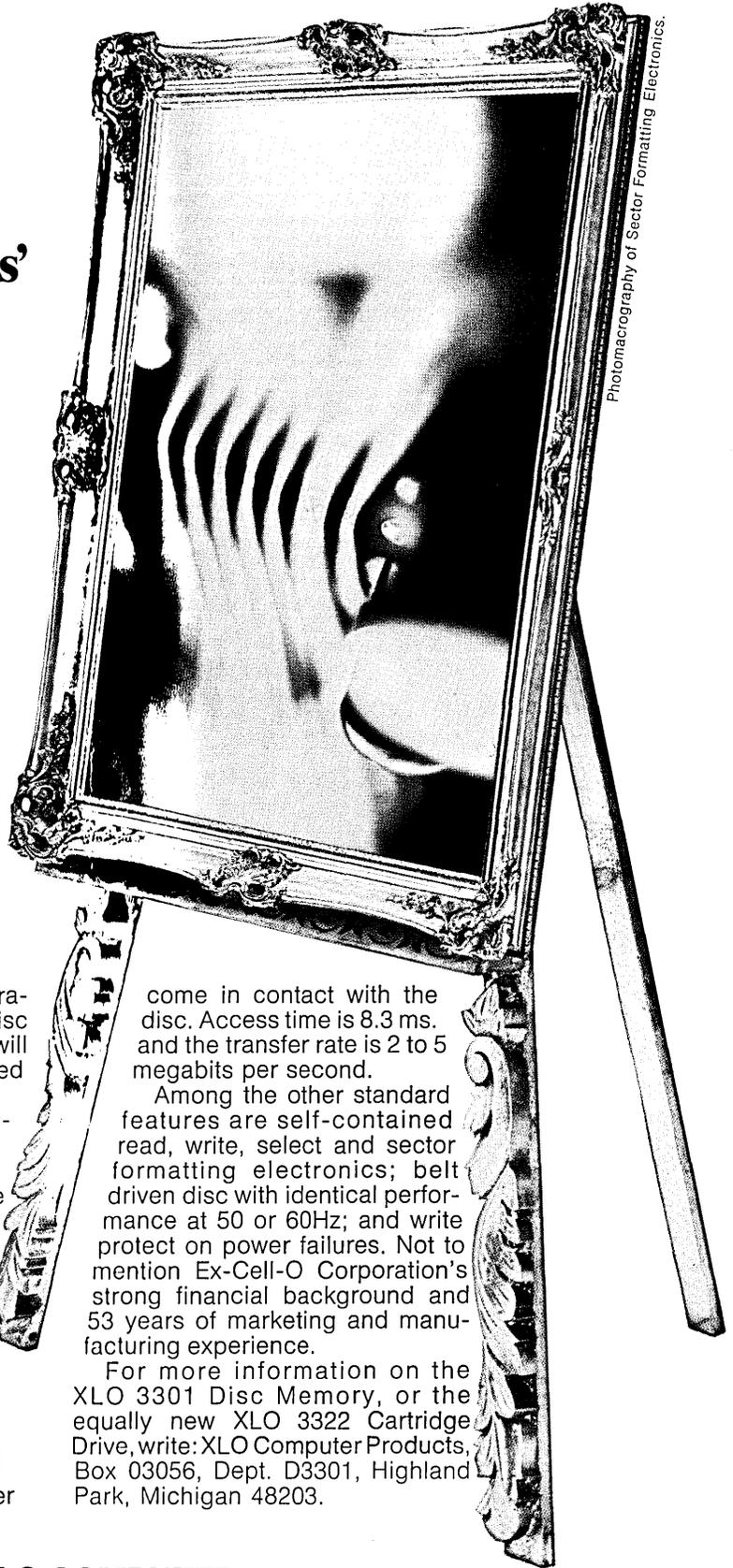
Although the 3301 is compact, to give designers greater freedom, it has a modular design (16 to 128 tracks, single disc) to provide a capacity of from 1 to 10 million bits. At a cost of less than 0.05¢ a bit. And the system has built in flexibility to let the OEM specify—not select—his memory requirements, while still maintaining catalog pricing.

The design of the 3301 is sheer simplicity—only 10 major elements—and for the highest reliability our heads never

come in contact with the disc. Access time is 8.3 ms. and the transfer rate is 2 to 5 megabits per second.

Among the other standard features are self-contained read, write, select and sector formatting electronics; belt driven disc with identical performance at 50 or 60Hz; and write protect on power failures. Not to mention Ex-Cell-O Corporation's strong financial background and 53 years of marketing and manufacturing experience.

For more information on the XLO 3301 Disc Memory, or the equally new XLO 3322 Cartridge Drive, write: XLO Computer Products, Box 03056, Dept. D3301, Highland Park, Michigan 48203.



Photomicrography of Sector Formatting Electronics.

**XLO COMPUTER
PRODUCTS**

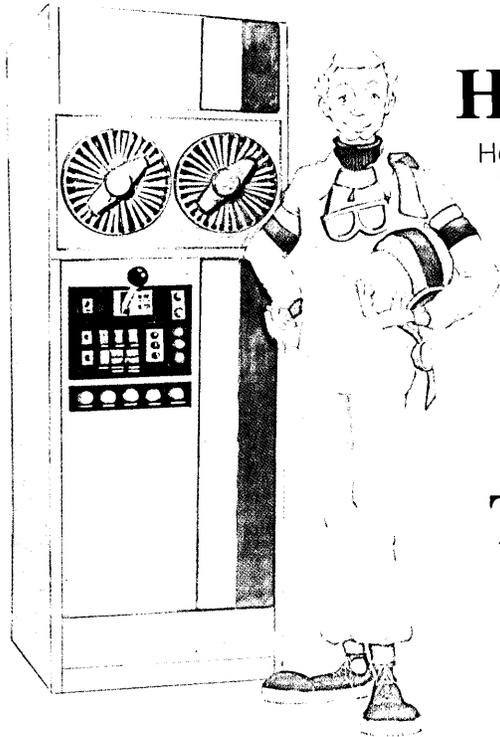
A UNIT OF

XLO

EX-CELL-O CORPORATION

CIRCLE 10 ON READER CARD

What the industry taught us about price/performance.



Hottest core in the time trials.

Here she is, racing fans. The flash of the industry. Speed to burn. The first mini to break the billisecond barrier. Yessir, just listen to that baby purr.

Unfortunately, of course, speed doesn't mean much by itself. Details like I/O handling and realistic operating systems tend to spill a little oil on the track.

The old benchmark trick.

Simply design a "standard" benchmark that happens to rely heavily on the particular strengths of your computer. Never mind the actual application. Just look at those cycle times. Sure . . .



The Interdata New Series. What you see is what you get.

We play it a little differently at Interdata. If we're forced to use numbers, our Model 70* has an LSI bi-polar control store that gives you a 90-nanosecond access time.

But if you want a minicomputer to do a job for you, consider this: It has 113 instructions with direct addressing to 65,536 bytes. Built-in multiply/divide and 32-bit floating point hardware. 255 I/O interrupts with automatic vectoring to service routine. Four direct memory access ports and a double-buffered Teletype interface. And 16 general purpose registers.

And our Model 80 has everything the Model 70 has — plus its own set of fancy numbers for the die-hards: a 75-nanosecond control store access time and a 240-nanosecond semi-conductor main memory.

So now you can choose from a whole family of minicomputers with price/performance you just couldn't get until now.

Now it's part of the extras you get from Interdata.

INTERDATA®

2 Crescent Place, Oceanport, New Jersey 07757 (201) 229-4040. Atlanta — (404) 288-7000. Boston — (617) 890-0557. Chicago — (312) 463-9080. Dallas — (214) 238-9656. Detroit — (313) 356-5515. Los Angeles — (213) 640-0451. Palo Alto — (415) 328-0783. Washington — (704) 525-4806. Toronto — (416) 678-1500. United Kingdom — Uxbridge 51483. Sydney — NSW 439-4155. West Germany — 0811/160031. Tokyo — 270-7711.

*Basic 8KB Model 70 — \$6800.
\$4828 with OEM discount
(quantity of 15).