



**technology  
profile:  
computer  
output  
microfilm**

**Take a close look  
at the big three  
in small computers.**

At Varian, we consider the 620 series as a kind of computer molecule, bonded by the same standard software: FORTRAN IV, MOS, BASIC, RPG, and others. This 620 family also offers the largest line of peripherals available in the industry.

620/i: one of the most popular ever built

— over 1300 sold worldwide — this systems-oriented digital computer features ease of interface and programing, full array of options required in today's multi-application environment and up to 32,768 words of memory, 16- or 18-bits.

*R-620/i*: a ruggedized version of the 620/i, it's a general-purpose computer that's designed to withstand environmental extremes. For truck, shipboard, or other military/industrial applications. The 620/i's large software library works with the R-620/i.

*620/f*: latest in the series, the 620/f has a 750-nsec cycle time, meaning it executes 2½ times faster than the 620/i. It is 100% upward compatible from the

620/i. And, this new computer also uses the 620/i's field-proven software.

The 620 series gives you three more good reasons for talking to the big company in small computers.

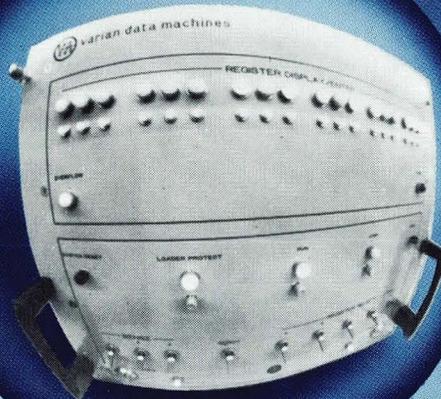
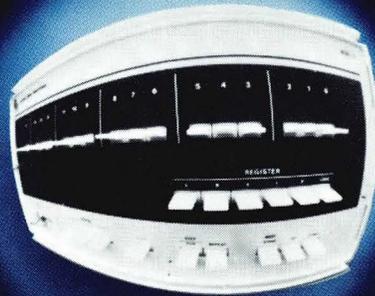
U. S. Sales Offices: Downey, San Diego, San Francisco, Calif.; Washington, D.C.; Atlanta, Ga.; Chicago, Ill.; Waltham, Mass.; Ann Arbor, Mich.; Albuquerque, N. Mex.; New Rochelle, Syracuse, N.Y.; Fort Washington, Pa.; Dallas, Houston, Tex. Other offices worldwide.

Varian Data Machines, a Varian subsidiary, 2722 Michelson Dr., Irvine, Calif. 92664. Telephone 714/833-2400.



**The Big Company in Small Computers**

Varian's computer molecule, with standard software bonds of FORTRAN IV, MOS, BASIC, and RPG.



CIRCLE NO. 1 ON INQUIRY CARD

# MODERN DATA HUMBLY ANNOUNCES ALL THERE IS TO KNOW ABOUT COMPUTER INSTALLATIONS.

We've done it by hiring a group of veteran EDP Consultants to assemble a completely new information package. To help you cope with the problems of unbundling.

To keep you up-to-date on the latest improvements in EDP Operations techniques.

To help you use your computer equipment more effectively. And to guide you in evaluating and training EDP personnel for all types of installations.

These EDP experts are called the MODERN DATA Professional Services Division, and they're readying a continuing series of regular reports, updating reports, surveys, and special newsletters designed especially for EDP management personnel.

The series is called Guidelines for EDP Management, or GEM for short. It's like having a continuing seminar of "how to" and "what's new" in computers without the expense in time and travel. The first series (GEM Series 70-1) will include three major reports on "EDP Personnel Training and Evaluation":

FIRST REPORT: Setting Up An In-House Computer Personnel Training Program (Available Mid-November 1970)

SECOND REPORT: EDP Personnel Evaluation Techniques (Available Mid-April 1971)

THIRD REPORT: Finding And Selecting EDP Personnel (Available Mid-September 1971)

GEM Series 70-1 is being compiled for us by Oyer Computer Services, Inc., the "People-

ware" Company, specialists in training, education, evaluation, and selection of EDP personnel since 1967. Paul D. Oyer, president, has been solving EDP problems since 1951.

These reports will be in loose leaf form, and bound in a hard-cover binder. The Division is also working on a nationwide survey of typical EDP personnel salaries by type and size of installation and major geographic regions. This survey will be the most comprehensive of its kind ever assembled. It will be included as a bonus with the third report to subscribers of the full series.

For your information, we have included an outline of some of the topics in the first report on the back of this page.

The subscription price for GEM Series 70-1 is \$350 per year. The single reports are available at a cost of \$150 each. If you order a single report, there is no further obligation. If you purchase the first report you will be given a 30-day option to convert to a full subscription for the additional \$200. If you are not fully satisfied with the report, return it to us within 10 days for a full money back guarantee.

To subscribe, send your remittance for the series or the first report in an envelope with the coupon below. This saves you billing and handling charges.

If you prefer to be billed later, simply check the appropriate box and drop the card in the mail.

GEM Series  
Prof. Services Div., Modern Data  
3 Lockland Avenue  
Framingham, Mass. 01701

- Check enclosed (Include this card in your company envelope)  
 Please bill me     P.O. Enclosed  
(Add 1% billing & handling charges)

Gentlemen:

Please enter my order for the following:

- One annual subscription to GEM Series No. 70-1, "EDP Personnel Training & Evaluation" at \$350.00 per year.  
 One copy of the 1st report in the above series—"Setting Up an In-House Computer Personnel Training Program" at \$150.00 per copy.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

State \_\_\_\_\_ Zip Code \_\_\_\_\_

Here's a sampling of some of the topics in our first report in GEM Series 70-1 ... "Setting Up An In-House Computer Program."

- Establishing a practical framework – including objectives, budgets, facilities
- How to build an effective training staff
- Establishing a curricula for top and line management – including EDP managers, system analysts, designers, programmers, machine operators
- Guidelines for determining instructional method, time and sequence.
- Effective use of training resources
- How to revise and up-date your curricula
- Percentages of time to be spent in learning
- Percentages of total EDP budgets for training programs
- Case study section – how to beat the new unbundled education prices and how some typical companies are solving their EDP training problems
- In-house training – potential problems and solutions
- And much more in this 250 page report.

First Class  
Permit No.244  
Framingham,  
Mass.

---

**BUSINESS REPLY MAIL**

No postage stamp necessary if mailed in the U.S.

---

Postage will be paid by:

Modern Data  
Professional Services Division  
3 Lockland Avenue  
Framingham, Mass. 01701

---

---

---

---

---

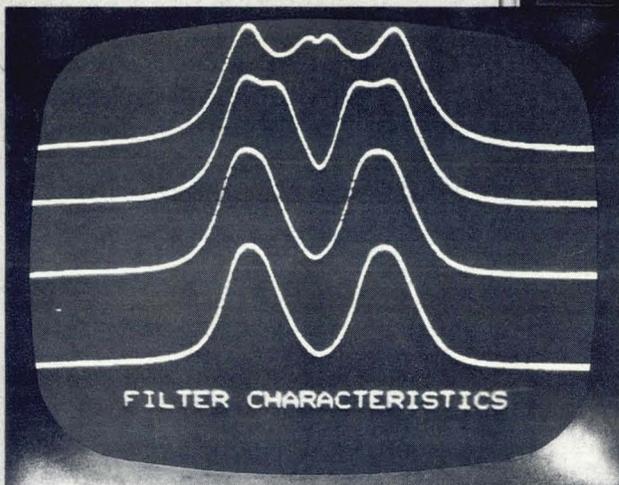
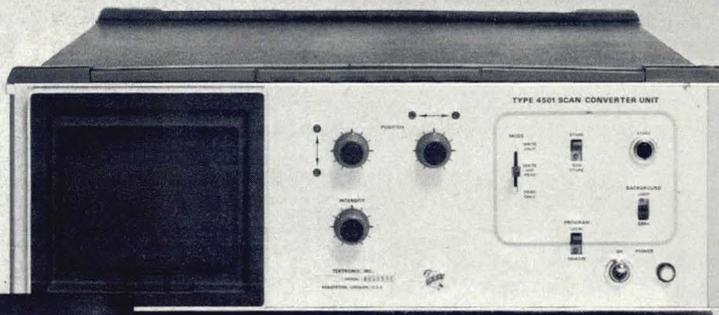
---

---

---

# Large Screen Displays

Link your data or signal source to TV display systems with Tektronix scan conversion . . .



for convenient viewing in labs, classrooms, production lines, hospitals, computer installations and many other areas.

## The display size depends only upon your choice of TV monitor or receiver.

The 4501 Scan Converter accepts alphanumeric and graphic data—in the form of analog inputs—and converts it to displays on TV receivers and monitors. The hi-contrast TV displays are ideal for individual or group viewing—even under bright light conditions. The displays may be viewed as light data on a dark background or as dark data on a light background, selected from the 4501 front panel.

The 4501 uses a Tektronix bistable storage CRT. Data may be written once on the storage CRT and retained for an hour *without refreshing*. The results are: call for your data once, then view it as long as one hour on a TV-size display. Besides that, the 4501 transfers continuously written data to your TV display.

**MULTIPLE DISPLAYS**—The 4501 will drive multiple, inexpensive receivers and monitors. The units may be located locally or remotely. Outputs from a TV camera can be mixed with

data from the 4501 to produce a picture that is an overlay of the two signal sources. With overlaying, you can instantly compare data from two different sources.

The uses for the 4501 are virtually unlimited. For a demonstration, contact your local Tektronix Field Engineer or write Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005. See your current Tektronix catalog for specifications.

4501 Scan Converter . . . . . \$2500

Available in U.S. through the Tektronix lease plan

U.S. Sales Price FOB Beaverton, Oregon



**TEKTRONIX®**

committed to technical excellence

See The Tektronix Display At FJCC

# The quad-squad

(from INCOTERM™)



Four friendly faces from INCOTERM — each with its own keyboard — each with functionally independent access to the powerful 2K computer that is built right into the Master terminal — each permitting up to 256 characters on the screen.

All this for under \$100 a month per operator position.

Each operator can verify, qualify and format input — right at the source. And because of the built-in computer, each terminal is fully compatible with virtually any main-

frame system and with most other types of terminals you may now be using.

If you want hard-copy output, there's the SPD™-P Printer. If you want to change jobs, there's the SPD™-L Program Loader. And for tying it all together, we offer the SPD™-M Multiplexer. Let's face it: that's a powerful lot.

For details, call or write M.R. Clement, Jr., *Vice President of Marketing*.

**INCOTERM™**  
CORPORATION

... the international computer terminals people

Hayes Memorial Drive / Marlborough, Massachusetts 01752  
Tel: (617) 481-2000

Atlanta, Georgia / (404) 451-2307

San Antonio, Texas / (512) 734-7016  
See you in Houston — Booths 2820 & 2822

New York, N.Y. / (212) 868-7557



64 CONFERENCE REPORT — ACM '70

*A MODERN DATA staff report on the recent ACM "Unconventional" Convention featuring Ralph Nader, A Black Panther, the Computer People for Peace — all this and Dr. Herb Grosch too!*

68 A SMALL COMPANY AND A BIG SYSTEM

*Can a small company from the West find love, happiness, and profit in the large-scale systems market?*

70 THE FCC REPORT AND THE "THRESHOLD ISSUE"

*After years of data-gathering, behind-the-scenes wrangling, and just-over-the-horizon conjecture, the EDP community and the proposed microwave carriers are finally beginning to see the light at the end of the tunnel.*

74 UNBUNDLING THE UNBUNDLER — Recent Congressional Hearings on Government Peripherals Procurement

*Witnesses testify as to the savings to be gained by purchasing from the independent peripheral manufacturers.*



TECHNOLOGY PROFILE

78 COMPUTER OUTPUT MICROFILM SYSTEMS

*The factors that go into evaluating COM systems are discussed along with a survey of commercially-available COM equipment. A COM glossary is also included.*

94 HOW TO INVEST IN SMALL COMPANIES or, "What the World Looks Like From Where I Stand"

*A revolutionary proposal for the creation of a Federal agency, called FARCE, to conduct a monthly investment lottery.*

46 Corporate Profile—LOGICON, CORP.

48 Communications Clinic—PRIVATE LINE SHARING REVISITED

54 On-Line—A SECOND-GENERATION PLOTTER?

56 Source Data Automation—OPTICAL READERS

58 Systems Scene—THE \$300 SALISBURY STEAK

60 Software Forum—CRIMINAL JUSTICE—A CHALLENGE TO THE SOFTWARE INDUSTRY

18 LETTERS TO EDITOR

28 NEWS ROUNDUP

30 ORDERS & INSTALLATIONS

36 INTERNATIONAL NEWS

38 DC DATASCAN

42 CORPORATE & FINANCIAL NEWS

44 STOCK TRENDS

62 WHBW

96 NEW PRODUCTS

102 NEW SOFTWARE & SERVICES

103 NEW LITERATURE

104 INDEX TO ADVERTISERS

READER SERVICE CARDS ..... OPPOSITE PAGE 104

# For a dime, PEC will knock 30% off what you've been paying for 75ips transports.

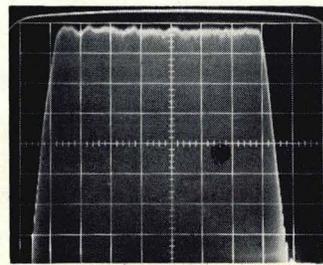


For the price of a phone call, PEC's new 75ips transports will give your minicomputer system faster throughput with higher transfer rates. And for 30% less than you've been paying.

These new 10½" reel transports have a unique, simple design and a vastly superior servo system for gentle, positive tape control, excellent speed stability, and controlled start/stop operation. Tape is accelerated to 75ips with negligible velocity transients or overshoot.

These PEC 6000 Series transports offer high data reliability in 7 and 9 track, 800cpi NRZI and 9 track, 1600cpi phase-encoded USASII and IBM compatible formats. They are available in read-after-write, with a dual gap head; and in write/read with a single gap head. Other outstanding features include program restriction-free operation, easy tape loading, and

IBM compatible tape guides. And all 75ips models are plug-for-plug compatible with PEC's other popular 6000 Series transports.



(5ms/cm)\*

For all the facts and figures on this 75ips breakthrough and an immediate price quote, call your local PEC office today. Or save the dime and write for our new brochure. Peripheral Equipment

Corporation, 9600 Irondale Avenue, Chatsworth, California 91311. (213) 882-0030.

\* This waveform is the voltage seen at the head when reading an "all ones" tape, and starting and stopping in the middle of the data.



SALES OFFICES: Los Angeles (213) 882-0030 • Orange County (714) 546-4836  
San Francisco (415) 948-4577 • Chicago (312) 696-2460 • Philadelphia (215)  
849-4545 • Boston (617) 899-6230 • Washington, D.C. (703) 573-7887 • New  
York (203) 966-3453 • London Reading 582115

"Visit us at FJCC'70. Booth 3016."



# MODERN DATA

EDITOR AND PUBLISHER . . . . . S. HENRY SACKS  
 ASSOC. PUBLISHER . . . . . WILLIAM A. GANNON  
 ASSOC. EDITOR . . . . . ALAN R. KAPLAN  
 ASSOC. EDITOR . . . . . JOHN A. MURPHY  
 ASSOC. EDITOR . . . . . LOUIS J. BROCK  
 CHIEF EDITORIAL CONSULTANT . . . . . DAN M. BOWERS

WASHINGTON EDITOR: Harold V. Semling, Jr. WEST COAST EDITOR: Karen Kuttner. FINANCIAL NEWS EDITOR: James I. Leabman. EUROPEAN EDITOR: Richard Pettersen.

CONSULTING AND CONTRIBUTING EDITORS: Ralph G. Berglund; J. Reese Brown, Jr.; Richard T. Bueschel; Larry L. Constantine; Thomas DeMarco; Maurits P. deRegt; Ken Falor; Lawrence A. Feidelman; Ivan Flores; Michael B. French; Fay Herman; Walter A. Levy; Thurber J. Moffett; Joseph Popolo; John E. Taft; Jerome B. Weiner.

Editorial Prod.: Ruth Martin, Manager; Judith DeWitt, Diane Burkin, Sally Haskins, Assts.  
 Circulation Dept: Carol Grace, Manager; Stephen E. Hughes, Asst.  
 Ass't. to Publisher: Donna L. Maiocca

Cover Artist: William Kwiatkowski

ADVERTISING PROD. MANAGER . . . . . BERNARD GREENSIDE

All correspondence regarding circulation, advertising, and editorial should be addressed to the publication offices at:

MODERN DATA  
 3 LOCKLAND AVENUE  
 FRAMINGHAM, MASS. 01701  
 (617) 872-4824

Published monthly and copyrighted 1970 by Delta Publications, Inc., 3 Lockland Ave., Framingham, Mass. 01701. The contents of this publication (in excess of 500 words) may not be reproduced in whole or in part without written permission.

SUBSCRIPTIONS: Circulated without charge by name and title to U.S.-based corporate and technical management, systems engineers, systems analysts, EDP managers, software specialists, and other personnel who qualify under our qualification procedures. Available to others at the rate of \$18.00 per year; single issues \$1.75. Subscription rate for all foreign subscriptions is \$25.00 per year (12 issues). POSTMASTER: Send Form 3579 to: Circulation Dept., Modern Data, 3 Lockland Avenue, Framingham, Mass. 01701. Controlled circulation postage paid at Concord, N.H.



## SALES OFFICES

SALES MANAGER . . . . . ROBERT J. BANDINI

NEW ENGLAND  
 Wm. A. Gannon, 3 Lockland Avenue, Framingham, Mass. 01701 (617) 872-4824

NEW YORK  
 Robert J. Bandini, 400 Madison Ave., Suite 401, N.Y., N.Y. 10017 (212) 753-0375, (203) 226-3544

PHILADELPHIA  
 Don McCann, 116 Haddon Ave., Suite C, Haddonfield, N.J. 08033 (609) 428-2522

MIDWEST  
 Gerald E. Wolfe, The Pattis Group, 4761 Touhy Ave., Lincolnwood, Ill. 60646 (312) 679-1100

WEST COAST & SOUTHWEST  
 John Uphoff, 711 East Walnut St., Lands Bldg., Pasadena, Cal. 91101 (213) 681-1133

THIS ISSUE OVER 80,000 COPIES

# Computer Automation announces two new mini-computers

## HIGH SPEED AND EXTENSIVE MEMORY OPTIONS ARE FEATURED.

Computer Automation, a California-based computer manufacturer, has added two more computers to its already broad mini line. The new machines, designated Models 116 and 108, are the top of the line of the sixteen-bit and eight-bit series, respectively.

An extensive line of interchangeable memory options has been added, allowing almost unlimited flexibility in structuring the computer configuration. These include:

- Small core memories in 1K, 2K, and 4K sizes at 1.5µs cycle time.
- ROM memories in 1K, 512, and 256 sizes with 400 ns access time.
- ROM with Scratchpad, which eliminates the need for alterable core in dedicated systems.
- Scratchpad of 128 x 16 or 256 x 8 that can be bought separately or mixed with various sizes of ROM.

A new high-speed DMA option operating at 1.3 megabytes is offered with the 116 that allows interfacing with superspeed peripherals and data collection devices.

Both new computers are software and hardware compatible with the existing Computer Automation machines, permitting freedom to move up or down in machine performance and price.

Delivery on either machine is 15 to 60 days, depending upon the configuration.

For full details on specifications, pricing, and OEM discounts write:



COMPUTER AUTOMATION, INC.  
 895 West 16th Street • Newport Beach, California  
 92860 • Phone (714) 642-9630 • TWX 910-596-1377

See us in Booths 3614-3618 at the FJCC.

CIRCLE NO. 5 ON INQUIRY CARD

# Honeywell computers may be applied liberally.

If you're looking for a general-purpose computer that really is general purpose, you ought to know about Honeywell computers. Like the H316 computer below, and other members of the Series 16 family. Then there's the Series 32 family. And the H112 minicomputer.

They're being used in all sorts of applications.

On off-shore oil rigs, they're helping keep free-floating ships directly over the drill.

In supermarkets, they're speeding checkouts and maintaining total inventory control.

In airline systems, they're concentrating data to cut back on expensive telephone line lease costs.

In hospitals, they're providing on-line, real-time access to both in-hospital communication systems and remote data facilities.

And if that isn't enough, try these: Space capsule simulation. Antenna control. Numerical control.

Remote manipulator control. Industrial control.

Weather reconnaissance. Weather forecasting. Patient monitoring. Navigation. Target tracking. Fire control.

Seismic studies. Travel reservations. Medical research.

Credit verification. River traffic control. Communications. Graphic data conversion . . . Whew.

Now that's what general-purpose computers are all about.

Get more information about Honeywell computers and the uses they're being put to. Write for our

Control Applications Kit. So you can consider the alternative: Honeywell, Computer Control Division, Framingham, Massachusetts 01701.

## The Other Computer Company: **Honeywell**

CIRCLE NO. 6 ON INQUIRY CARD

**HONEYWELL INTERNATIONAL**—Sales and Service offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, U.K. and U.S.A.



# Moore New Ideas for Data Processing

## Speed up expediting with your computer

When materials and purchased sub-assemblies aren't ready on schedule, the production operation grinds expensively to a halt. Moore can provide a computer-controlled expediting system that keeps suppliers on their toes. Preparation of queries is quick and inexpensive. Needed information comes back by return mail. System also provides an effective way to appraise vendors. Ask about Idea #451.

## Increase legibility of source documents

The more copies of a document you need, the more likely that some will be blurred and virtually illegible. Moore has a system that gets around the problem. Instead of requiring your automatic printer to hammer out seven carbons, Moore designed a system that uses two sets of four copies. Everyone gets legible copies, mistakes are averted, better utilization is made of print-out capability. Ask about Idea #452.

## Keep parts lists current and error-free

Where parts are both manufactured and bought from outside vendors, record keeping can be a nightmare. Especially with design changes and new models being introduced. Moore has a way to turn this task over to your computer so it is done quicker, more accurately, and at far less cost. It even lets you determine at a glance which parts come from outside vendors. Ask about Idea #453.

## For short-run, single-part detaching

Detach one-part continuous forms anywhere—at a low cost and with high efficiency. The Moore Model 305 Detacher machine handles short runs, varying sizes—and supplements other equipment to solve peak load problems. Detaches 110 feet of forms per minute (120-11" deep forms per minute). Quiet, safe operation with maximum economy. Ask about Idea #454.

## Refresher for business

One fresh idea, a new twist on an old one, and a business can perk up. Moore ideas have a way of taking the tedium out of routine. A way of making things work smoother. Your Moore man has thousands of them. Call him. He's in your telephone book. One Moore idea may be what you need.



**MOORE<sup>®</sup> BUSINESS FORMS, INC.**

Over 675 offices and plants, 2618 salesmen in North America

# HOW WE'RE THE MINI COM

We're winning by introducing three new Nova-line 16-bit mini computers that go faster and cost less than the competition.

We're winning by being smart.

By looking ahead at what mini computers are going to be used for.

By designing new computers to take advantage of new technologies.

By staying one step ahead of the competition.

We've been winning the battles consistently.

In just 2½ short years we've introduced a complete line of mini computers, software and peripherals, and we've grown from a total newcomer to one of the big three.

Our latest victory can best be described by describing our three new machines:

## SUPERNOVA SC:

The first mini computer with a high-speed all monolithic memory, making it the fastest mini computer in the world.

## NOVA 1200:

The first mini computer to take advantage of large- and medium-scale integration, making it very fast (1200 nanosecond cycle time), most reliable, and considerably less expensive than any other mini computer at its performance level.

## NOVA 800:

A new machine that offers even more speed and performance than the Nova 1200 for the guy who needs it. At a price he can afford.

## The first mini computer with all monolithic memory: SUPERNOVA SC.

There's only one real reason to build a machine around a monolithic memory: speed.

Not just cycle-time speed.

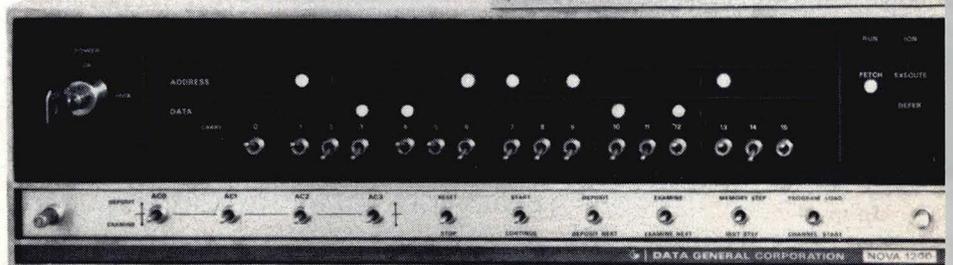
Real speed, that can only be measured in terms of instruction execution.

The Supernova SC can execute arithmetic and logical instructions in 300 nanoseconds.

Supernova SC



Nova 1200



In a single memory cycle.

That's because we built the Supernova SC processor around its monolithic memory.

It overlaps the instruction execution cycle with the fetch of the next instruction.

Which takes advantage of the real speed break available with a monolithic memory.

As we said, we used a monolithic memory in order to take advantage of it.

Not just so we could say we had it.

Price: \$11,900

## The first mini computer to use LSI and MSI to gain performance and economy: NOVA 1200.

Other machines use large-scale integration.

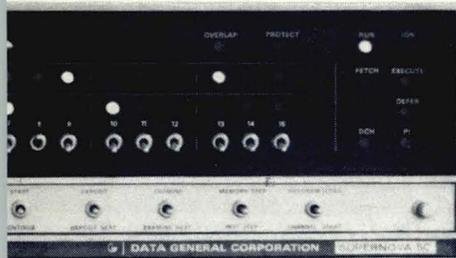
No machine has used it as effectively as the Nova 1200.

We've combined LSI with a high degree of medium-scale integration.

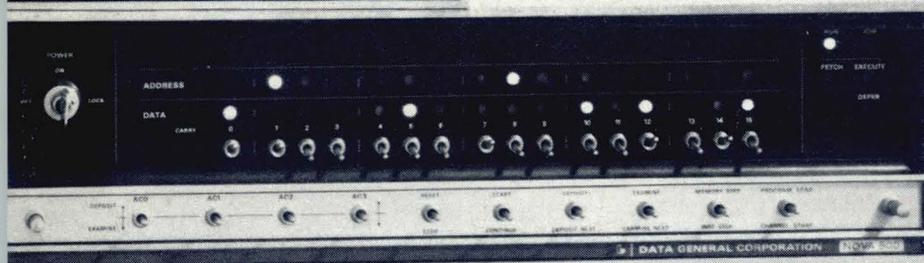
Not just so we could say we did.

But so we could drastically lower the parts count, increase reliability, lower cost, and still make the Nova 1200 2½ to 3 times

# WINNING PUTER WAR.



Nova 800



faster than its predecessor, the Nova.

So we could offer a mini computer that ranks, in terms of performance, at the upper end of the multi-accumulator 16-bit machines, yet sells for about the same as most single-accumulator 12-bit machines. Price: \$5,450.

## The faster, more powerful Nova: NOVA 800.

For the guy who wants more speed but doesn't want to spend much more dough, we've got the Nova 800.

Faster, more powerful than the 1200, Nova 800 has a fully parallel central processor and a basic cycle time of 800 nanoseconds.

But what makes it extra special is its extremely flexible IO structure that allows it to handle a heavy load of IO traffic of varying types and speeds.

Price: \$6,950.

## We're more than machines.

O.K.

So now you know something about each of our new mini computers in particular.

Now we want to tell you something about all of our computers in general.

They're compatible.

The first Nova we ever built uses the same software, the same IO interfaces, fits in the same amount of space, uses the same peripherals as our new Supernova SC.

They offer systems manufacturers a range of machines and performance options that they can plug into a system without any modifications, all backed by as generous an array of discount schedules as you'll find anywhere.

We mentioned software.

We've developed a complete line of it.

Big computer software, designed, not scaled down, for mini computers.

Like ALGOL 60, FORTRAN IV, Time Sharing BASIC, and Disc Operating System.

The same goes for our peripherals: disc systems, industry-compatible mag tape units, paper tape equipment, card readers, line printers, real-time clocks, A/D, D/A, communications equipment.

As you can see from all of the above, we are and have been winning the mini computer battles.

Simply because we've consistently come up with the mini computers, and all that goes with them, that perform better and cost less than ever before.

To the victor go the spoils.

## DATA GENERAL

Southboro, Mass. (617) 485-9100 / Hamden, Conn. (203) 248-9660 / Commack, L.I., New York (516) 368-3304 / Rochester, New York (716) 235-5959 / Clark, New Jersey (201) 381-3500 / Bowie, Maryland (301) 262-1198 / Bryn Mawr, Pa. (215) 527-1630 / Orlando, Florida (305) 425-5505 / Chicago, Illinois (312) 539-4838 / Richardson, Texas (214) 231-4846 / Englewood, Colo. (303) 771-0140 / Manhattan Beach, Cal. (213) 376-7917 / Palo Alto, Cal. (415) 321-9397 / London, England 0149-97735 / Munich, West Germany 0811-295513 / Zurich, Switzerland (051) 34 07 77. DATAGEN OF CANADA LTD.: Hull, Quebec (819) 770-2030 / Montreal, Quebec (514) 341-4571 / Toronto, Ontario (416) 447-8000 / Vancouver, British Columbia (604) 731-2711.

# How to evaluate DEC and SYSTEMS and other small real-time computers.

Go to a company that makes a complete line for the OEM and end-user markets. Which leaves only DEC and SYSTEMS.

Forget everything you've heard. Take a hardnosed look for yourself. Compare dollars against performance—right down both lines.

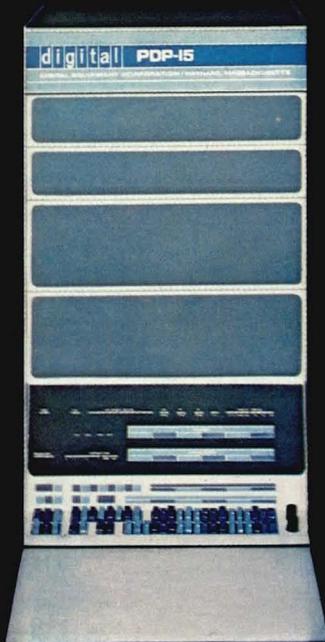
If you need large memory, compare SYSTEMS 72 with the PDP-8 and PDP-11. You'll find the SYSTEMS 72 has a little more speed and a lot more memory (max. 65,000 words of programmable memory—almost twice as much as the other two). On many applications, this will cut cost as much as 40%.

If you need more speed, you'll find the SYSTEMS 82 is 4-5 times faster than the PDP-8 or 11. And because it's designed for real-time systems use, you can hang on a wide variety of analog front ends and peripheral equipment.

If you need even faster speeds and heavier software, check out SYSTEMS 810B—the fastest field-proven 16-bit machine in the business. It comes with a whole library of software including FORTRAN IV and a foreground-background-middleground programming system called Real-Time Executive.

SYSTEMS also makes some very large, very fast real-time computers. But that's another story.

As far as small real-time computers go, don't take our word for it. Send the coupons.



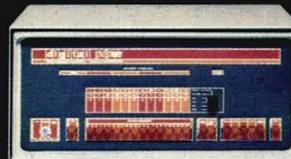
**PDP-15**

Word length—18-bit  
 Cycle time—800 nanosec.  
 Maximum core memory—131



**PDP-11**

Word length—16-bit  
 Cycle time—1200 nanosec.  
 Maximum core memory—32



**PDP-8 Series**

Word length—12-bit  
 Cycle time—1200-1600 nanosec.  
 Maximum core memory—32

5

**Digital Equipment Corp.**

146 Main Street  
 Maynard, Mass. 01754

I'd like to compare the DEC and SYSTEMS lines of small real-time computers. Please send me more information.

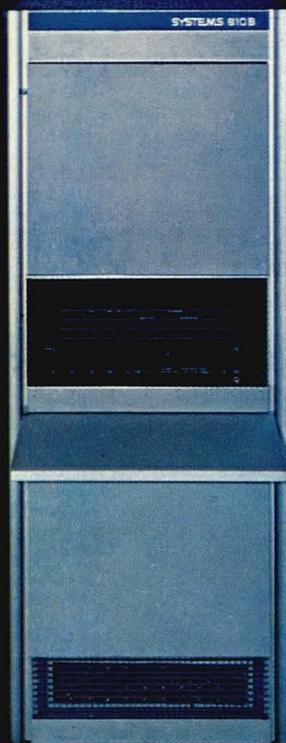
Name \_\_\_\_\_

Title \_\_\_\_\_ Tel. \_\_\_\_\_

Company \_\_\_\_\_

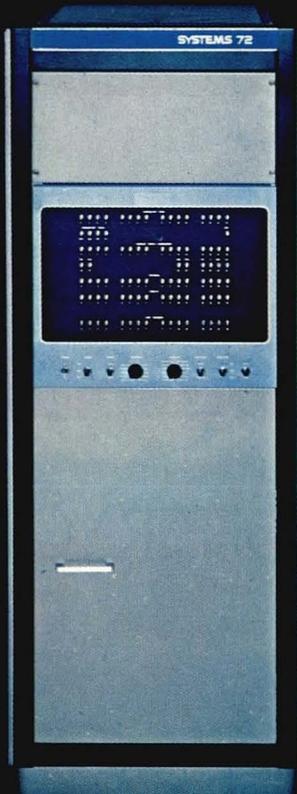
Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



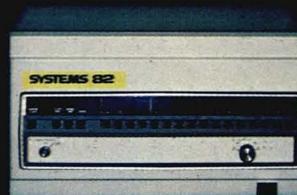
**SYSTEMS 810B**

Word length—16-bit  
 Cycle time—750 nanosec.  
 Maximum core memory—32



**SYSTEMS 72**

Word length—16-bit  
 Cycle time—880 nanosec.  
 Maximum core memory—65



**SYSTEMS 82**

Word length—16-bit  
 Cycle time—900 nanosec.  
 Maximum core memory—16

5

**SYSTEMS Engineering Laboratories**

6901 West Sunrise Blvd.  
 Ft. Lauderdale, Fla. 33313

I'd like to compare the SYSTEMS and DEC lines of small real-time computers. Please send me more information.

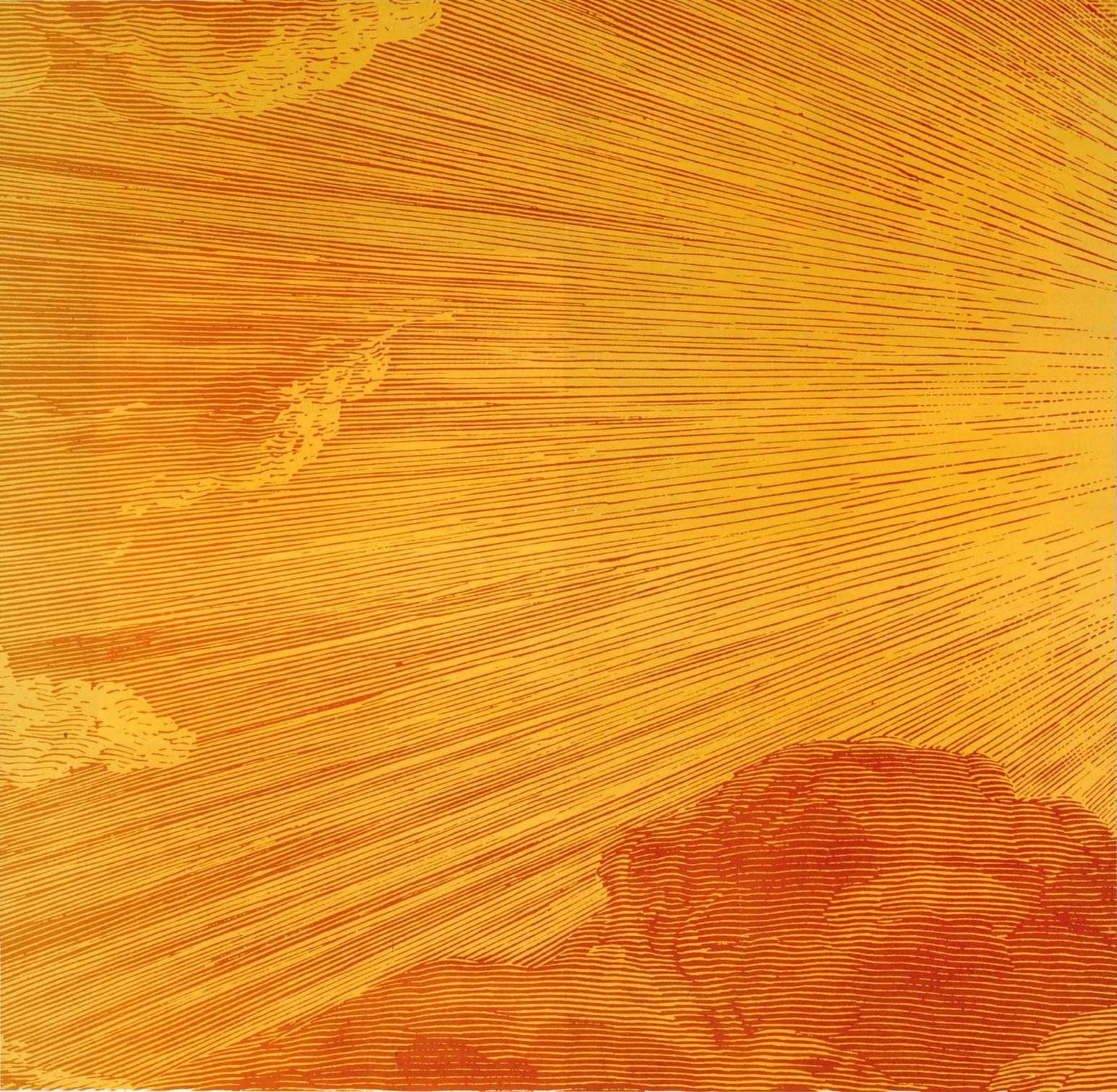
Name \_\_\_\_\_

Title \_\_\_\_\_ Tel. \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



WE HUMBL Y OFFER YOU EVERYTHING



## THERE IS TO KNOW ABOUT DATA PROCESSING.

To do this properly, we at Modern Data have created a Professional Services Division.

And in turn, this new division has created an annual subscription service that gives you practical up-to-date information and advice on how to develop and maintain a more efficient computer installation. Through regular reports, updating reports, surveys and special newsletters.

We call our first series "Guidelines for EDP Management." (GEM, for short.)

Each GEM series will concentrate on one particular aspect of managing a computer installation.

The first series reports will discuss "EDP Personnel Training and Evaluation." They'll cover setting up an in-house training program, personnel evaluation techniques and how to find and select the right

people for an EDP job.

The first report is available in mid-November.

We put a special order card on the first page of this issue. Fill it out and we'll send you the GEM reports. They'll make your computer operation a work of art.

**MODERN DATA**

**Computer Utility  
users  
help design  
our products!**

The COPE mylar tape punch.  
(There's a reader, too.)

The COPE .30 remote terminal.  
(One of eight.)

Our 30-inch  
incremental  
plotter.

(We've a new  
14-inch model  
if you want it.)

The COPE printer.  
(Perfect mate for the .30.)



The Datal 31 terminal.  
(Datal 30's big brother.)

The Datal tape cartridge.  
(Goes with our tape deck  
— or all alone.)

## Look what they've done for us lately.

We built the Computer Utility Network when most people, except a handful of computing engineers, said it couldn't be done. And through the Network, UCC and its customers have evolved a wide range of products to allow users to realize the full advantages of computer power... by accessing UCC's large-scale computer centers from terminals at their own locations.

For instance, our COPE line of high speed remote batch terminals is industry's broadest (ranging all the way from the new COPE .25 to the proven .45). For the timesharing user, the UCC-Datal keyboard data terminals provide point-to-point communication and computer interface, with the model 31 offering an added benefit — a simple, reliable magnetic tape recorder which gives an off-line data capturing capability that results in greatly reduced transmission costs.

Other UCC products include incremental plotters and computer output microfilm (COM) equipment, tape decks, multiple speed modems and even tape

cartridges — but for computers instead of stereos. Whether or not you're now using our Computer Utility, you'll find UCC products best for accessing computer systems — yours or ours. And if you're making systems to sell someone else, remember ours are *user designed* components.

For more information on how UCC computing products can work for you, contact: Corporate Marketing, Dept. 11MD, The UCC Tower, P. O. Box 6228, Dallas, Texas 75222 (214) 637-5010.

# UCC

**UNIVERSITY COMPUTING COMPANY**

Corporate Offices: The UCC Tower  
P. O. Box 6228/Dallas, Texas 75222

New York Stock Exchange ticker symbol: UCX

# We have the right combination. The 6155 Dual-Processor.

Another combination of unique features from *The System Builders!* The 6155 Dual-Processor Computer System . . . offers complete big system concepts and capabilities for the medium-scale computer market. In spite of today's mounting costs, we offer this highly sophisticated dual system for the same price that often accompanies a single computer from our competitors.

The 16-bit 6155 provides fast concurrent processing, with the dual processor configuration yielding a high order of reliability for a relatively small investment. Users may perform batch oper-

ations of various kinds simultaneously with real-time functions. The shared disc/shared core capability of this system enables either processor to handle the critical application when necessary.

A considerable number of special features have been developed to enhance system dependability: power fail detection, parity checks on all input/output, dual power entry capability, and a watchdog timer which monitors all system operation. Allowing continuous processing of critical jobs are the Common XIO interface, enables either pro-

cessor to control any peripheral, and the Disc Exchange gives disc memory access to both processors. System recovery from a malfunction is automatic and instantaneous.

Sales or lease plan, employee-oriented equipment, complete training programs, and "total" customer service. Contact your nearest EMR Computer Sales Office or our National Sales Manager at 8001 Bloomington Freeway, Mpls., Minn. 55420, (612) 888-9581.

**EMR** COMPUTER  
*the system builders*

EMR Division of Weston Instruments, Inc., A Schlumberger Company

CIRCLE NO. 11 ON INQUIRY CARD



**THE FIRST TOTAL, FULL PERFORMANCE,  
ON-LINE COM SYSTEM FOR AN HONEST \$49K.**

## **We call it "MOM." She pays her own way.**

MOM, our new Micromation On-Line Microfilmer, pays her own way. Just two small printout applications per month make MOM self-supporting. Your savings in postage and paper alone can absorb her monthly rental rate. The rest is pure gravy.

How full is "full performance"? For openers, MOM is a giant step ahead in resolution and micro-imagery. DatagraphiX' CHARACTRON® Shaped Beam recording sees to this. MOM is a total package. That means everything is standard. Like:  our Universal Camera for recording images on 16mm, 35mm, 105mm  both comic and cine mode sequencing  both roll film and microfiche  a built-in controller and forms projector  25X and 42X reductions  fully software-supported  direct data conversion from any IBM 360 model 25 and up. And so on.

All for an honest \$49,000. Or low leasing if you prefer. A great bargain for a great MOM, or the DatagraphiX 4200, MOM's official title.

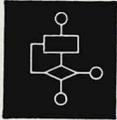
It's easy to afford the brightest picture of COM. For more information about COM's MOM, please write or call us.

### ***DatagraphiX***

Stromberg DatagraphiX, Inc.,  
a General Dynamics subsidiary  
P. O. Box 2449, San Diego, Calif. 92112  
(714) 283-1038 TWX (910) 335-2058

**CIRCLE NO. 12 ON INQUIRY CARD**





## LETTERS TO EDITOR

To the Editor:

As a user of the Mark II time-sharing service, we have in the past very frequently engaged in the wishful thinking that it would be of great benefit to us if we were able to share the experiences of other users in coping with Mark II.

For this reason, I would like to explore the feasibility of forming a Mark II User's Group. The objective of this group should be to maintain communication between users relating to Mark II problems and opportunities.

I would therefore appreciate your publishing this letter inviting interested readers to participate in this undertaking by writing to:

**Heinz Dinter, President, Computer Management Corp., 1105 West University Avenue, Gainesville, Florida 32601. Telephone 904-378-1615.**

**Heinz Dinter,  
President  
Computer Management Corp.  
Gainesville, Fla.**

To the Editor:

In his June On-Line column, Thurber Moffett reviewed "*Past and Future Trends in Computer-Aided Design and Manufacturing*," a paper written by Wallace E. Dietrich and myself. Copies of the original paper can be obtained upon request from:

**Auerbach Associates, Inc., 1501 Wilson Blvd., Arlington, Va. 22209.**

**Donald E. Craig  
Principal Consultant  
Auerbach Corp.**

To the Editor:

We appreciate your including Cal-Comp in the "Technology Profile: Digital Plotters" in your July 1970 issue of MODERN DATA. However there is an error which we would like to call to your attention.

On Page 77, last column headed "1136 Series," in the section entitled "Resolution (Step, Increment

Size)," you list the value as .05"/.025" although the correct value is .0025" or .05 mm. This results in a factor of 20 for improper interpretation of resolution and line generation rates.

**James L. Pyle  
Asst. to the President  
and Dir. of Public Relations  
California Computer Products, Inc.**

To the Editor:

I would like to correct certain information about INFORMS, General Analytics Corp.'s information management system, contained in your article "Survey of Program Packages—Report Generation and File Management Systems" in the August, 1970 issue.

The primary access method used by INFORMS is direct access BDAM, with a secondary sequential access method, QSAM, however, the system does not handle indexed sequential files as indicated in Table 2 of the article. Also the major structure of the data files in an INFORMS data base is not inverted, although the system has the capability of handling inverted files.

INFORMS is a general-purpose data base management system that creates a multiple-file data base from multiple input English-like free form report generator language selects, calculates, and formats reports in virtually any desired output style from any multiple-file INFORMS data structure.

**David H. Mortlock, Jr.,  
Customer Representative,  
General Analytics Corp.,  
Bethesda, Md.**

To the Editor:

Congratulations to Mr. David R. Bell on his July article titled "*Up The System Down-Time*." As an ex-programmer, systems analyst, computer sales rep., and branch manager, I really enjoyed Mr. Bell's comments, but his third paragraph demonstrated that the most troublesome problem is the communication between a systems analyst and a programmer.

Find the one or two people most affected and get their approval at each significant development step. This in no way mitigates the project leader's responsibility; it hopefully

minimizes the chance that he won't get the rug pulled out from under him before he goes on the air.

A programmer who was given that paragraph as a "statement of the objective" would write a program to solve for the minimum chance that he won't get the rug pulled out, or, stated another way, the programmer could solve for the maximum chance that he will get the rug pulled out. Mr. Bell probably did not mean that, and probably would be very unhappy with a Monte Carlo program that suggested the best road to disaster. Although the article is intentionally humorous, I suspect that "an extra

negative" got in that sentence.

Thanks again to Mr. Bell for a near-perfect job.

**A.V. Parker, Branch Mgr.  
General Electric Co.**

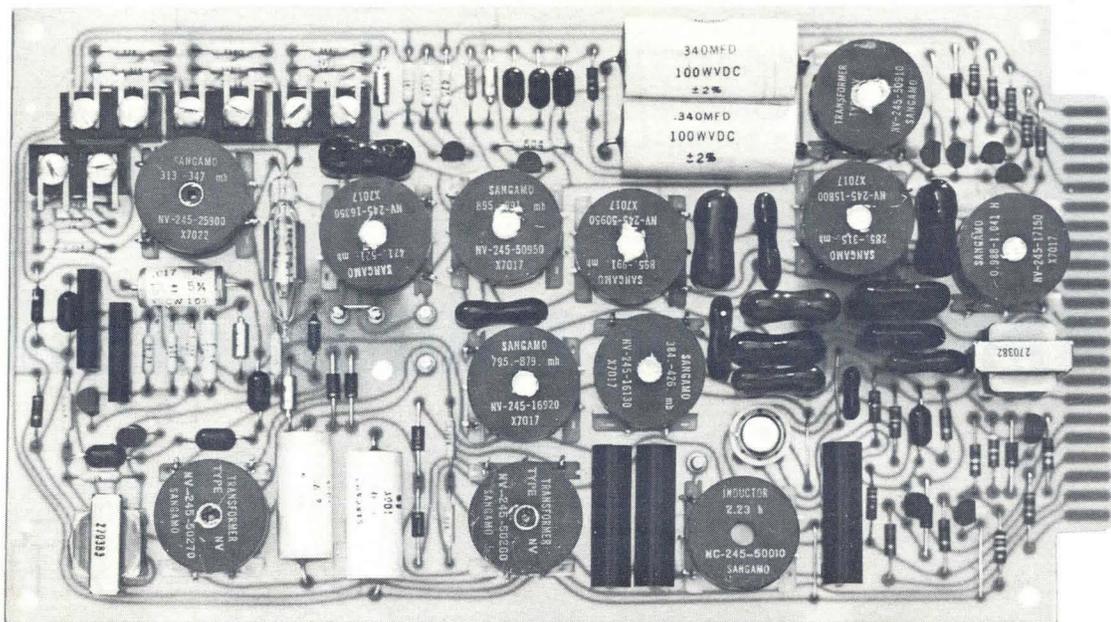
**The Author's Reply:** *Mr. Parker is right. I was negatively negative and should have been positively negative. I'll bet the editor will 'not let nothing' like that slip by him again!*

**The Editor's Reply:** *Like what?*

# 300 Bits/Sec Full Duplex Modem on one P.C. Card

# \$99<sup>00</sup>

ANY QUANTITY



## C113AS

- Frequencies compatible with Bell 103E, 103A, 103F, 101C, 113A
- Card Size 5" x 9"
- Channel separation 60 db
- Transmit level—0 to -12dbm
- Receive level—0 to -45 dbm
- Local copy—selectable
- Interface—EIA/TTL

When you make the decision to build the modem into your terminal, call Sangamo... the people that make modems for the telephone companies, the OEM's and the end users. Application assistance as near as your phone. Need data? Let's communicate.

Communication Systems

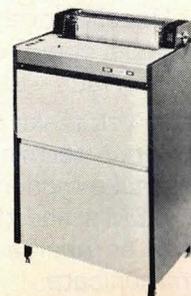
# SANGAMO ELECTRIC COMPANY

Springfield, Illinois 62708  
(217) 544-6411  
Telex: 406-421

ACCOUNT NAME	NRA CODE	DISTRIBUTOR LOCATION	SLS DIS	DIST CODE	CATEGORY	TOTAL	EQUIPMT	MISC SUPP	MASTER	QTY MASTER		
IRS	011-02	PARKERSBURG N VA	02	4687	SET	181	5,788	21	98	182	421	GRAPH RIT
IRS	011-02	DENVER COLO	03	582	GRAPH R PPR	52	3,988	83	79	581	4221	EO SET RIT R PPR
BU	011-02	HOUSTON TEXAS	03	4131	CTRO	131	9,658	52	79	278		
BU	011-02	AUSTIN TEXAS	03	4135	SET CTRO	1,568	1,272	47	249	587	4511	R PPR
BU	011-02	PHOENIX ARIZ	04	231	GRAPH	215	228	99	115	507	1124	GRAPH
BU	011-02	SAN FRANCISCO CAL	04	421	GRAPH RIT	824	784	152	472		1817	EO SET
BU	011-02	SALT LAKE CTY UTAH	04	4221	EO SET RIT R PPR	113	658	58	85	73	2121	GRAPH R PPR
BU	011-02	SEATTLE WASH	04	4511	R PPR	8	12	8			3337	SET CTRO
AF ACC/FIN	011-02	SPRINGFIELD	05	1124	GRAPH	26	52	26	53	284	4784	CTRO
AF ACC/FIN	011-02	DETROIT MICH	05	2817	EO SET	3	18	3	7	36	4487	SET GRAPH
US	011-02	MINNEAPOLIS MINN	05	2121	GRAPH R PPR	53	858	37	53	80	683	EO
DEP	011-02	CINCINNATI OHIO	05	3337	SET CTRO	58	788	17	47	256	1886	EO
DEP	011-02	MILWAUKEE WIS	05	4784	CTRO	111	7,834	17	94	4167	4484	EO SET
POST	011-02	ARLINGTON VIRGINIA	07	4487	SET GRAPH	11	2,788	11	3,962	4167	4221	CTRO
SAY.	011-03	PITTSFIELD MASS	01	683	MED	4,422	1,123	468	3,962	123		
SAY.	011-03	BALTIMORE MD	02	1886	MED	222			222	123		
SAY.	011-03	RICHMOND VA	02	4484	MED SET	382	65	382		5978		
SAY.	011-03	SALT LAKE CTY UTAH	04	4221	CTRO	148	738	522		5888		
TOTAL PARENT CO.						23,543	4,165	4,617	14,761	212		

# Observe one minute of silence

## The whisper-quiet ink jet printer.



Actual photograph of one minute of Videojet printout.

ACCOUNT NAME	N&A CODE	DISTRIBUTOR LOCATION	SLS DIS	DIST CODE	PROCESS CATEGORY	TOTAL	EQUIPMT	MISC SUPP	MASTER	BY MASTER
IR3	011-02	PARKERSBURG W VA	02	4687	SET	101	5.700	21	88	102
IR3	011-02	DENVER COLO	03	582	GRAPH R PPR	52 79 131	9.900 8.736 9.650	52 83 52	79 79	581
BU	011-02	HOUSTON TEXAS	03	4131	CTRO	1.568	1.272	47	249	270
BU	011-02	AUSTIN TEXAS	03	4133	SET CTRO	215 624 839	220 784 651	99 152 251	116 472 588	507
BU	011-02	PHOENIX ARIZ	04	231	GRAPH	14	7.382	14		
BU	011-02	SAN FRANCISCO CAL	04	421	GRAPH RIT	720 113 833	710 650 710	18 48 58	96 85 85	221 123 73
BU	011-02	SALT LAKE CTY UTAH	04	4221	ED SET RIT R PPR	8 26 3 53 90	12 52 10 850 700	8 26 3 37	53 53	204
BU	011-02	SEATTLE WASH	04	4511	R PPR	7	18		7	36
AF ACC/FIN	011-02	SPRINGFIELD	05	1124	GRAPH	69			69	206
AF ACC/FIN	011-02	DETROIT MICH	05	2017	ED SET	35 262 297		182 182	35 168 195	109 200 80
US	011-02	MINNEAPOLIS MINN	05	2121	GRAPH R PPR	64 47 111		17 17	47 94	107 256
DEP	011-02	CINCINNATI OHIO	05	3337	SET CTRO	11 4.411 4.422	2.780 1.123	449 468	3.962 3.962	4167
DEP	011-02	MILWAUKEE WIS	05	4704	CTRO	222			222	123
POST	011-02	ARLINGTON VIRGINIA	07	4487	SET GRAPH	382 148 522		382 148	522	5978 6000 7100
SAV.	011-03	PITTSFIELD MASS	01	603	ED	6	21	2	4	12
SAV.	011-03	BALTIMORE MD	02	1006	ED	7	11	7		
SAV.	011-03	RICHMOND VA	02	4484	ED SET	488 488	488			
SAV.	011-03	SALT LAKE CTY UTAH	04	4221	CTRO	3.457	1.362	105	1.990	212
TOTAL PARENT CO. -						23.543	4.165	4.617	14.761	

# from A. B. Dick Videojet®

One minute of silence from Videojet is worth 15 minutes of mechanical clatter from ordinary communications printers.

That's because Videojet prints a completely new way—with an ink jet. So at 250 characters a second, the sound of printing is no louder than the sound of ink hitting paper. There's another advantage to the ink jet—its simplicity. This makes for very little servicing.

And because Videojet prints as fast as your telephone lines can deliver, you can use it in remote applications with your computer. It's also plug to plug interchangeable with IBM 2848/2260 terminals.

Videojet prints full computer length lines on standard, fan-fold business forms. And unlike most impact printers, character sizes and number of characters per line (up to 200 characters) can be adjusted to fit your needs. So if you're looking for a flexible inexpensive printer, this is it.

Now that you've observed one minute of silence from Videojet, wouldn't you like to see a lot more? Videojet, Another information handling product from A. B. Dick Company, 5700 Touhy Avenue, Chicago, Illinois 60648.

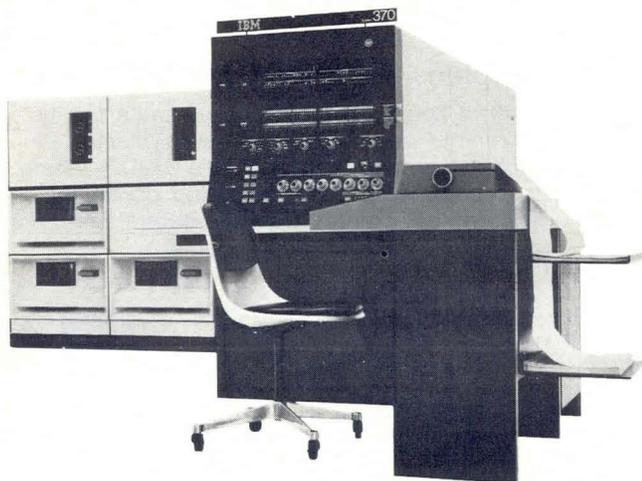


"Videojet" and "A. B. Dick" are registered trademarks of A. B. Dick Company.

**IBM  
introduces  
all-monolithic  
technology,  
memory and logic.  
And a new  
computer that  
makes the most  
of it:**

**System/370  
Model 145.**

## You might call it a new era of computers, or a new generation, or a technological breakthrough. But what really counts is what it means to you.



### The hottest concept in computer technology

System/370 Model 145 is the first general-purpose business computer with 100% monolithic circuitry. Including main storage.

The use of this technology with its very high circuit density cuts main storage space in half.

Monolithic technology also speeds up the computing process. And improves reliability as well.

### New advancements in speed

Model 145 is 3 to 5 times faster than System/360 Model 40. 5 to 11 times faster than System/360 Model 30.

And that's another reason it's the natural system to move up to if you're a Model 30 or 40 user.

### Features, features, features

Like the other computers in the System/370 line, Model 145 is newly engineered inside and out. It's loaded with features.

Like four selector channels. So you can run more jobs and get more work done in the same time.

Like reloadable control storage. So you can have features like block multiplexing, 1400 and 7010

compatibility, and DOS emulation at no extra charge.

Like our new low-cost, high-speed disk facility (the 2319) that holds 87 million characters. And attaches directly to the system without the need for a separate control unit.

### System/370: IBM's computer line for the '70s

With System/370, whatever you've got to get out gets out a lot faster.

With any model, you can get our new high-speed printer (the 3211). It fires out numbers and letters at the rate of 2000 lines a minute. Faster than you can blink.

With any model, you can also get our new high-speed disk facility (the 3330). It can hold up to 3½ times more information than our current files. 800 million characters in all. And it can send it into your computer up to 2½ times faster. At a rate of 806 thousand characters per second.

We think it's the best file around.

### Revolutionary new product line

But perhaps the most amazing thing of all is that we've been able to make System/370 this advanced while still making it compatible with System/360.

And you also know with IBM you have the support of the most complete program library in the world. As well as the support of our Systems Engineering and Education services.

We've used a lot of words to describe System/370 Model 145. Like 100% monolithic circuitry. Like faster speeds. Increased performance. New features. Greater reliability.

These words aren't empty chatter.

Everything we've said is backed up by hard facts.

Our products change. But our philosophy doesn't. We want you to get the most out of your computer system.

## System/370. The performance computers for the seventies.

# IBM®

## terminal operations controller

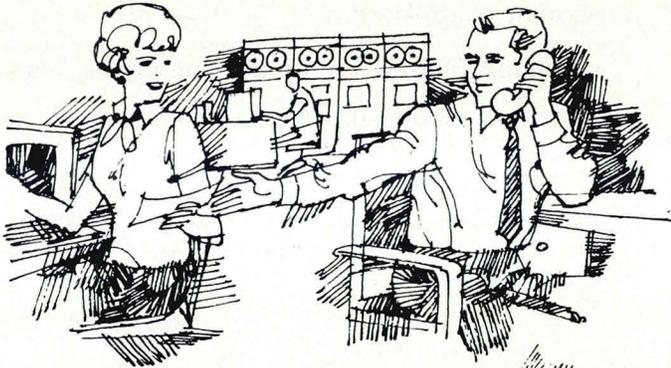
T.O.C.S. starts with the CDC® 20290 Multistation Controller. This device interfaces directly to the Selector Channel; handles the chores of polling 12 independent ports for inbound data traffic . . . directing outbound messages . . . performing EBCDIC-device code translation.



# T.O.C.S.

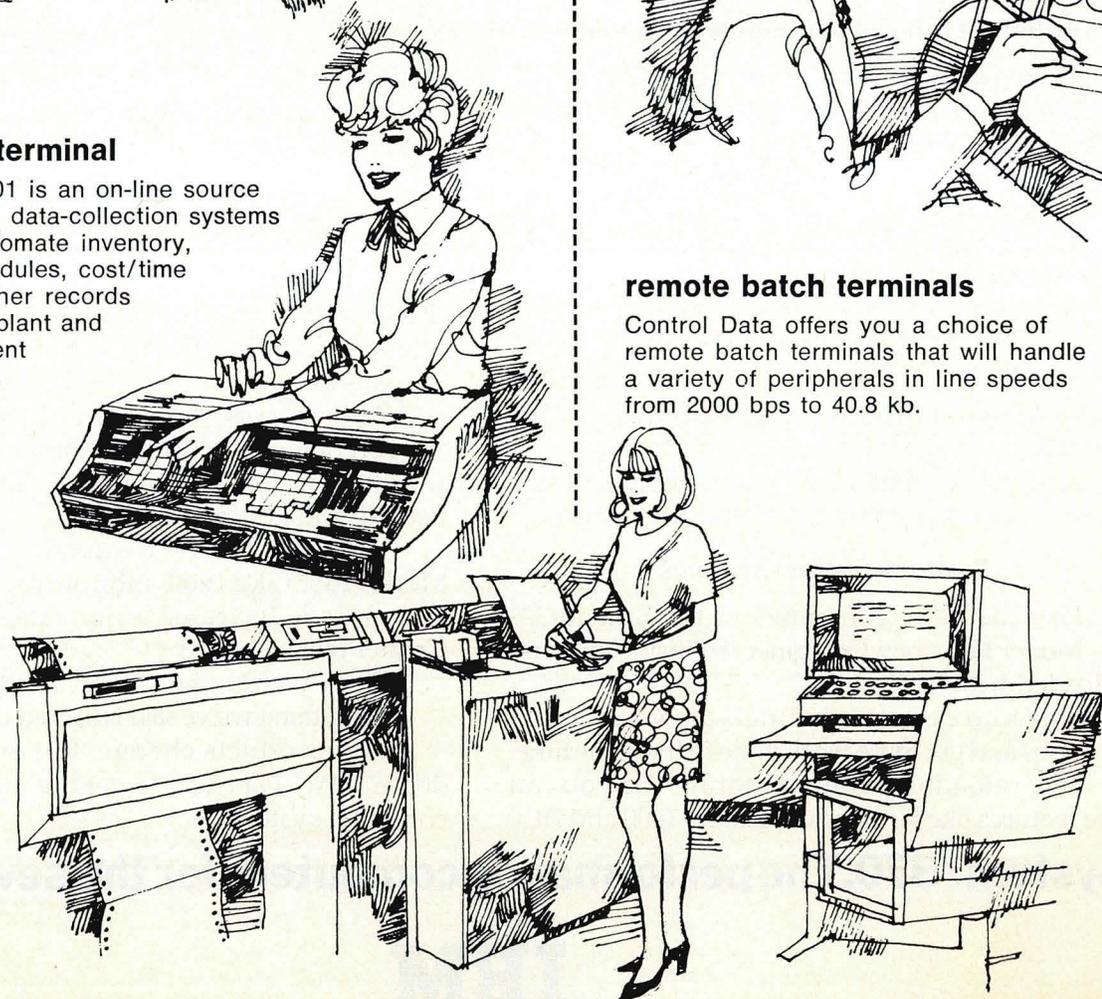
## multistation controller

CDC's 20290 Local Controller and 216 Remote Controller will support CRT displays, typewriters, hardcopy recorders and line printers in any combination. Permits the high-volume data entry and retrieval operations demanded by on-line management systems.



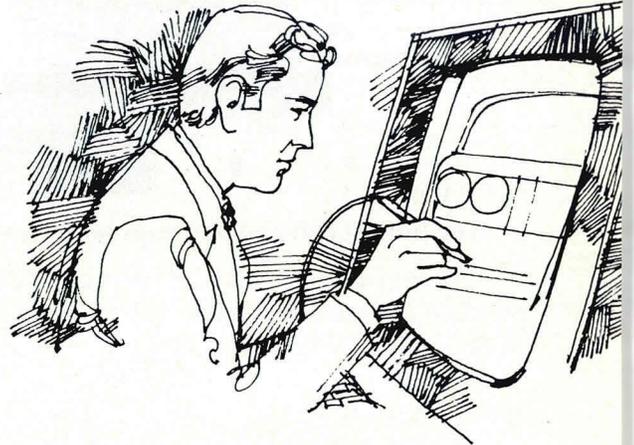
## source data terminal

The CDC® SD-101 is an on-line source data terminal for data-collection systems that lets you automate inventory, production, schedules, cost/time reporting and other records needed to keep plant and office management up-to-the-minute.



## graphics subsystem terminals

Control Data can provide a versatile family of remote graphic terminal subsystems. Included among them is CDC's GRID™ which incorporates its own computing capability, and can be remoted from the central site via 201-A or -B, or 301 Modems.



## remote batch terminals

Control Data offers you a choice of remote batch terminals that will handle a variety of peripherals in line speeds from 2000 bps to 40.8 kb.

# TERMINAL OPERATIONS CONTROL

... a unique cost-saving way to expand your EDP capability without getting "sold-up" to a bigger CPU

Now — get far more from your existing computer — spare yourself the expense of going to a bigger mainframe. CDC® T.O.C.S. is the versatile new "Terminal Operations Control System" that offers a *simpler, more efficient answer* to controlling local and remote terminals within your communications network *with faster transfer rates throughout!* Compatible with major computer system mainframes including IBM 360, T.O.C.S. actually takes over many routine communications housekeeping chores, clears the way for more profitable use of your central processor.

## **Speeds communications . . . expands channel capacity**

Much of T.O.C.S.' enormous gain in efficiency is due to its versatile multistation display controller that handles functions such as polling for inbound traffic . . . directing outbound messages . . . EBCDIC-code translation . . . and other tasks that would unnecessarily burden your CPU.

T.O.C.S. software accommodates Control Data's entire family of terminal systems. Handles any combination of single or multistation CRT displays, typewriters, hardcopy recorders, line printers, and communication-line

pollers. Supports both local and remote terminals and communication lines . . . regardless of mix or number — right up to practical load limits for the line, channel and your applications software. The controller interfaces directly with the Selector Channel at 59,500 characters per second.

## **Control Data's cost cutting total-systems approach**

T.O.C.S. adds up to one of the most complete lines of *fully operational* terminal-control hardware/software packages available. So you get precisely the system you need . . . at *single-source* savings. Shown here are just a few of the many terminal options available to you.

From the world's most powerful computers, to people-oriented terminal systems, Control Data *means* cost saving efficiency . . . compatibility that only a total systems supplier can provide. CDC has the hardware, the software, everything you need from engineering services to set-up, operator training, documentation and support.

For more information on T.O.C.S. and a copy of our new brochure, "Terminal Operations Control Systems," just call our HOT LINE collect.



**HOT LINE 612-884-8195**  
Or if you prefer, write directly to:  
Control Data Corporation  
Dept. MD-110, P.O. Box 1980  
Minneapolis, Minnesota 55111

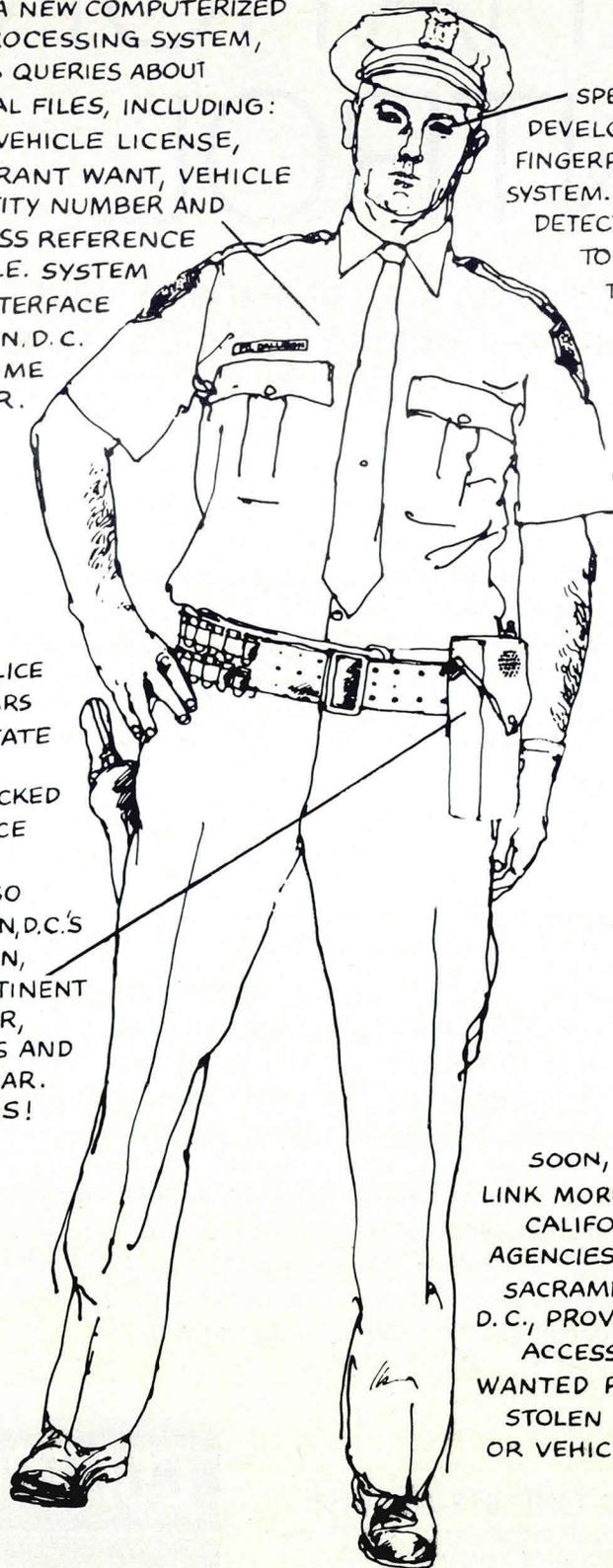
**CONTROL DATA**

**CORPORATION**

OUR NETWORK ALLOWS AN UNDERMANNED POLICE FORCE TO PROTECT LARGE POPULATION AREAS. IN SECONDS, ALERT, A NEW COMPUTERIZED TELEPROCESSING SYSTEM, ANSWERS QUERIES ABOUT SEVERAL FILES, INCLUDING: NAME, VEHICLE LICENSE, WARRANT WANT, VEHICLE IDENTITY NUMBER AND CROSS REFERENCE INDEX FILE. SYSTEM

CAN ALSO INTERFACE WITH FBI'S, WASHINGTON, D.C. NATIONAL CRIME INFORMATION CENTER.

OUR NETWORK LETS POLICE CHECK OUT SUSPICIOUS CARS BY RADIO. OUT-OF-STATE LICENSES ARE CALLED TO HEADQUARTERS AND CHECKED THROUGH THE STATE POLICE COMPUTER SYSTEM. IF NECESSARY, THEY ARE ALSO RUN THROUGH WASHINGTON, D.C.'S SYSTEM. IF A CAR IS STOLEN, COMPUTER TRANSMITS PERTINENT FACTS, VIA TELETYPEWRITER, BACK TO HEADQUARTERS AND THEN TO WAITING PATROL CAR. ALL WITHIN 15 SECONDS!



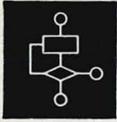
SPECIALISTS ARE DEVELOPING A COMPUTERIZED FINGERPRINT CLASSIFICATION SYSTEM. USING OUR NETWORK, DETECTIVES WILL BE ABLE TO IDENTIFY "SCENE OF THE CRIME" FINGERPRINTS WITHIN SECONDS.

SOON, OUR NETWORK WILL LINK MORE THAN 450 CALIFORNIA LAW ENFORCEMENT AGENCIES TO CRIME FILES IN SACRAMENTO AND WASHINGTON D.C., PROVIDING INSTANT ACCESS TO INFORMATION ON WANTED PERSONS, LOST OR STOLEN PROPERTY, FIREARMS OR VEHICLES.

Data communications helps enforce the law and protects the public.

Next time you're moving information, remember—no one knows more about moving it than the people who run the world's largest communications network.





### CPMA CHARGES HARDWARE BUNDLING

The Computer Peripheral Manufacturers Association (CPMA) is "vitaly concerned" that IBM may be embarked on a course which would restrict independent peripheral manufacturers from offering their products for use with IBM equipment. CPMA president L. Richard Caveney charges that there is evidence of an emerging IBM design strategy of "native attachment," i.e., bundling normally independent subsystems. Caveney referred in particular to the 2314-type disk drive controller, which is included as an integral attachment with the S/360, Model 25 and, he suspects, with forthcoming models in the S/370 series. While the controller package is formally offered as an "option," its additional cost is unrealistically low. This, says Caveney, represents a form of hardware bundling in that it effectively amounts to charging the IBM mainframe customer for the controller whether or not he wishes to use it.

Further aggravating the situation is an alleged failure on IBM's part to provide as comprehensive technical information on the con-

troller-drive interface as it provides on the channel-controller interface. Release of the latter information is obviously beneficial to IBM since it supports sales of the internally-controlled Model 2314 disk drive. Caveney maintains that the net effect of these measures is not only to price the independent controller manufacturers out of the market, but to force the disk drive manufacturers to develop their own controllers since they cannot design for operation with the controller provided by IBM.

In the opinion of the CPMA, whether or not this strategy is being practiced intentionally by IBM, it "can only result in greatly reducing or eliminating the competition in the peripheral equipment marketplace." To prevent "native attachment" policies from spreading, the CPMA is requesting all computer manufacturers and the government to resolve "That all future computer systems be designed so as to define clearly the electrical and mechanical connecting interfaces between the peripheral equipment and the controller, the controller and the channel, and the channel and the central processing unit. And that these interfaces be defined and published in detail at the time a new product is announced."

### MINIS FROM DATA GENERAL

Data General Corp. has announced three new minicomputers. The new Nova 1200, Nova 800, and Supernova SC are all 16-bit machines and fully software- and peripheral-compatible with each other and with Data General's present Nova and Supernova models. Base prices of the Nova 1200 and Nova 800 (the numbers refer to memory cycle times in nanoseconds) with 4K of core, DMA channel, and TTY interface, are \$5450 and \$6950, respectively. The Supernova SC, with 4K of 300 nanosecond semiconductor memory, is priced at \$11,900, including DMA and TTY interface.

### LARGEST NC MACHINE TOOL

A \$1.6 million numerically controlled five-axis mill-machine, believed to be the largest computerized machine tool ever built, was recently unveiled by Onsrud Machine Works and its parent firm, Danley Machine Corp., Cicero, Ill. The giant tool completely machines marine propellers up to 17 feet in diameter and weighing up to 15 tons—from the raw casting to the final polishing stage. It is 32 feet high and covers almost a thousand square feet of floor area. The control unit, an Allen-Bradley Model BR 3300, is programmed in APT.

# BYE, BYE, BUCK-A-BIT.

Say goodbye to former notions of modem price/performance. Our new DigiNet TDM-330 will do more for much less.

If you want to use all of the speed your peripherals have built into them, you'll want to meet the TDM-330.

It gives you switch-selectable rates of 2400/4800/9600 bps.

It operates up to three miles over 4-wire twisted pair cable, point-to-point or multipoint.

And there's no installation fuss—plug it in and go.

No monthly rental.

No more maintenance hang-ups—a screwdriver to replace a unit with a spare is all that's needed.

The TDM-330 is equipped with a built-

in test facility and an automatic line equalizer for easy installation and maintenance.

It interfaces to your data terminal or controller with a standard EIA RS-232 connector.

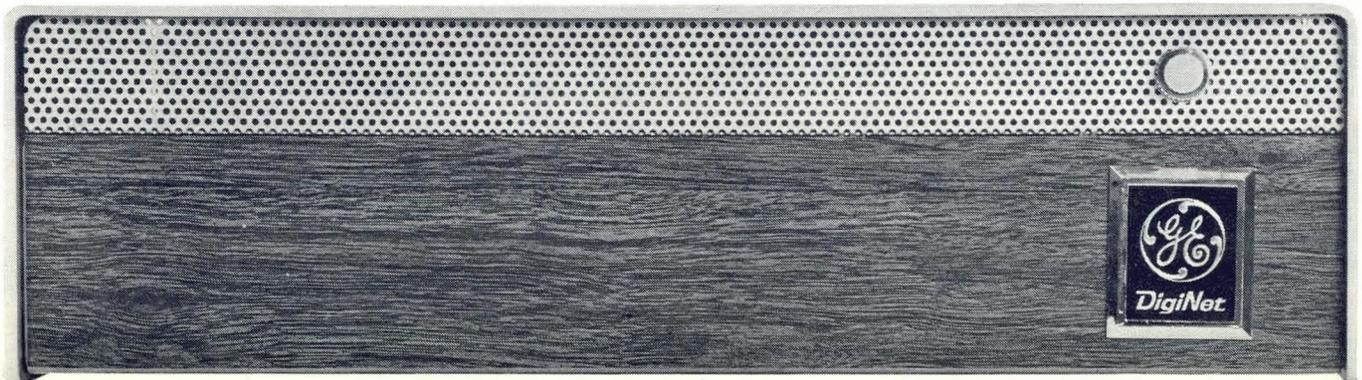
Best of all, it's here—ready to let your peripherals operate at rated speed.

Say goodbye to buck-a-bit notions.

Say hello to our DigiNet TDM-330.... at only \$925—and 9.6¢ per bit.

Inquiries and orders to Wayne Evans, Telecommunication Products Department, General Electric Company, Mountain View Road, Lynchburg, Virginia 24502.

**GENERAL  ELECTRIC**



## GE'S NEW 9600 BPS SHORT-HAUL MODEM

## BIGGIES FROM BURROUGHS

Burroughs Corp., which expects to ship in excess of \$500 million worth of EDP equipment in 1970, has announced a new family of computers to succeed its "500" systems. The new "700" medium to very large systems presently include the B 5700 series (2 models), B 6700 series (5 models), and B 7700 series (3 models). All systems provide a high degree of modularity and will be made available in multi-processor configurations. Top of the line is the Model B 7748, which utilizes a "central ex-

change" concept to accommodate up to 8 inter-mixed I/O and central processors with a total main memory capacity of over 6 megabytes. Full memory cycle time for B 7700 CPs is 1.5 usec., but, by phasing and interleaving, the B 7700 is said to have an effective speed of 60 nanoseconds/byte. Purchase prices range from \$750,000 for the B 5700, to \$15 million for a super B 7700 system. The B 5700, and single-processor versions of the B 6700 will be available in 1970 (!). Deliveries of the B 7700 are slated for early 1972. Also announced: new head-per-track disk files with capacities from 150 million bytes to 112 billion bytes; new magnetically-actuated disk pack drives; and a dedicated communications processor.



## ORDERS AND INSTALLATIONS

The Swedish Government Office of Organization and Management (Statskontoret) has purchased two Univac 1106 and two Univac 418-II computer systems on behalf of Centrala Bilregistret, Stockholm, the central automobile registration agency for Sweden. Value is \$4.6 million. Delivery from Sperry Rand is scheduled early in 1971.

McDonnell Automation Co., St. Louis, Mo., a division of McDonnell Douglas Corp., has installed a Control Data 6600 computer system which when linked to analog computers will provide one of the most advanced hybrid computing facilities in the nation. The system is valued at \$3 million.

A contract in excess of \$8 million has been awarded to Technical Associates of New Orleans, Inc. by the Advanced Marine Technology Division of Litton Systems, Inc., El Segundo, Cal. The contract encompasses development and fabrication of automation systems and data centers for nine new U.S. Navy amphibious assault vessels.

Odetics, Inc., has been awarded a contract for \$346,000 by the NASA Goddard Space Flight Center, Greenbelt, Md., to build long-life digital spaceborne recorders for use in the Atmosphere Explorer satellite program.

The National Cash Register Co. has installed a \$334,075 Information International FR-80 Computer Output Microfilm Recorder at the NCR microfilm facility in Dayton, Ohio.

Colorado Instruments, Inc., Broomfield, Colo. has agreed with Ford Motor Co. to produce and install \$2.4 million of Colorado Instruments' source data collection equipment throughout major Ford production facilities.

System Development Corp., Falls Church, Va., has received a \$717,000 contract from the Navy to develop new computer systems to help monitor submarine and surface ship movements.

The U.S. Army has awarded two contracts totaling \$6.9 million to Control Data Corp. for February installation of two CDC 6600 computer systems. One of the systems will process scientific data at the Redstone Arsenal, Huntsville, Ala. The second will be at Fort Belvoir, Va., under control of the Army's Mobility Equipment Research and Development Command.

International Computer Optics, Ltd., a Canadian-based service bureau specializing in optical character recognition, has installed a \$1.1 million OCR system ordered from Recognition Equipment (Canada) Ltd. at its Toronto data processing center.

The Franklin Institute Research Laboratories, Philadelphia, has retained Satellite Computer Service, Inc., Philadelphia, to provide about \$200,000 worth of remote batch computing services over a year's period. Computing tasks include stress analysis of nuclear vessels, and CalComp plotting for analysis of thermal gradients.

# If the new PDP-8/e is so great, how come it's so cheap?



We've got the price down under \$5000 for the basic 4K computer. (With teletype, under \$6500.) And our new modular design means that you don't have to pay for anything you won't use. The peripherals, the options, even the CPU, all plug into the OMNIBUS™. In any order. Buy only what you need for your application. Expand later if you want.

And you don't have to spend any time or money to debug the

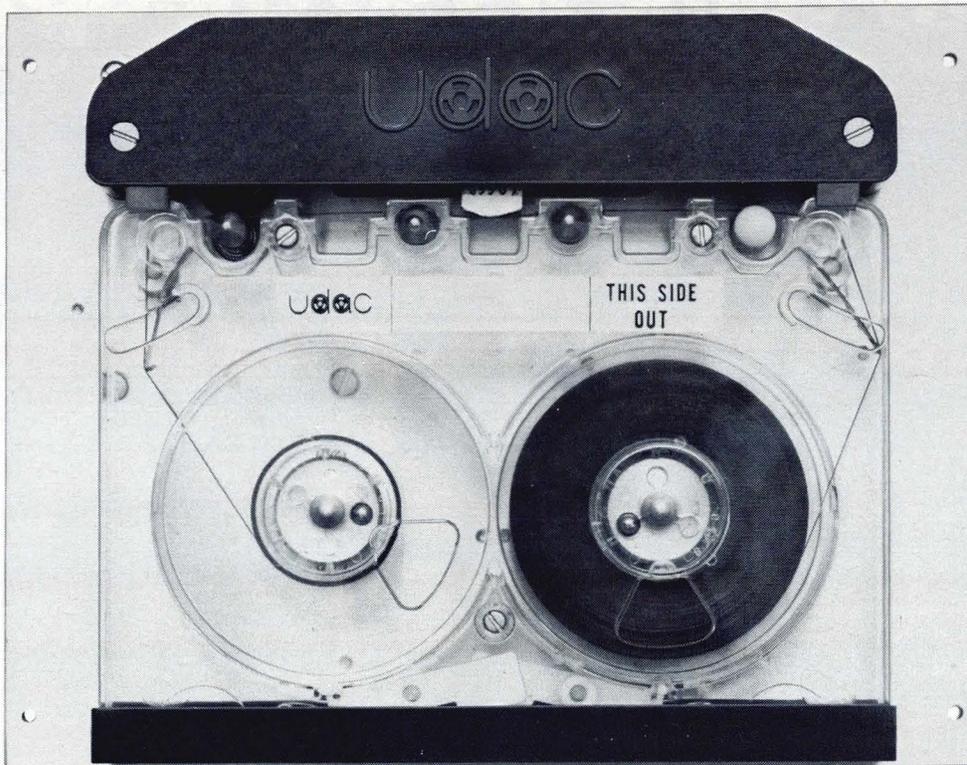
software. 7500 other PDP-8 family computers have done it for you. The PDP-8/e is completely compatible with all the lovely software that's working right now in laboratories and factories, steel mills and power plants.

The PDP-8/e is made by the most experienced company in the small computer field. That's why it's such a great mini-computer. And that's why it costs so little.

**digital**  
COMPUTERS · MODULES

Digital Equipment Corporation  
Maynard, Mass. 01754 (617) 897-5111  
CIRCLE NO. 17 ON INQUIRY CARD

# Computer Expander



## UDAC's Model 160 Tape Deck

Imagine a compact unit so versatile and flexible it can "double in brass" as a: Buffer Storage Device, a Data Collection Device for Audit Trail purposes, a Memory Augmentation Unit for Terminal and Mini-Computers and as a Replacement for Paper Tape Punches and High-Speed Readers. That's UDAC's new Model 160 Tape Deck. It gives data faster . . . more reliably . . . and at lower cost, too!

### USES CARTRIDGES —

Up to 1,440,000 characters at 400 bpi are stored in UDAC's "snap-in/pop-out", 5" x 7" cartridges. There's no threading, no reel locking, and any format consistent with bit density can be used: RZ, NRZ, NRZI or RB. Accepted data returns by a record status line to external equipment.

### OPERATES IN FOUR MODES —

- I. Record and playback on command by character.
- II. Record on command by character and playback slew rate with no blocking.
- III. Record and playback slew (block command).
- IV. Record and playback, 8-level code by character.

### REPLACES P/T PUNCH AND HI-SPEED READER —

Two available options, a Read Pre-amp/Write-Erase Driver Card and a Data Dispatch Card can be interfaced, permitting the basic deck to function as a Paper Tape Punch and High-Speed P/T Reading unit.

### GIVES OEM'S A COMPETITIVE EDGE —

If you are a Computer OEM, the Model 160 Tape Deck can add both utility and versatility to your line regardless of size. Result: more sales to more markets in less time.

For complete technical and application data, contact:

*Marketing Manager,*



Universal Data Acquisition Company  
An MCA Tech. Division  
11822 W. Olympic Blvd.  
Los Angeles, California 90064  
(213) 478-0261



**With \$250,000 a race riding on his system, this OEM places his bets on an HP tape drive.**

American Totalisator has just computerized its world-famous Tote Board. So odds and payoffs can be posted instantly. And with indisputable accuracy.

Unless the computer "crashes."

In which case, you've got a mob of outraged race fans to contend with. So the computer is backed up with HP's 7970 Digital Magnetic Tape Recorder. If there is a "crash," the 7970 can be relied on to get the numbers back on the board in minimum elapsed time.

Reliability makes the 7970 a money winner for American Totalisator. Its exclusive HP features assure trouble-free

operation from 10 to 37.5 ips.

And to make sure the 7970 stays in the winner's circle, there are 141 Hewlett-Packard sales and service offices around the world to serve you and your customers. If a 7970 should need work, simple plug-in service cards permit repairs on-site with minimum down time.

American Totalisator chose the HP 7970 Digital Magnetic Tape Recorder for reliability. If you want a sure thing, just call your local HP field engineer. Or write to Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

CIRCLE NO. 19 ON INQUIRY CARD

42003



MAGNETIC RECORDERS

Rent or buy our  
extraordinary  
page reader  
and get a \$150,000  
document reader

# FREE

That's what you get when you  
install the new Scan-Optics  
20/20™ page/document reader.  
Because the 20/20 is two  
OCR's in one!

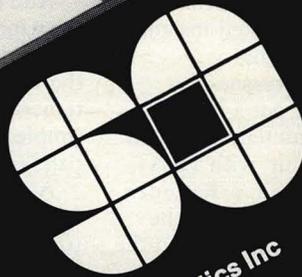
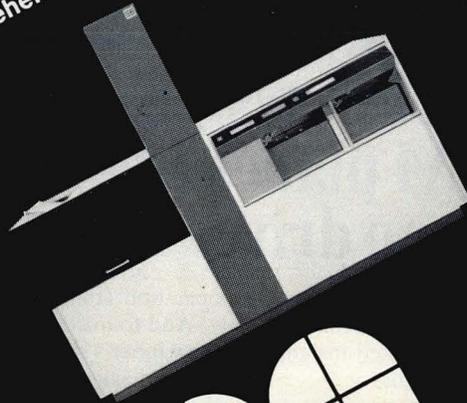
And that's not all. The 20/20  
processes both pages and multi-  
line documents, at extremely high  
thruput rates (like 110 full size  
600-character pages per  
minute) . . . and at a low cost

that'll please your Controller.

Other 20/20 features and advan-  
tages? The best cost/perfor-  
mance ratio (less than 1/2¢ per  
1000 characters processed) in the  
whole industry . . . and that takes  
in a lot of OCRs. Off-line opera-  
tion. Direct conversion of your  
data to mag tape. Modular design  
for add-on options. Font variety.  
Comprehensive software.

Even more . . . but see for your-  
self. Call 203 289-6001 for an eye  
opening demo. Or for starters,  
send for our brochure and specs.  
Scan-Optics Inc  
Prestige Park  
East Hartford  
Connecticut 06108

When was the last time you were  
offered a \$150,000 document  
reader FREE?



Scan-Optics Inc

# Now! A 60 page report in 1 minute.

Make room for Statos® 21 — the new line of electrostatic printer/plotters featuring the quickest output in the EDP business. Statos 21. Zings out 8½x11 hardcopies at a page-a-second rate. Or 5,000 very readable lines a minute. On Z-fold or roll paper.

And *plots* at the same time, if you wish.

At that rate, Statos'll do the work of 2, 3, even 4 contemporary printers or plotters. Or eliminate a mag tape unit as a middle-man. All in a space of 4 square feet.

It'll give you plug-to-plug compatibility with computers ranging from the IBM/360 to the Varian 620/f. And something no other non-impact printer offers: forms control.

Designed from the floor up as a full-fledged computer peripheral, Statos 21 will handle full lines of alpha-numeric data, allowing efficient I/O programming at the data source.

With its 80-character line buffer the Statos 21 can handle card-image records, teletype-compatible listings plus a wide gamut of other business data formats. Statos 21.

You can't beat it. For the whole persuasive story, with a surprise cost ending, contact us at 611 Hansen Way, Palo Alto, Calif. 94303. Call 415-326-4000.



**varian**  
graphics & data  
systems division

## Statos 21





**HONEYWELL-GE MERGER** — Under the terms of the purchase of General Electric by Honeywell, Honeywell Information Systems (HIS) will have all the stock of GE's wholly-owned Italian computer subsidiary, 25% in its UK company/GEIS Ltd., and 66% interest in Bull-GE (B-GE). Not included in the transaction are GE time-sharing services in Canada.

In most countries where B-GE is active, B-GE will absorb the Honeywell operations. These countries are: Austria, Belgium, France, Mexico, the Netherlands, Spain, Sweden, Switzerland, and West Germany. Honeywell's computer operations in Italy will merge with GE Information Systems Italia.

In the UK the operations of GEIS Ltd. will become a part of Honeywell's computer operations. In Canada and Australia GE's computer business will be transferred to a new computer division of the respective Honeywell subsidiaries in those countries.

**YUGOSLAVS HEADACHES** — With more than 200 computers in use Yugoslavia is experiencing difficulty in the recruitment of qualified programmers and operators, UPI reported recently. Lack of systems uniformity and the high cost of computerization are also creating headaches for the Yugoslavians.

**AEC EXPERIMENT** — The feasibility of tying a computer base of information to terminals on the other side of the world was demonstrated for the Atomic Energy Commission in Paris recently. Using a terminal consisting essentially of an electric typewriter and a TV tube, a computer in Palo Alto, Cal., containing over 100,000 abstracts of research in nuclear science was probed. The link was accomplished by means of the new TAC #5 transatlantic telephone cable which became operative in March. Similar results are believed possible using communications satellites. This experiment was the first attempt to obtain instantaneous access to a large literature file over very long communication lines.

**PRIVACY** — Delegates attending a recent conference on "Man and Computer" at the University of Bordeaux, France, were urged by U.S. Assistant Secretary of Commerce for Science and Technology Myron Tribus to go back to their own countries and ascertain how the Law is protecting individual rights with respect to computers. He, also, suggested that an international conference be held in three years to review experience in different countries.

**GLOBAL MARKETS** — Reports on overseas opportunities in 25 markets for electronic data processing equipment have been summarized into one volume by the U.S. Department of Commerce. For a copy write: **Global Marketing, BIC-912, Bureau of International Commerce, U.S. Department of Commerce, Washington, D.C. 20230.**

**IMPROVED DESIGN** — Improved design, but no great reduction of cost, is likely to result from the use of computer-aided design by small- and medium-sized engineering companies, a recent report of the British Ministry of Technology concludes. The study, based on six typical mechanical-engineering firms employing 100 to 200 persons, found two prime areas for computer-aided design application: (1) situations where the use of simplified formulas in manual methods of design give less than optimum results; (2) situations where products of common basic purpose require detailed redesign for every order using standard design rules. Although design costs can be reduced they are only a minor part of the total costs, the report said. The report concluded that the benefits lie in improved design leading to better performance, economy in materials, shorter design time, and in quicker and more accurate estimating.

### QUICKLY AROUND THE WORLD

The U.S. dominates the EDP field in Cyprus, the American Embassy at Nicosia reports. This area, it expects, "will expand as the island's businessmen adopt more modern management techniques."

Computer applications to the mineral industry will be discussed at a symposium to be held in Johannesburg, So. Africa, in April and May 1972.

Computer Sciences International UK, Ltd., a subsidiary of Computer Sciences Corp., and the British Airways Corp. plan to offer a broad range of systems development services to the travel and transportation industry.

Exports of computers and parts in the first half of 1970 totaled \$500 million, according to the U.S. Dept. of Commerce. Most of them went to Western Europe. There was also a strong increase in deliveries of computer parts to Hong Kong where U.S. affiliated firms assemble semi-finished products for shipment to other markets.



## SYSTEMS MANAGER

When your central data processing unit is being fed from several distant locations, and the data streams are in parallel for any significant mileage, you need a General DataComm **TDM-1201 Time Division Multiplexer** to increase capacity of the data link, improve system performance, and reduce maintenance problems.

The immensely versatile **TDM-1201** will take the output of as many as 112 terminals; maximum bit packing efficiency is achieved since channel capacity is not determined or limited by highest input rates. Any mixture of rates and codes can be used in the same system.

But while providing greater capacity, versatility and flexibility in data transmission, the **TDM-1201** acts also as a silent systems manager: an efficient diagnostic center, to tell you instantly, on-line, if a problem arises at the Multiplexer — or even at a distant data termination, attended or unattended. Proper operation is self-validated and system problems bypassed automatically at all times.

Best of all — installation and maintenance can be handled by untrained personnel, without special tools or test equipment, with the aid of the operator's handbook.

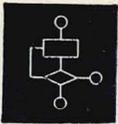
**Find out more about the TDM-1201. Write today for an illustrated, detailed brochure.**



**General DataComm Industries**

537 Newtown Avenue ■ Norwalk, Connecticut 06851 ■ (203) 847-2445

*for Systems and Solutions*



## DC DATASCAN

**DRAMATIC RISE IN GOVERNMENT COMPUTERS** — A dramatic rise in Federal Government use of computers has been revealed by the General Services Administration. "Only 531 computers were in use ten years ago, but well over 5,000 are in use today," said GSA Administrator Robert L. Kunzig. "This is indicative of an increasing awareness on the part of Federal agencies that their programs can be accomplished more timely, efficiently, and economically through automation." The figures are contained in the latest edition of the *"Inventory of Automatic Data Processing Equipment in the United States Government,"* which is now available from the: **Superintendent of Documents, U.S. Government Printing Office, 710 N. Capitol Street, Washington, D.C. 20401.** The reference number when ordering is **GS2.15:970** and the price is **\$2.75 a copy.**

**FIRST PHASE FINISHED** — The first phase of the Federal Reserve System's new communications network has been completed. Ultimately the network will be able to transfer funds, securities, and economic statistics at speeds up to 40 times faster than the present conventional teletypewriter system. At present the new electronic transfer grid links 11 of the 12 Federal Reserve Banks (New York is not included), the Bank's Washington headquarters, and the Treasury Department Automation of the new system is centered in an M1000 store-and-forward switch, developed and manufactured by the MDM Communication Division of Control Data Corp. By the end of the year, 2400-baud terminals will be phased into the switch increasing the traffic capacity 16 times. On-line computers will be added early in 1971.

**FEDERAL DATA BANKS** — The Senate Constitutional Rights Subcommittee is conducting hearings on federal data banks and the Bill of Rights. Subcommittee Chairman Sen. Sam J. Ervin, Jr. (D. N.C.) cited some reasons for concern: (1) The failure of the heads of executive departments and agencies to mind their own stores and stay out of the business of other agencies; (2) The tendency of executive branch officials in the interest of political expediency and "law and order" goals, to seize techniques of data banks as a substitute for practical law enforcement work.

**DOD RECOMMENDATIONS** — A presidential panel, in its final report on the organization and management of the Defense Department, has recommended that the responsibilities for defense EDP activities be given to the Assistant Secretary of Defense (Telecommunications). The panel also called for: (1) improved management of EDP capacity; (2) testing through model programs the feasibility of computer services/centers which could standardize and centralize the EDP system by functions and/or geographically; and (3) the development of a training program for EDP specialists.

**INCREASINGLY INTERACTIVE** — The roles of government and industry are becoming increasingly interrelated. Bernard Strassburg, Chief, Common Carrier Bureau, Federal Communications Commission, told a recent Carnegie Institute conference in New York. "As in many other areas of the economic and social life," he explained, "we find government entering more and more into the role of promoter, planner, and policy maker, affecting both the direction and shape of our communications institutions." "If the public is to be protected," the FCC official stressed, "the government must anticipate problems and set regulatory and policy guidelines before the problems become institutionalized and irreversible."

**GOVERNMENT SOFTWARE INVENTORY** — Congressman Jack Brooks (D. Texas) has called for an inventory of government software. "In order to avoid the unnecessary duplication of software development in the future," he said, "we need to know who is doing what now. For example, with the computer software inventory, perhaps we can avoid the development of 104 independent payroll systems in the government during the next cycle of software development." Other areas requiring specific attention by the government, according to Congressman Brooks are: equipment performance standards; procurement practices; and the coordination of various EDP installations.

### IN BRIEF

An on-line, time-sharing computer operates equipment and analyses data for the high flux nuclear reactor at the National Bureau of Standards.

A 41-page *"Review of Hospital Information Systems,"* prepared by the RAND Corp., is available for \$3 a copy from the **Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Va. 22151.** Request by number—**AD 708-427.**

Several hundred Washington, D.C. high school students are expected to prepare for possible data processing careers through a new curriculum developed under a \$129,196 grant to the D.C. Public Schools by the National Science Foundation.

The Patent Office is studying the use of OCR equipment to translate patents from the conventional paper to machine-readable form.

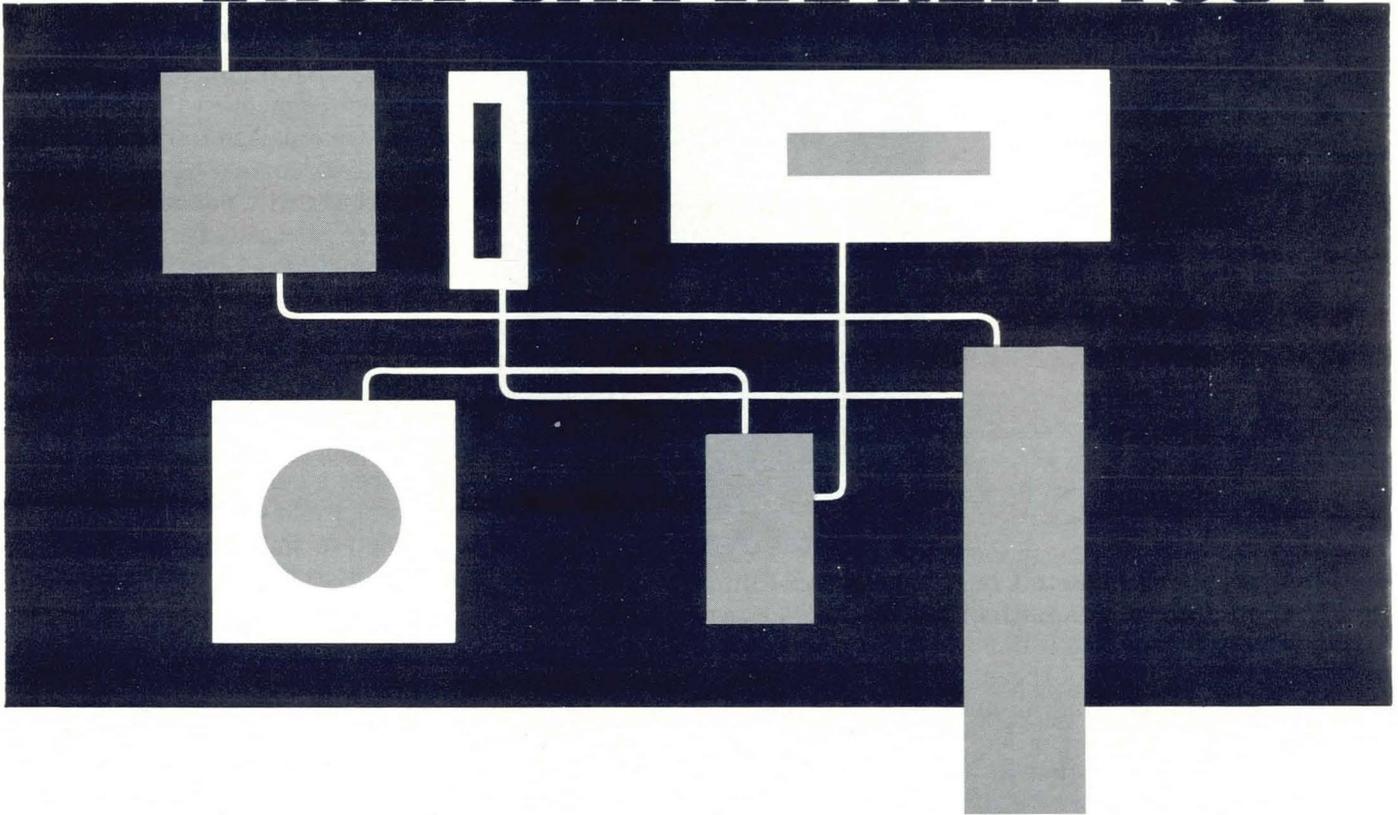
The Office of Management and Budget has established procedures for computerized methods to provide State and local taxing authorities with payroll data on Federal employees in their jurisdiction.

The occupation of computer repairer is now open to women, according to the U.S. Department of Labor Women's Bureau.

Congressman Emilio Q. Daddario (D. Conn.) has requested the President to call a joint executive-legislative conference on Federal research.

Regional Administrators of National Banks met recently in Washington for a course on the use of EDP techniques in bank examination. The course was designed and presented by Peat, Marwick, Mitchell & Co., the certified public accounting firm.

# ? HOW CAN WE HELP YOU?



**Our special talent  
is an intimate knowledge  
of both hardware  
and software.**

We have successfully designed hardware ranging from tiny to immense special and general purpose computers. We have developed assemblers, simulators, sort utilities and components of operating systems. We make hardware and software live together harmoniously.

Much of our effort is with in-house education in OS360 from BAL thru JCL up to SysGen filling a gap left from unbundling and we provide training courses in most areas.

Why not call Ivan Flores at (212) 789-1312, or write for our brochure.

**Flores Associates**  
108 Eighth Avenue, Brooklyn, New York 11215

# We didn't learn about Mini-Computer Memories by putting our foot in our mouth



## Avoid Growing Pains...

Don't paint yourself into a corner with a memory that is difficult to expand. After all, today's Mini may become a Midi or a Maxi. That's why the new ICC memories are easily field expandable from 8 to 144 bits and from 4K to 32K words.

## Don't let the Tail Wag the Dog...

You don't want to re-design your whole system to accommodate a finicky memory. ICC has developed a comfortable memory. It's compatible with both TTL and DTL to smoothly interface with your computer or terminal.

## Don't buy a High Cost Dropout...

One picture (on your 'scope) is worth a thousand claims. So put each prospective core memory thru a battery of dynamic tests. With temperature and supply voltage cycled over the entire range. It's in this competitive arena that ICC has picked up most of the marbles because our memories have built-in temperature compensation for rock-solid operation to +50°C.

## Memory and other Lit Available...

New lit on ICC's COMRAC 50 and 90 core memories is yours for the asking. Or if your need is urgent, contact us today for a demonstration of our Memories, Light Pens, or Logic Modules at **Information Control Corporation**, 9610 Bellanca Ave., Los Angeles 90045, Calif. (213) 641-8520.

You'll find the "Sleepers" are a wide awake bunch.



## The Sleepers

Instead, at Information Control Corporation, we put our foot in many doors – slugging it out with the big guys like Lockheed, Ampex and Fabritek. And more times than not we got the order by proving conclusively that we had the best core memory for the job. Plus an abundance of customer empathy.

No, we haven't done a lot of loud talking at ICC. Or goofing up or goofing off. But we have quietly delivered many millions of dollars in high quality core memories during the past 5 years. That's why they call us "The Sleepers."

Sure, we've taken a lot of lumps playing "David" in this world of "Goliaths." But we've learned a lot, too. Like what you should look for when choosing a core memory for your mini-computer, data system or terminal.

## Call in a Few Real Pro's...

A lot of the new core memory builders won't be around for long. So buyer beware. Call in 3 or 4 firms with proven track records.

And include Information Control Corp. We've earned our credentials in the crucible of competitive bidding, evaluation and production for over five years.

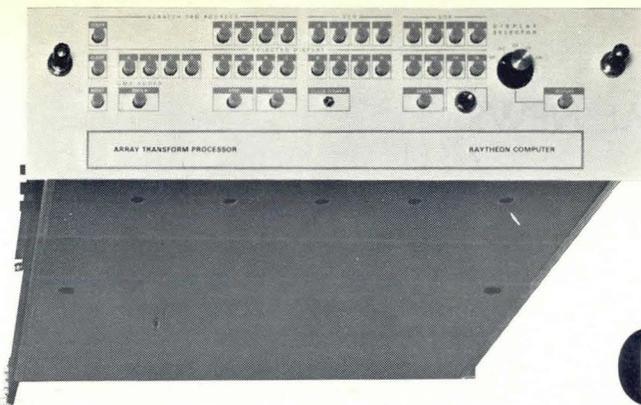
## War and Peace...

At Information Control Corp., we cut our eye teeth on demanding DOD and NASA core memory projects. And it has helped us produce a high quality commercial product. After all, it takes the ultimate in QA and assembly techniques to satisfy the picky government inspectors and to pass the sadistic tests dreamed up by aerospace standards labs. So check out the service record of your potential suppliers. A few tours of military duty makes for mature memories.

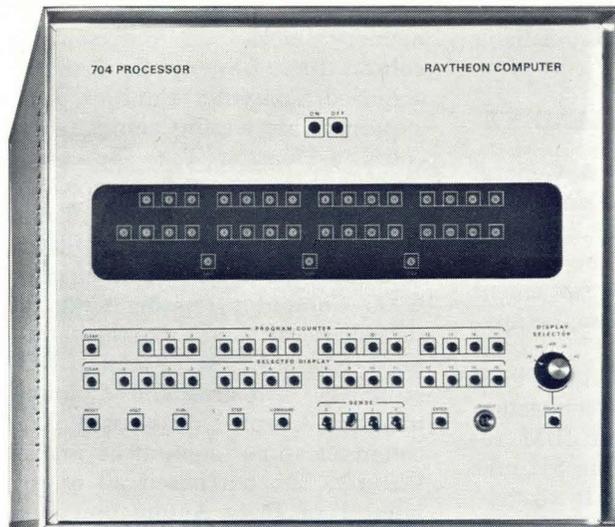
## Don't Overspec Speed...

As access and cycle time gets shorter, cost goes up and flexibility goes down because wire length and component placement becomes more critical. That's why ICC has come up with two new mini-computer core memories – COMRAC 50 with a cycle time of 1.5  $\mu$ -sec and COMRAC 90 which checks in at 900 nanosec. With ICC memories you can take the high road or the low road.

"See the COMRAC 50 and 90 at FJCC"



# Our new ATP gives the Raytheon 704 20 times more power than you bargained for.



Raytheon Computer's new Array Transform Processor has made fast Fourier analysis practical and inexpensive. A Raytheon 704 mini with our ATP runs a typical FFT with 2048 complex data points in only 150 milliseconds! And FFT range is 2 to 8192 data points. The Array Transform Processor also performs integration, differentiation, convolution, auto and cross correlation, and signal averaging.

The Raytheon ATP is an auxiliary processor that connects to a Raytheon 704 or 706 computer ready to go to work on your

problems immediately. The ATP complete with a Raytheon 704 general purpose computer costs about \$40,000.

If you don't need real time processing, we have an ATP software simulator for our 704 computer which will compute FFT's for less than \$20,000.

At Raytheon Computer we have all the equipment you need to do signal processing and analysis. Processors. Interfaces. Converters. Peripherals. So write today for Data File C-192. Raytheon Computer, 2700 S. Fairview St., Santa Ana, Calif. 92704. (714) 546-7160.



"See us at FJCC '70. Booth 1403."

**The only thing Raytheon Computer does is your job. Cheaper.**



## CORPORATE AND FINANCIAL NEWS

**RECENT ENTRIES IN THE COMPUTER FIELD:** **Cowan Marketing Co.**, specializing in the sale of proprietary software packages in the Midwest area, has been formed in Barrington, Ill. . . . **International Data Terminals, Inc.**, Ft. Lauderdale, Fla., will develop and manufacture a line of data terminals and related peripheral equipment. Western Union Corp. has acquired a 50 percent interest in the new company for \$500,000. Data Research and Western Union Computer Utilities, Inc., a franchiser of data processing centers, each acquired a 25 percent interest for \$250,000 . . . **The KMS Technology Center**, Alta Dena, Cal., has been formed as a publicly-owned division of KMS Industries to provide programming, education, and consulting services in the numerical control area . . . **McKee Computer Services Co.** has been formed in Cleveland by Arthur G. McKee & Co., engineers & contractors. The new organization will specialize in providing computer consulting services to process industries . . . **Quantor Corp.**, recently formed in Cupertino, Cal., will retain Vendere and Comma Corp., respectively, to market and service the Quantor 1.2.3 COM system . . . **Recession Programming Services** of Los Angeles will provide fixed-price contract programming services . . . **Systematic Data Processing Services, Inc.**, Waltham, Mass., was originally the New England branch of Data Processing Financial and General Corp. The new company retains the same management, operational personnel, and clientele.

### **\$50 MILLION FOR CCL'S KEY-EDIT**

Consolidated Computer Ltd., headquartered in Toronto, Canada, has negotiated a \$50 million sales agreement with giant International Computers Ltd. of London, England. ICL expects to purchase more than

500 of Consolidated's "Key-Edit" multi-station data preparation systems for use by existing and potential ICL customers in the U.K., Europe, Asia, Australia, and South Africa. The agreement, which Consolidated Computer describes as "almost doubling its forecasted sales for the next 3 years," does not restrict the company from continuing to sell and service Key-Edit in the U.S.

### **DPF&G — IBM SETTLEMENT**

Data Process Financial & General Corp. and IBM reached an out-of-court settlement of the anti-trust litigation pending between the two companies. Terms of the settlement were that DPF&G dismissed its lawsuit and released IBM from all claims; IBM reimbursed DPF&G for all costs incurred in connection with the litigation; and IBM refinanced DPF&G's existing \$42 million indebtedness to IBM by stretching out the payments over a longer period of time. The interest rate for the refinancing is the average rate being paid by DPF&G on its existing indebtedness to IBM, a rate which the financing company characterized as "highly favorable" to it in light of prevailing money market conditions.

### **COGAR GETS SINGER FINANCING**

The Cogar Corp. announced a definitive agreement with The Singer Co. for the purchase by Singer of \$6.5 million principal amount of 15-year, 7.5 percent notes convertible into shares of Cogar common stock. In addition to the \$6.5 million from Singer, Cogar president George R. Cogar purchased one million dollars of similar notes.

**MERGERS AND ACQUISITIONS:** **Adage, Inc.** plans to expand its line of graphics terminal products by acquiring **Computer Displays, Inc.**, Waltham, Mass. CDI manufactures the ARDS graphics display ter-

minal, which is complementary to Adage's existing line of computer terminal systems . . . **Alumina Ferrite Corp. of American (AFCOA)**, Cal.-based manufacturer of magnetic recording heads, has acquired **Computer Components Corp.** for an undisclosed number of shares of AFCOA common stock. Computer Components Corp. produces core memory stacks . . . **Anderson Jacobson, Inc.** of Sunnyvale, Cal. has acquired **Computer Equities, Inc.**, a peripherals leasing company located in Houston, Tex. The acquisition was made on an exchange of stock basis . . . **Boothe Computer Corp.** has announced that a subsidiary of Boothe will acquire **GAC Computer Leasing Corp.**, a subsidiary of GAC. Boothe Computer will pay GAC a total of \$5.3 million . . . **Carterfone Communications Corp.**, Dallas-based data communications equipment manufacturer, has purchased all of the interest of **Data Automation Co., Inc. (DAC)** in its subsidiary, **Data Automation Communications Corp. (DACOM)**, a nationwide data communications equipment leasing and servicing firm . . . An agreement has been reached for the purchase of **Addo Canada, Ltd.** (Toronto) by **Comperipherals, Inc.** (New York) and **Business Computers, Ltd.**, a London-based computer manufacturing firm. Addo Canada is the sole Canadian importer and distributor for Addo-X Inc., Business Computers, Ltd., ITEL Corp., and Comperipherals Inc. . . . **Computer Devices Inc.** of Cambridge, Mass., a manufacturer of portable computer terminals and data communications equipment, has merged into **SDM Corp.** of Woburn, Mass., an electronic systems manufacturer . . . Two Houston companies, **Dynamic Computer Systems, Inc.** and **Aviation Activities, Inc.**, have agreed to merge. **DCS, Inc.** will be the name of the surviving corporation . . . **Key-matic Data Systems Corp.**, Bay

## BOX SCORE OF EARNINGS

Company	Period	Revenues	Net Earnings (Loss)	Earnings (Loss) per Share
Am. Tel. & Tel.	Yr. 8/31/70	16,607,406,000	2,177,978,000	3.97
	Yr. 8/31/69	15,142,132,000	2,175,576,000	3.96
Andersen Laboratories	3 mos. 5/31/70	1,703,306	52,472	.10
	3 mos. 5/31/69	1,318,502	(6,338)	(.01)
Applied Logic	9 mos. 6/30/70	2,100,122	(3,838,599)	(1.89)
	9 mos. 6/30/69	1,867,744	(259,155)	(.13)
Beta Instrument	6 mos. 6/30/70	1,039,254	(17,161)	(.02)
	6 mos. 6/30/69	372,137	(192,570)	(.24)
Central Data Systems	Yr. 5/31/70	2,005,242	152,976	.35
	Yr. 5/31/69	828,763	112,113	.30
CGA Computer Assoc.	13 wks. 7/31/70	210,988	20,873	.09
	13 wks. 7/31/69	124,845	(6,144)	(.06)
Colorado Instruments	Yr. 5/31/70	1,286,616	(121,479)	(.21)
	Yr. 5/31/69	1,843,961	321,016	.64
Computing & Software	9 mos. 7/31/70	60,104,000	4,468,000	.91
	9 mos. 7/31/69	54,616,000	3,354,000	.70
Data Design Labs.	Yr. 6/30/70	8,112,237	386,745	.35
	Yr. 6/30/69	5,821,157	342,729	.32
Dataram	Yr. 4/30/70	2,123,581	84,214	.10
	Yr. 4/30/69	749,167	(299,386)	(.46)
Datatab	6 mos. 6/30/70	1,901,495	48,348	.09
	6 mos. 6/30/69	1,615,977	35,861	.06
Digital Equipment	Yr. 6/27/70	135,408,000	14,400,000	1.51
	Yr. 6/28/69	91,244,000	9,400,000	1.04
Hewlett-Packard	9 mos. 7/31/70	264,723,000	17,251,000	.68
	9 mos. 7/31/69	235,608,000	17,814,000	.71
Int. Timesharing	Yr. 5/31/70	1,834,718	96,318	.05
	Yr. 5/31/69	458,047	(1,262,548)	(1.44)
Mohawk Data Sciences	Yr. 7/31/70	102,550,000	8,325,000	1.52
	Yr. 7/31/69	83,000,000	6,650,000	1.22
Nat. Computer Services	Yr. 3/31/70	578,012	(167,415)	(.29)
	Yr. 3/31/69	351,369	(153,813)	(.29)
Nat. Computer Systems	6 mos. 7/31/70	1,700,000	(147,000)	(.33)
	6 mos. 7/31/69	1,300,000	16,000	.02
Scientific Software	6 mos. 7/31/70	305,633	14,410	.01
	6 mos. 7/31/69	114,016	(137,729)	(.14)
System Development	Yr. 6/28/70	55,674,000	(553,000)	(.17)
	Yr. 6/30/69	60,852,000	244,000	.04
Tracor	3 mos. 6/30/70	1,972,000	(1,033,000)	(.206)
	3 mos. 6/30/69	1,872,000	(1,169,000)	(.372)

Shore, N.Y., has acquired **Magnetic Input Services Corp.**, New York. Keymatic manufactures an encoder for computerized phototypesetters. Magnetic Input is a data preparation firm . . . **Lear Siegler, Inc.** has purchased a majority interest in **Applied Computer Time Share, Inc.**, of Southfield, Mich. . . . **National Computer Services Corp.** of N.Y.C. has acquired **Automated Statements, Inc.** of E. Orange, N.J., a designer of automated accounts receivable systems . . . **Pitney-Bowes, Inc.** has agreed to acquire **Sage Systems Corp.**, a manufacturer of copying machines . . . **Recognition Equipment Inc.** and **Information Processing Corp.** have announced an agreement in principle for the sale by REI to IPC of a 54 percent interest in **Docutel Corp.**, a 59 percent subsidiary of

REI . . . **Syner-Data, Inc.** of Beverly, Mass. has acquired **Fort Electronic Products, Inc.**, Wilmington, Mass. Syner-Data manufactures computer peripheral and terminal equipment. Fort Electronic Products is a manufacturer of data entry peripheral equipment . . . **Ultronic Systems Corp.**, a subsidiary of Sylvania Electric Products, Inc., has acquired all of the outstanding stock of **Novar Corp.** of Mountain View, Cal., a computer terminal manufacturer . . . **Tally Corp.** of Kent, Wash. has made a proposal to acquire **Vanguard Data Systems** of Irvine, Cal. Vanguard is presently in proceedings under Chapter XI of the Bankruptcy Act . . . **Tracor, Inc.** of Austin, Tex. has an agreement in principle to acquire **Datamark, Inc.**, a New York producer of medium- and high-speed line printers.

**Superbly  
Engineered**

**Amazingly  
Economical**

**Error-Free  
Performance**

**Stand Alone**

**Data Sets**

**0-2400 BPS**

**Direct Bell  
Replacements**

**Off-The-Shelf  
Delivery**

**Need We  
Say More?**



11810 Parklawn Dr.,  
Rockville, Md. 20852  
(301) 933-8170

**TEL-TECH CORP.**

In Canada: Canteltech, Ltd.



# COMPUTER STOCK TRENDS

MONTH ENDED OCTOBER 9, 1970

EXCH	COMPANY	PRICE					VOLUME (IN 100'S)			EARNINGS	
		1970 RANGE (1)	1 YEAR AGO	CLOSE OCT. 9, 1970	MONTH NET CHG.	MONTH % CHG.	THIS MONTH (3)	LAST MONTH	AVG. VOL. UME (2)	PER SHARE LATEST 12 MONTHS	PRICE-EARNINGS RATIO
N	BECKMAN	19- 52	54 1/2	27 7/8	+ 1/4	+0.9	2353	2711	1784	1.43	19
N	BURROUGHS	80-173	157 3/8	117 1/2	+11 7/8	+11.2	8055	9305	9225	3.54	33
N	CONTROL DATA	30-123	145 7/8	48 3/8	+5 3/8	+12.5	10427	6484	8730	1.76	27
O	DATA GENERAL	16- 36	N/A	33 1/2	+7	+26.4	(3)	-	-	-	-
O	DATACRAFT	5- 19	N/A	8 1/2	+2 3/4	+47.8	(3)	-	-	-	-
A	DIGITAL EQUIPMENT	50-124	83	77	+5 3/8	+7.5	5575	6153	5779	1.51	51
N	ELECTRONIC ASSOC	4- 12	17 5/8	6	+ 3/8	+6.6	1215	720	841	-3.01	-
O	GENERAL AUTOMATION	9- 42	N/A	14 3/4	+2 3/4	+22.9	(3)	-	-	-1.28	-
N	GENERAL ELECTRIC	60- 86	84 1/8	84 3/8	+4 1/8	+5.1	6764	6995	8129	1.99	42
N	HEWLETT-PACKARD	19- 46	49 3/4	27 7/8	+1 3/8	+5.1	4958	2680	3737	0.98	28
N	HONEYWELL	66-152	140	85 5/8	-4 3/8	-4.8	4054	4549	4629	4.26	20
O	INTERDATA	3- 13	N/A	10 1/4	+4 5/8	+82.2	(3)	-	-	-	-
N	IBM	223-387	347	296 1/8	+27 3/8	+10.1	7981	9083	9805	8.54	35
N	LITTON INDUSTRIES	15- 38	44 5/8	24 1/8	+2 7/8	+13.5	14090	16106	12363	1.85	13
N	NCR	30- 63	73 5/8	41 1/2	+3 3/8	+8.8	11145	9009	7968	2.11	20
N	RCA	18- 35	42	25 7/8	-1 1/8	-4.1	5300	7026	8351	1.91	14
N	RAYTHEON	16- 34	39 3/4	23 1/4	+ 1/4	+1.0	3161	3029	3274	2.35	10
O	REDCOR	4- 34	15 7/8	6 3/4	- 5/8	-8.4	(3)	-	-	0.17	40
O	SCIENTIFIC CONTROL	2- 9	26 1/2	2 3/4	- 1/8	-4.3	(3)	-	-	-2.44	-
N	SPERRY RAND	19- 40	43 5/8	26 1/2	+2 3/4	+11.5	13082	10822	10301	2.35	11
A	SYSTEMS ENGRG LABS	11- 49	45 3/8	19 1/4	+2 1/4	+13.2	10836	6101	5559	0.82	23
N	SYSTRON DONNER	8- 29	22 3/4	11 1/4	- 1/4	-2.1	835	424	505	0.82	14
N	VARIAN ASSOCIATES	10- 29	31	16	+ 1/4	+1.5	5413	5366	4479	0.85	19
O	VIATRON	4- 51	N/A	4 3/4	-1	-17.3	(3)	-	-	-3.38	-
A	WANG LABS	19- 52	40 3/8	32 3/8	- 3/8	-1.1	1446	2304	2081	0.77	42
A	WYLE LABS	3- 10	8 1/4	5 1/4	+ 1/8	+2.4	857	817	895	0.01	525
N	XEROX	66-116	100 1/4	86	+8 1/8	+10.4	14507	14007	16364	2.26	38
N	AMP	41- 57	52 5/8	50 3/4	+2 1/2	+5.1	1464	1565	2595	2.01	25
N	AMPEX	13- 49	44 3/8	18 5/8	+ 1/8	+0.6	8076	6083	5726	1.10	17
O	APPLIED MAGNETICS	9- 26	13 3/4	15 1/2	+1 1/4	+8.7	(3)	-	-	0.52	30
A	ASTRODATA	4- 35	17 3/4	7 7/8	+1 1/4	+18.8	(3)	-	-	-	-
O	ASTROSYSTEMS	2- 9	6	3 5/8	+1 3/8	+61.1	(3)	-	-	-	-
N	BUNKER RAMO	6- 15	12 3/4	9 1/2	+ 5/8	+7.0	4363	2724	4107	0.54	18
A	CALCOMP	11- 34	24	26	+9 7/8	+61.2	7880	3756	3862	0.35	74
O	CHALCO ENGRG	2- 5	N/A	2	+ 1/8	+6.6	(3)	-	-	-	-
O	CODEX	3- 35	N/A	9 5/8	+3 3/8	+54.0	(3)	-	-	-	-
O	COGAR	37- 94	N/A	54	-4	-6.8	(3)	-	-	-	-
O	COGNITRONICS	3- 14	17	8 3/4	+4 3/4	+118.7	(3)	-	-	0.37	24
N	COLLINS RADIO	10- 37	45 3/8	16 3/4	+2 5/8	+18.5	2689	2368	2116	0.15	112
O	COMCET	5- 50	N/A	7 1/2	-1 1/2	-16.6	(3)	-	-	-	-
O	COMPUTER COMM	6- 36	N/A	13	+4 1/2	+52.9	(3)	-	-	-0.14	-
O	COMPUTER CONSOLES	7- 22	13 1/2	7 3/4	0	0.0	(3)	-	-	-	-
A	COMPUTEST	14- 28	24 3/4	18 5/8	+1 3/8	+7.9	829	358	500	0.92	20
N	CONRAC	11- 32	35 1/2	16	+1 3/4	+12.2	684	747	440	1.01	16
O	DATA 100	5- 17	N/A	6 3/4	- 1/2	-6.8	(3)	-	-	-	-
A	DATA PRODUCTS	5- 26	15 3/8	8 1/4	- 3/4	-8.3	(3)	-	-	0.25	33
O	DATARAM	3- 16	N/A	5 1/4	-1 1/4	-19.2	(3)	-	-	-	-
O	DATASCAN	5- 27	25	8	+2 1/2	+45.4	(3)	-	-	-	-
O	DIGITRONICS	4- 14	14 1/4	5	0	0.0	(3)	-	-	0.07	71
A	ELEC ENG OF CAL	4- 15	12 1/4	6 5/8	+2 1/8	+47.2	284	97	187	0.08	83
N	ELEC MEMORIES + MAG	7- 40	26 7/8	11 7/8	0	0.0	17004	8829	6265	0.55	22
N	EXCELLO	17- 28	23	20 1/8	+ 1/4	+1.2	1649	590	914	2.22	9
O	FABRI-TEK	3- 8	7	3 7/8	- 1/8	-3.1	(3)	-	-	0.14	28
O	FARRINGTON MFG	2- 17	15 1/4	2 7/8	- 1/4	-8.0	(3)	-	-	-1.46	-
A	GERBER SCIENTIFIC	9- 39	19 1/4	17 3/4	+2 1/8	+13.5	192	383	388	0.86	21
O	GRAPHIC SCIENCES	8- 42	46 5/8	23 3/4	+9 1/4	+63.7	(3)	-	-	-2.41	-
A	HI-G	6- 17	10 3/8	7	-2 1/4	-24.3	(3)	-	-	0.25	28
O	INFORMATION DISPLAYS	4- 20	12	8 1/4	+3 1/4	+65.0	(3)	-	-	-	-
A	ITEL	6- 26	N/A	13 1/2	+1 1/8	+9.0	(3)	-	-	0.86	16
O	LOGIC	5- 14	9	5 5/8	+ 7/8	+18.4	(3)	-	-	-	-
A	MILGO	15- 41	18 1/2	36 1/8	+9 3/4	+36.9	15312	12204	12184	1.00	36
N	MOHAWK DATA SCIENCES	19- 87	71 3/4	35 3/8	+1 5/8	+4.8	5525	5758	6147	1.52	23
O	NORTH ATLANTIC IND	3- 8	10	3 1/4	- 1/2	-13.3	(3)	-	-	0.70	5
O	OPTICAL SCANNING	11- 52	43	19 1/2	-2	-9.3	(3)	-	-	-0.21	-
A	POTTER INSTRUMENTS	15- 43	38 3/8	22	-2	-8.3	1956	2421	3381	0.90	24
O	RECOGNITION EQUIP	13- 84	55 1/2	19	-1 1/8	-5.5	(3)	-	-	0.38	50
N	SANDERS ASSOCIATES	7- 30	30	15 3/4	+3	+23.5	2372	2084	1555	-0.24	-
N	SANGAMO	9- 29	21 5/8	15 7/8	+ 7/8	+5.8	1872	756	1155	0.43	37
O	SCAN-DATA	6- 53	29	6 5/8	+ 1/8	+1.9	(3)	-	-	-	-
A	SEALCTRO	4- 13	7	6 1/2	+ 3/4	+13.0	185	164	247	0.21	31
O	SYKES DATATRONICS	4- 9	N/A	3 1/2	-1	-22.2	(3)	-	-	-	-
O	TALLY	10- 23	22	15 1/2	+1 3/4	+12.7	(3)	-	-	-0.03	-
N	TELEX	10- 26	13 1/8	20 3/4	+5 5/8	+37.1	57073	27845	29541	0.83	25
N	TEXAS INSTRUMENTS	62-135	126	76	- 5/8	-0.8	2881	4069	4075	3.20	24
O	VARIFAB	1- 5	6 1/2	3 3/8	+1 5/8	+92.8	(3)	-	-	-	-

**COMPUTERS**

**PERIPHERALS & COMPONENTS**

FOOTNOTES: (1) TO NEAREST DOLLAR  
 (2) AVERAGE MONTHLY TRADING VOLUME SINCE JANUARY 1, 1970  
 (3) VOLUME IS NOT REPORTED FOR OVER-THE-COUNTER ISSUES AND NEW LISTINGS  
 EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE; O=OVER-THE-COUNTER; L=NATIONAL EXCHANGE; T=TORONTO EXCHANGE

EXCH	COMPANY	PRICE					VOLUME (IN 100'S)			EARNINGS	
		1970 RANGE (1)	1 YEAR AGO	CLOSE OCT. 9, 1970	MONTH NET CHG.	MONTH % CHG.	THIS MONTH (3)	LAST MONTH	AVG. VOL. UME (2)	PER SHARE LATEST 12 MONTHS	PRICE-EARNINGS RATIO
A	APPLIED DATA RESCH	4-24	19 3/4	7 1/4	+1 1/8	+18.3	847	982	926	-0.28	-
O	APPLIED LOGIC	2-19	N/A	2	-1	-33.3	(3)	-	-	-	-
O	ARIE	1-8	7 1/2	2 5/8	+1 1/4	+90.9	(3)	-	-	-	-
A	AUTOMATIC DATA PROC	22-48	31	39 5/8	+4 1/2	+12.8	2646	3579	3908	0.66	60
O	BOLT, BERANEK, NEWMA	6-11	14 1/2	8 1/2	+7/8	+11.4	(3)	-	-	0.32	27
O	BOOTHER COMPUTER	8-26	24 3/4	13 1/2	+1 5/8	+13.6	(3)	-	-	1.48	9
O	BRANDON APPLIED SYS	1-10	7	1	-1/2	-33.3	(3)	-	-	-	-
O	COMP ENVIRONMENTS	3-14	N/A	2 7/8	-1/8	-4.1	(3)	-	-	-	-
O	COMPUTER EXCHANGE	3-8	6	5 1/2	+1/8	+2.3	(3)	-	-	-	-
A	COMPUTER INVESTORS	4-12	8 1/2	8 7/8	+1 1/4	+16.3	428	103	298	0.52	17
O	COMPUTER METHODS	1-3	N/A	1/2	+1/8	+33.3	(3)	-	-	-	-
O	COMPUTER PROPERTY	5-15	N/A	5 3/4	-1/2	-8.0	(3)	-	-	-	-
N	COMPUTER SCIENCES	6-34	22 1/8	11 7/8	-1 5/8	-12.0	16426	15094	11258	0.28	42
O	COMPUTER TECHNOLOGY	2-13	N/A	7 1/4	+2 1/2	+52.6	(3)	-	-	-	-
O	CTC COMPUTER	1-19	N/A	3 1/4	+1	+44.4	(3)	-	-	-	-
O	COMPUTER USAGE	2-9	11	4 1/4	-1/4	-5.5	(3)	-	-	1.81	2
A	COMPUTING + SOFTWARE	18-76	52 3/8	31 1/8	+4 7/8	+18.5	2348	1503	2060	1.32	24
O	COM-SHARE	3-15	N/A	3 5/8	+5/8	+20.8	(3)	-	-	-	-
O	CYBERMATICS	5-14	6 3/4	9 3/4	+1 1/4	+14.7	(3)	-	-	-	-
O	DATA AUTOMATION	1-24	N/A	2 1/2	-1/8	-4.7	(3)	-	-	-	-
O	DATA DYNAMICS	1-4	N/A	1 3/4	+3/8	+27.2	(3)	-	-	-	-
N	DATA PROC FIN + GEN	7-32	32 5/8	14 7/8	+1 1/4	+9.1	6045	2407	3462	0.36	41
O	DATA SYSTEMS ANALYST	1-6	N/A	2 1/2	-1/4	-9.0	(3)	-	-	-	-
O	DATRONIC RENTAL	2-8	5	4	+1 5/8	+68.4	(3)	-	-	-	-
A	DEARBORN COMPUTER	10-24	27 7/8	19 1/2	+1	+5.4	476	571	622	1.47	13
O	DECISION SYSTEMS	1-4	4	1 1/2	+1/2	+50.0	(3)	-	-	-	-
O	DIGITAL APPLICATIONS	2-7	6	3	+1	+50.0	(3)	-	-	-	-
O	DIGITEK	2-5	N/A	1 3/4	0	0.0	(3)	-	-	-	-
A	DPA, INC	3-10	9 5/8	5 3/8	+1/2	+10.2	1224	590	696	0.69	8
O	EFFICIENT LEASING	2-5	3 3/4	1 3/4	-1/4	-12.5	(3)	-	-	-	-
A	ELEC COMP PROG INST	3-12	11	5	+1 1/4	+33.3	621	250	394	0.02	250
O	ELEC DATA SYSTEMS	31-161	133	63 1/2	+12 1/2	+24.5	(3)	-	-	0.61	104
A	GREYHOUND COMPUTER	5-14	12 1/4	8 1/2	-1/2	-5.5	382	377	348	0.85	10
O	INFORMATICS	4-21	N/A	8 3/4	+2 3/4	+45.8	(3)	-	-	-0.03	-
O	INTL COMPUTER	1-8	11 1/4	4	+1	+33.3	(3)	-	-	-	-
L	INTL COMPUTER SCI	1-3	N/A	1 1/8	+1/4	+28.5	(3)	-	-	-	-
N	LEASCO	7-31	27 1/2	14	+1 7/8	+15.4	14821	8472	7621	1.86	8
O	LEVIN-TOWNSEND	3-19	25 1/8	6 1/8	-7/8	-12.5	(3)	-	-	-1.29	-
O	LMC DATA	1-4	3 3/8	1 5/8	+3/8	+30.0	(3)	-	-	-0.43	-
O	MGMT ASSISTANCE	1-4	4 3/4	1 5/8	0	0.0	(3)	-	-	-2.57	-
A	MANAGEMENT DATA	8-26	18 3/8	13 3/8	+1 7/8	+16.3	270	169	239	0.85	16
O	NATIONAL COMP ANAL	1-9	5	2 3/4	-3/4	-21.4	(3)	-	-	-	-
N	PLANNING RESEARCH	14-53	36 1/2	22	+1/8	+0.5	3397	1984	2962	0.72	31
O	PROGRAMMING METHODS	9-27	16	15	+1 1/2	+11.1	(3)	-	-	-	-
O	PROGRAMMING SCIENCES	2-17	9 3/4	2	-1/2	-20.0	(3)	-	-	-	-
O	PROGRAMMING SYSTEMS	2-6	4 3/4	2 1/4	-5/8	-21.7	(3)	-	-	-	-
O	SCIENTIFIC COMPUTER	1-4	3 3/8	1 5/8	-1/8	-7.1	(3)	-	-	0.11	15
N	SCIENTIFIC RESOURCES	2-15	13	4 7/8	+1 1/2	+44.4	8570	2991	4111	-0.98	-
O	SYSTEMS CAPITOL	1-8	5	3 1/4	+7/8	+36.8	(3)	-	-	-	-
O	TIME SHARE	1-7	N/A	1 5/8	+1/8	+8.3	(3)	-	-	-	-
O	TRACOR COMPUTING	2-8	N/A	2 5/8	0	0.0	(3)	-	-	-0.89	-
A	URS SYSTEMS	5-21	N/A	6 7/8	+1/8	+1.8	(3)	-	-	0.41	17
O	UNITED DATA CENTERS	2-5	4	2 3/4	+1/8	+4.7	(3)	-	-	-	-
N	UNIVERSITY COMPUTING	14-99	71 3/4	31 3/8	+4 5/8	+17.2	26311	17449	14228	2.28	14
O	US TIME SHARING	3-14	N/A	6 1/4	+1/2	+8.6	(3)	-	-	-	-
N	ADAMS MILLIS	8-15	12 1/2	13 5/8	+3/4	+5.8	718	512	445	1.14	12
O	BALTIMORE BUS FORMS	9-21	N/A	9 1/4	-1 1/2	-13.9	(3)	-	-	-	-
A	BARRY WRIGHT	6-25	23 7/8	10 3/8	+7/8	+9.2	944	836	614	0.74	14
A	CAPITOL INDUSTRIES	15-54	46	20 5/8	+2 7/8	+16.1	4306	2393	1562	1.91	11
A	DATA DOCUMENTS	15-36	30 3/4	19 1/2	+2	+11.4	110	131	123	1.82	11
O	DATA PACKAGING	5-29	20 3/4	8 1/4	+1/2	+6.4	(3)	-	-	0.51	16
N	DENNISON MFG	11-25	28 3/4	19 1/2	+1	+5.4	1628	1617	1254	1.38	14
N	DUPONT	93-128	112 1/4	116	-6	-4.9	3209	3607	3925	7.18	16
N	ENNIS BUSINESS FORMS	11-19	17 5/8	12	+1/4	+2.1	401	207	293	0.92	13
O	GENERAL BINDING	14-31	33	23	+3	+15.0	(3)	-	-	0.82	28
O	GRAPHIC CONTROLS	7-17	18 1/2	9 1/2	+2 1/2	+35.7	(3)	-	-	0.87	11
O	LEWIS BUSINESS FORMS	11-20	17	12 1/4	-3/4	-5.7	(3)	-	-	0.91	13
N	MEMOREX	46-167	108	83	+4 3/4	+6.0	17842	14046	13034	2.08	40
N	3M	72-115	114 7/8	88	+2 7/8	+3.3	5232	5775	4950	3.28	27
T	MOORE CORP LTD	27-38	N/A	34	+2	+6.2	(3)	-	-	-	-
O	REYNOLDS + REYNOLDS	25-49	39 1/2	38 3/4	+8 3/4	+29.1	(3)	-	-	1.48	26
A	SAFEGUARD INDUSTRIES	7-16	15	9 3/8	+7/8	+10.2	611	348	499	0.77	12
O	STANDARD REGISTER	17-31	23 3/4	19	0	0.0	(3)	-	-	2.08	9
N	UARCO	22-39	28 1/2	28	+1	+3.7	118	132	198	2.40	12
O	WALLACE BUS FORMS	25-41	32 1/4	37	+3 1/2	+10.4	(3)	-	-	2.31	16

SOFTWARE & SERVICES

SUPPLIES & ACCESSORIES

AVERAGES	COMPUTER STOCKS	13-36	34.9	19.8	+1.6	+8.7				0.89	22.2
	DOW JONES INDUSTRIALS	631-811	808.41	768.69	+6.9	+0.9				3.64	14.4



## CORPORATE PROFILE

Featured this month:

### **LOGICON, INC.** (over-the-counter)

Wells Fargo Bank Building  
Del Amo Financial Center  
Torrance, Cal. 90503

**DIRECTORS:** John R. Woodhull, Chairman of the Board and President; John K. Brigden, Vice President-Treasurer; Vilas D. Henderson, Vice President-Director of the Washington Division; James D. Hogan, Senior Vice President; W. Edgar Jessup, Jr. Attorney, Ervin, Cohen, and Jessup; William E. Killingbeck, Program Manager; Puzant V. Levonian, Hughes Aircraft Corp.; Robert E. Martin, Vice President; Richard N. Southworth, Program Manager; Frank R. Troeger, Secretary; Ramon E. Wolfe, Vice President.

**BACKGROUND:** Logicon, Inc., was founded in 1961, to perform defense-oriented computer development. The company has steadily grown, at 40% annually or better, and has been profitable for its entire nine year history. It is now diversifying toward commercial applications.

**FACILITIES:** Logicon maintains its corporate offices in Torrance, Cal. The company's operating divisions are located in Los Angeles, San Diego, and Falls Church, Va.

**SERVICES/PRODUCTS:** Logicon's revenues continue to be primarily derived from prime contracts with the Department of Defense. This work involves all phases of system development from early conceptual design through delivery and test of equipment and/or computer programs. Missile systems, command control and tactical data systems, and training systems are specific areas which the company emphasizes. Commercial products being developed and marketed at the present time include process control systems for application in the paper industry, interface equipment, and a time-sharing system. The interface unit known as the LI/ON, is a multipurpose peripheral unit which is an accessory to the IBM 1130 computer. It allows the computer to function in new applications of data communications and process control. Ten of these units were installed for commercial users by the end of fiscal 1970 (March 31). Development of similar interface equipment, but aimed at different applications and computers, is in progress.

Substantial commercial development effort is being based upon past success in the area of real-time tactical data systems. The company will

shortly introduce a time-sharing system for computer utilities and large organizations. The system will be called the "Logicon 2+2". Priced at approximately \$600,000, it will offer the capabilities of more expensive systems. Deliveries of this system are expected to begin in 1971.

**CURRENT POSITION:** First quarter results for the three months ended June 30, 1970 showed continued growth and earnings of \$.12 per share compared with \$.10 per share for the similar period in fiscal 1970. Net income was \$99,974 on revenues of \$2,083,737, up from \$78,076 on revenues of \$1,519,433 for the same period a year earlier.

Logicon completed its first public stock offering in October 1969 through the issuance of 110,000 shares of common stock which were sold at \$10.50 per share. A major portion of the \$1-million raised as a result of this offering is being used to finance the diversification into commercial markets. The current financial condition is unusually good with no long term debt and a current ratio of approximately three.

**OUTLOOK:** Contrary to the prevailing trend in the industry, Logicon is presently expanding its military business at a rapid rate and expects this rate of growth to continue over at least the next two years. In addition, prospects for commercial business look promising. Some success has already been achieved in marketing the interface equipment line.

**FINANCIAL SUMMARY:** The following statement of revenues and earnings depicts results of the company's operations for the five years ended March 31, 1970.

YEAR ENDED MARCH 31			
Year	Revenues	Net Income	Net Income Per Share
1970	\$7,138,657	\$318,888	\$.40
1969	5,036,905	238,757	.33
1968	3,787,131	138,509	.20
1967	2,179,475	100,418	.16
1966	1,370,679	13,576	.02

# Singer's System Ten. The computer that goes where the work is.

A computer on every desk. In shipping and receiving. In the stockroom. In billing. In payroll. In the Office of the President. And in the budget.



It's the Singer System Ten. The computer that goes wherever your people need data processing, or you need data input. And it's designed to be understood and used effectively

by nearly everyone.

System Ten goes so much further and does so much more because we've designed it with seven important advantages especially for business applications:

1. The workstations can be located virtually anywhere in your office or plant.
2. The system can process up to 20 jobs simultaneously. Including batch processing. 20 jobs, no waiting.
3. The system has mass storage. 10K built into the CPU, expandable to 110K, and an additional 100 million characters is available with disc drives. Room for all.
4. Time-sharing control is built in with hardware. So no expensive executive software is needed.
5. System Ten uses simple assembler-

language programming. Anyone can do it.

6. Data communications capability to interface System Ten with other on-site or remote computers.

7. Total modularity, leading to remarkable cost economies. Total flexibility of size and configuration now, expandability for the future. For a new application, just add a new workstation.

In addition to these functional advantages, System Ten hardware needs only minimal environmental control. And the simple two-wire connections eliminate the need for expensive false-flooring to conceal heavy cable.

Find out more about the computer system of the decade. Call where the System



Ten people are, your nearest Friden office. Or write: Friden Division, The Singer Company, San Leandro, California 94577.

**SINGER**  
FRIDEN DIVISION



# PRIVATE LINESHARING REVISITED

In our July Clinic we discussed the sharing provisions of the AT&T private line tariff, FCC 260. Among other items, we noted that there hadn't been much evidence of sharing, much less of arbitrageurs. Since then there has been a change in the tariff; we have noticed substantially greater interest in sharing; and at least four entities have emerged who are promoting shared use service.

The original tariff provided for a 10% surcharge on shared facilities, and joint users paid for their own local loops and service terminals. The changed tariff now specifies monthly charges of \$7.50 per joint user, plus \$10 for every service terminal on the jointly used facility. Figure 1 illustrates the tariff principles. The cost for the basic service would be the normal charges for mileage and service terminals, plus a surcharge of \$10 per month for each service terminal on the facility, or \$30 for the example. This total cost would be apportioned among the users. In addition to this charge, each joint user, i.e.,  $J_1, J_2, \dots, J_n$  would pay \$7.50 per month for the general privilege of joint use. He would still also pay regular rates for mileage and service terminals to connect his terminal to the mux. The general effect of the change is to increase costs (non-surprise of 1970) if there are "many" joint users, or "short" services. Suppose a \$500 a month basic two-point service of mileage and service terminals and twenty joint users. Under the old tariff, the cost per user would have been one-twentieth of \$500 plus 10%, or \$27.50 per month. Under the new tariff, the joint user will pay one-twentieth of \$500 + \$20 in service terminal surcharges, or \$26 per month, plus the \$7.50 joint user fee, or a total of \$33.50 per month. With our compulsive proclivity for comparative analyses, we find that for the new tariff to result in equal or lesser costs than the old one, the situation must be as follows:

If the number of joint users on a two-point service is:	The cost of mileage and service terminals must exceed approx.:
2	\$350
4	501
6	651
8	802
10	952
20	1704

This seems to us to penalize the smaller users. Such users are likely to have short private line requirements, and many of them would have to

Communications Clinic is a regular monthly column written by the staff of **Berglund Associates, Inc.**, consultants in telecommunications. Readers are invited to submit questions on any aspect of communications or suggestions for future Clinics to:

**Communications Clinic**  
 c/o Berglund Associates, Inc.  
 1060 Kings Highway North  
 Cherry Hill, New Jersey 08034

band together to amortize mux costs. But, the more that get together to reduce mux costs, the longer their line needs must be to make out as well under the revised tariff. We have never been among those who claim that Machiavelli is alive and well in AT&T's tariff department. However, we do find the tariff revision very interesting.

That the revised tariff does penalize many-user systems is the basis of an informal complaint filed

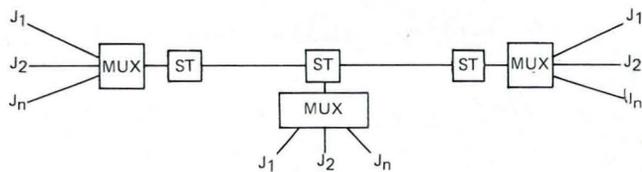


Fig. 1

by **Fairfield Data Technology, Inc.**, against the new tariff. Fairfield is one of the four entities mentioned above, who are promoting shared service. Their proposal has been directed primarily to supplemental news services, such as *Copley Press* and the *New York Times News Service*. Fairfield has charged that the new rates discriminate in favor of large users. In their complaint, they cite a much worse example than we have used above. With supplemental news services, the terminals would be widely distributed, meaning more service terminals on the shared facility, for each of which there is a \$10 surcharge. A 100-drop circuit, for example, would incur \$1000 per month joint user surcharge. Fairfield reports that their planned 1000 terminal, eight-user system was priced at \$4000 per month under the old tariff language, and is now \$10,060 a month. We think we'd complain, too.

A second promoter is **Timeplex**, the Norwood, New Jersey, manufacturer of time-division multiplexers. Timeplex is offering 150-bps, full duplex circuits between New York and Washington, D.C. for \$147 per month. They state that of this, \$47

per month goes to AT&T. This apparently covers the multiplexed channel and the \$7.50 surcharge. They also state that this will be reduced as more users share the cost. The charge for this circuit — a 3002, full duplex, with C-4 conditioning, and two service terminal surcharges of \$10 each — is about \$530 a month, so Timeplex is assuming some 14 subscribers initially.

In addition to the \$147 per month, the subscriber will also pay for a local loop and service arrangements to connect his remote terminal to the Timeplex mux. Notwithstanding this, it is still a bargain compared to the AT&T charge of \$335 per month for just the mileage on a full duplex, 150-bps service between New York and Washington, D.C.

The Timeplex announcement evoked a response from the FCC's Common Carrier Bureau, and Timeplex graciously provided us with a copy of the inquiry letter and their response. The Bureau letter stated that the sharing provisions "create possibilities of arrangements whereby the customer for the service could act as a common carrier for hire." If such service were to provide interstate or foreign communications, the customer would "become subject to regulation by this Commission." The letter then raised a number of questions about Timeplex's relation to the public, and the economies of the undertaking, particularly profits. Finally, the Bureau wanted to know if Timeplex's use of the shared channel reflected "a *bona fide* need for communications for other purposes than administration of the joint use arrangement." The questions reflect, we think, the Commission's concern with joint use, a reminder that they allow tariffs to go into effect while reserving the right of subsequent approval or disapproval. We find this situation unusual in that AT&T seemingly couldn't care less, but the Commission may take some action.

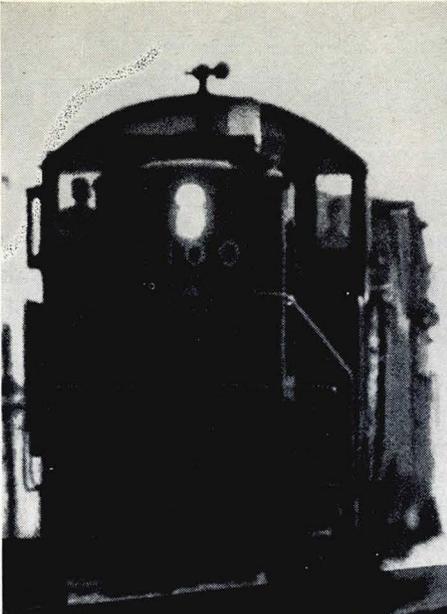
The *bona fide* communications requirement aspect is from the tariff itself, and is probably AT&T's optional basis for denying service to pure arbitraguers who become too successful and dent AT&T's private line revenue. Presumably, it is also there as a lip-service obeisance to the venerable prohibition on resale of communications service. If such is not the case, we can at least say that the requirement is, at best, a superficial one. Timeplex contends they do have a *bona fide* communication

requirement of their own over the joint user route. With headquarters near New York and a sales office in Washington, there is, on the face of it, a communication requirement. Furthermore, Timeplex will use the system as a demonstrator to support their TDM sales. In its purest sense, however, the latter doesn't seem to constitute a communication requirement. And we cannot but wonder whether their normal headquarters-to-sales office traffic would, *per se*, merit any kind of private line service. But that shouldn't be a criteria either, as volume does not seem to be in the essence of a "*bona fide* communication requirement."

So, to a first approximation, we conclude that Timeplex does comply with the tariff — though perhaps not its intent in AT&T's eyes. Therefore, it seems that the questions addressed by the Bureau go more to the nature of the tariff than to Timeplex's case. And this would be so even in the case of the pure arbitraguer, who should be smart enough to establish a *bona fide* communication requirement along the joint use route he desires.

The two remaining sets of questions posed by the Bureau were those of relationship to the public, and the service economies. The public interface aspect presumably relates to Timeplex's role as a common carrier. An attempt to decode this question leads one into the rat's nest of Federal communication law and policy. On the one hand, Timeplex is holding themselves out to the public with a service for hire. On the other hand, they are actually providing only an interface or connecting service. Therefore, even if one finds them a common carrier, they are probably little more than a connecting carrier, i.e., engaged in interstate communication solely through physical connection with the facilities of another carrier at arms length. As a connecting carrier they would not be under FCC jurisdiction.

There is an interesting correlation here with the issues in the computer-communications docket. The Commission's proposed policy would require regulation of pure message switching. In that instance, a vendor of such service could be providing only an interface between lines ordered and paid for by subscribers, as is the case with Timeplex. And what of the remote batch service bureau which provides a high speed terminal (card reader-punch-line printer) to its customers. They,



# data bits from Teletype

8 million  
pounds of food  
moved daily!

When you handle 14,000 food-filled freight cars annually, deal with more than 160 truck carriers to service the daily needs of over 500 retail chain and independent outlets, the need to know takes on staggering proportions.

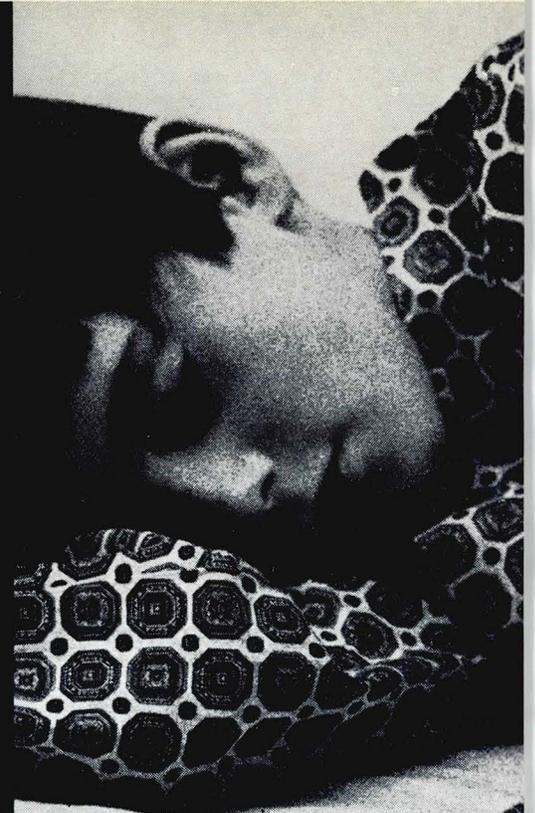
The warehouse that copes with this logistical problem has linked its customers with a computer using Teletype® terminals. Shipping data from processors and food packers is fed into the computer on a daily basis. Retail buyers use Teletype equipment to obtain up-to-the-minute inventory status reports, to place orders and receive concise shipping data. This enables the warehouse to keep track of, and move some 8 million pounds of food every day. Fast, accurate data communications has also helped cut processor billing time down from over a week to twenty-four hours.

## time-sharing money saver

There are probably more Teletype 33 sets being used in time-sharing applications than any other data terminal. Because, on a price/performance basis, it is one of the most reliable and economical terminals available.

The model 33 has everything required for preparing programs, getting them into the computer and retrieving information. It communicates in ASCII and operates at 100 words per minute. Its design simplicity makes computer dialog easier for the operator. But, what's really nice, is the price: It's amazingly low for all of its capabilities.

The model 33 line includes options and accessories needed for a variety of time-sharing needs. If you would like to know more about this low-priced terminal line, write for the model 33 brochure.



nine year old  
squeezes  
a year  
into  
38  
days

A young boy became so fascinated with a Teletype 33 terminal that he completed a whole year's arithmetic program in 38 days. His school is involved in a computer assisted educational program using a remote university computer. The simplicity of the terminal enables the youngest of students to master its operation in a short period of time.

Some subjects included in the program are reading, science and arithmetic. Students receive individual drill and instruction geared to their own level of comprehension. The slower student gets much needed practice at a level which he can achieve. The average student reinforces his grasp of the subject with drill and practice at the terminal. The bright are offered programs that challenge and are limited only by their own abilities. Computer assisted education also enables teachers to find more time for individual student needs.

## erasing errors on-line

Teletype has an interesting solid-state device called the Stuntronic™ parity error detector which helps locate and eliminate parity errors. It can be used with Teletype 33, 35, 37, Telespeed™ and Inktronic® terminals.

This accessory will accept a signal with up to 45% distortion and regenerate the signal with less than 5% distortion before passing it on to the terminal. Minimizing erroneous print-outs due to distorted signals.

It will also locate individual vertical parity errors and alert the station operator so that corrective action can be taken.

**HERE IS AN EASY WAY TO SPOT AND CORREC\* ERRORS RECEIVED IN TEXT OR NUMBER TRANSMI\*SION.** 432\* 5678 90\*2

With the Stuntronic detector, a preprogrammed substitute character can be used to graphically indicate exactly where an error is on the terminal print-out.

Stuntronic accessories can also count errors, light a signal lamp and generate a line break, notifying the sender of any errors.



## recommended reading

Teletype has a number of bulletins on equipment, applications, and case history data. A short description of what is available is contained in: "How to get answers to your questions about Teletype equipment." Write for your copy.

Teletype data communication equipment is available in send-receive capabilities of up to 2400 words per minute. Included are hard-copy, magnetic-tape and paper-tape terminals, error control devices, options and accessory equipment to fit most data communication system requirements. For information, write:



**TELETYPE CORPORATION**  
Dept. 40-12, 5555 Touhy Ave., Skokie, Ill. 60076  
***machines that make data move***  
Teletype is a trademark registered in the U.S. Pat. Office

too, are providing an interface between the customer and lines paid for by the customer. Subject to regulation? We certainly hope not. Yet the Bureau's questions as to economics and profit could be just as readily directed to suppliers of remote batch terminals and service.

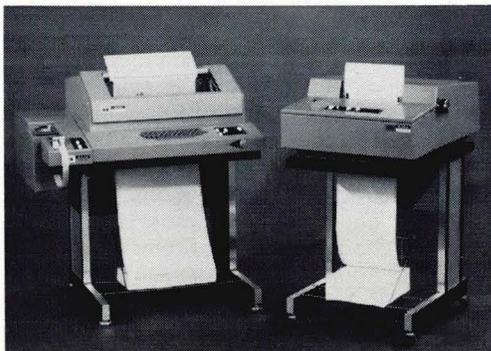
The remaining two promoters are **Series 11,000, Inc.**, of New York City, and **IMIS** (International Management Information Services) in Los Angeles. Series 11,000 is acting as a manager of Series 11,000 bandwidth under the sharing provisions of that series. Here, no terminal equipment is being provided by Series 11,000, Inc. Their customers simply sign up for facilities in an 11,000 channel. They are providing only the services of planning and administering the legitimate (under tariff) sharing of channels. As such it is even more difficult — if not impossible — to construe them as a common carrier. IMIS is in the same category as Timeplex, i.e., providing channels from a multiplexer on a voice channel.

Aside from the "profit-making" approaches to sharing, a move began this summer to establish a shared network among several of the nation's largest corporations and largest consumers of communications. The contemplated network might have serviced 3000 to 5000 terminals, and produced a respectable backlog for some multiplex vendor. To our great surprise, the plans seem to have gone on the rocks. Reasons cited include administrative management and organizational problems, and the substantial investment in planning and design.

In short, where the sharing scene was quiet last July, it is now a very active area, posing all sorts of interesting technical, legal and planning questions. In our own view, we never understood why AT&T introduced sharing, and we still don't. Because its growth can produce a substantial imbalance in rate structures, raising questions of fairness; and because its growth will certainly be on the carrier's cherished "cream-routes", we will not be surprised at its eventual demise. ▲

# We're very compatible

Whether your application is time-sharing,  
communications or special purpose . . .  
we will help you get the job done faster, easier  
and at lower cost. We know that's saying a lot . . .  
and we love to be asked to prove it!



ASR-300



ALPHA

BETA

The ASR-300 paper tape punch/reader provides: Automatic sending/receiving; data recording/play-back; and paper tape interpretation, duplication and editing.

The Alpha is a 300 line-per-minute printer which makes up to six copies and is priced almost \$1,000 lower than its nearest competitor.

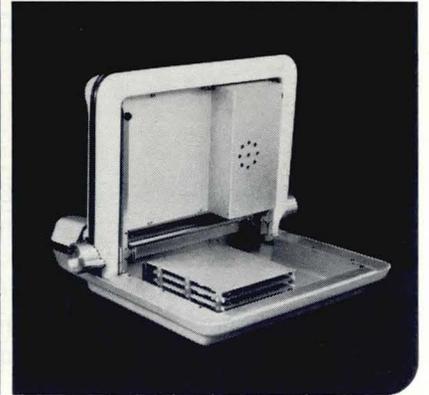
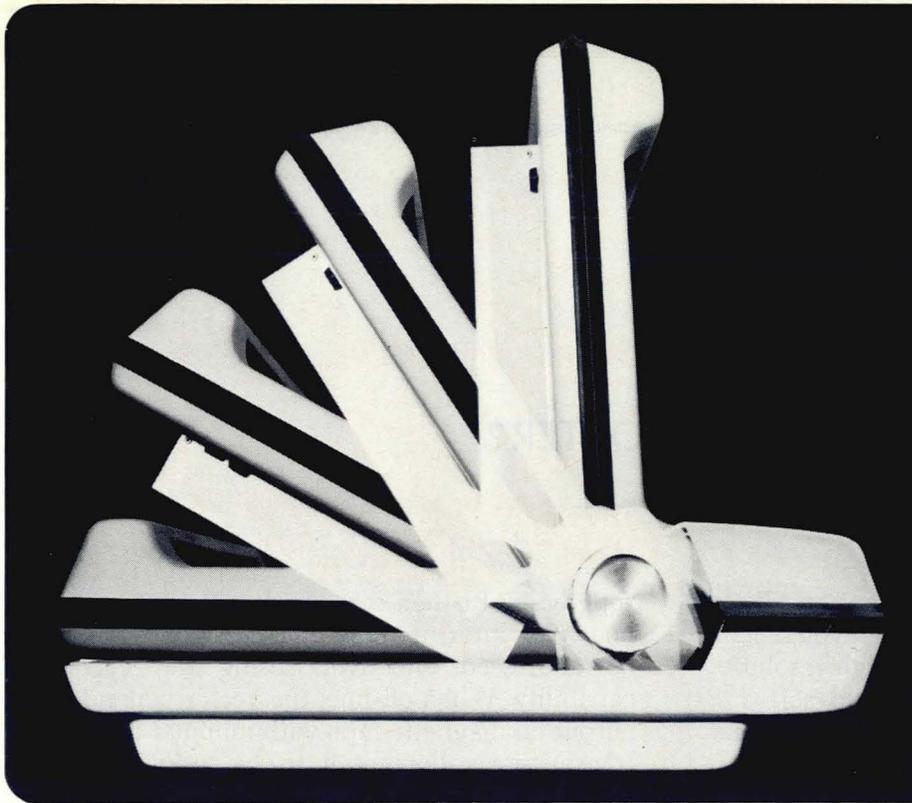
The Beta interactive computer terminal is three times faster than conventional teleprinters and capable of making up to five carbon copies.



**SYNER-DATA, INC.**  
133 Brimbal Avenue, Beverly, Ma. 01915  
SYNER-DATA CANADA, LTD., 130 Rivalda Rd.  
Weston, Ontario, Can.



SYNER-DATA SALES AND LEASING/OEM SALES: SYNER-DATA, INC., 133 Brimbal Ave., Beverly, Mass. 01915, (617)927-3222 • SYNER-DATA, INC., 1570 East Edinger Ave., Santa Ana, Calif. 92705, (714)836-1944 • SYNER-DATA CANADA, LTD., 130 Rivalda Rd., Weston, Ontario, Canada, (416)742-7804 • DATABASE, LTD., 22-25 Finsbury Sq., London EC2, England, 01-638-8774 • DISTRIBUTOR LEASING/SERVICE: NATIONAL DATA COMMUNICATIONS SYSTEMS, INC., 59 Union Sq., Somerville, Mass. 02143, (617)623-7800 • DATA AUTOMATION COMMUNICATIONS, INC., Plainview, N. Y., (516)433-1330 • Edina, Minn., (612)941-5880 • Birmingham, Mich., (313)399-4711/645-9394 • Niles, Ill., (312)647-0166 • Colorado Springs, Colo., (303)634-5479 • Dallas, Tex., (214)637-2403 • San Diego, Calif., (714)297-6821 • Los Altos, Calif., (415)967-9506



# plotter x 3 = Fasplot

*It's a simple equation.*

FASLOT—The time-share analog plotter from Omega-t Systems, with a pen speed of 10 inches per second, is over three times faster than the competition's 3 ips. But speed in plotting isn't the only important factor. And speed in plotting isn't all that FASLOT has to offer . . .

⌚ Because no special programs are required, anyone can learn to operate the FASLOT with only a few minutes of instruction.

⌚ The FASLOT's interfaces include on-line or local modes of operation, hardwired TTY, EIA, 30 CPS Paper Tape Reader, and Logic Level.

⌚ An Automatic Axis Segment Mode saves up to 50% of the line time required to make a plot, without the necessity of special programming.

⌚ FASLOT is fast, too! It has the capability to accept inputs from TTY or TTY replacement terminals at 10, 15, or 30 CPS.

⌚ A tiltable plotting bed up to 90° provides for convenient viewing while a special muting feature keeps input terminal operations silent.

FASLOT: There are three models to suit your time-share needs. Glen Renfro will be glad to tell you how FASLOT can save you time and money. Write or call him at: Omega-t Systems, Inc.; 300 Terrace Village; Richardson, Texas 75080; (214) 231-5121.

See us at Booth 3633 at the FJCC in Houston.

**omega-t systems incorporated**





ON-LINE

## A SECOND-GENERATION PLOTTER?

What distinguishes a Second-Generation digital plotter from a First-G depends on what you're looking for. If it's speed and lots of it, high resolution and linearity, available interfacing and software, relatively low cost, and a standard 11"x17" format, here's a line on one. It's from Graphic Data, Inc. in Burlington, Massachusetts.

Graphic Data's entry employs a hopped-up version of the old wire printer idea for a novel approach to plotting. It outputs on electrographic paper, now commercially available for about \$.06 a sheet. The electrographic paper is what permits the device to write electronically at microsecond speed. The resultant image has excellent contrast and quite acceptable image quality. The electronic writing head is a 10x10 matrix of wires on .010" centers, approximately the size of a typewriter character. By properly addressing the wires, characters of this size can be formed in one operation in less than 200 microseconds.

To plot, the writing matrix is moved over the path of the desired line or curve by X and Y step per motor control. Writing is actually accomplished by charging the paper in the area where an image is desired. Up to 100 points can be plotted per motor step instead of the usual one point per step. High performance stepping motors add to the plotter's speed and yield a positional accuracy of  $\pm .005''$ .

Vector commands are used rather than point-to-point commands, permitting the unit to operate on an interrupt basis using its vector generator. When on-line and operating on a cycle-steal and inter-

rupt basis, further commands are sent asynchronously on interrupt, and characters or symbols can be addressed effectively using the cycle-steal capability. When off-line, the vector generator can output on magnetic tape with minimal data phone transmission, allowing it to be used as a high-speed alphanumeric and graphic terminal at remote time-sharing stations.

The electrographic writing technique, in addition to producing finished plots rapidly, is also more flexible than ink-on-paper systems. For example, variable width and variable line intensity are available on computer command at any point on the plot. Because of the writing head size, the unit can provide a line writing capability of 40 to 100 characters per second for labeling and graph annotations. Special motor driving circuits can increase this to over 300 characters per second.

The resulting plotted spot size is .006". The line writing rate is a **minimum** of 4"/sec for any length line or any curvature, and can be a **maximum** of 10,000"/sec (still maintaining the .005" non-accumulative accuracy).

The unit at present is interfaced and is operational with an IBM 1130 computer over a storage access channel. Since the Graphic Data plotter contains the controller to draw vectors, during actual vector plotting, the computer can perform other functions.

Thus, an old issue is raised again. Does interactive graphics, where it is essential to the problem-solving process, really depend on the refresher CRT? The answer is more in doubt as plotters get faster and interactive displays give up their high cost burden grudgingly. Nothing has clearly pointed the way. However, with second-generation refresher displays already overdue, second-generation plotters may help settle the issue. ▲

Mr. Moffett is a regular contributing editor.



# This tape will self-destruct.

## This will keep it alive.



It's a fact of life. Tapes destroy themselves during normal computer operation.

Wear particles of oxide accumulate causing head to tape separation. Which causes 90% of all tape errors. Which means lost data. Missed deadlines.

Can tapes be saved? The mission is possible if you install a CDC® 781 Magnetic Tape Cleaner.

It removes the contaminating wear particles. Eliminates the static build-up which makes them adhere.

So your tape reads like it should. And you aren't faced with the cost of re-creating data, or the hidden cost of read-skips.

Also, the CDC 781 eliminates storage and handling problems. Because it rewinds with perfect stacking and tension.

Easy to operate, too. Just load and let it run. It stops when the tapes are clean. Automatically.

The CDC 781. It saves tapes. And you and your computer save time and money.

In 15 seconds, you can stop the self-destruction in your installation. Call collect on our Hot Line (612) 884-8195. Or circle the number below.

Business Products Operations  
Dept. 353  
Control Data Corporation  
P.O. Box 1980  
Minneapolis, Minnesota 55111

**CONTROL DATA**  
CORPORATION



## SOURCE DATA AUTOMATION

## OPTICAL READERS

The optical reader represents the prime example of Source Data Automation equipment. Unlike keyboard data entry devices, optical readers are designed to eliminate any manual retranscription of data. Rather than data being entered manually at a keyboard, data enters the system automatically by optically scanning printed or coded material. The ultimate goal of optical reading is to "read" any type of handwritten data. This goal is still far in the future, but the technology has presently progressed to reliable reading of typed characters and numeric hand-printed characters under strictly controlled conditions.

Optical readers fall into three distinct classes: bar code readers, mark-sense readers, and character readers.

## BAR CODE READERS

Bar code readers "read" a character indirectly by recognizing an associated bar code. The bar codes are usually placed on the paper by either an embossed card or keyboard imprinter. The easily ma-



Fig. 1 Bar Code Optical Font

chine-readable font shown in Fig. 1 results in a highly reliable low-cost (\$10,000 to \$20,000 range) optical reader. The basic disadvantages are the requirement for a specialized preparation device and a limited numeric character set.

Mr. Feidelman is a regular contributing editor.

## MARK-SENSE READERS

Mark-sense readers "read" characters indirectly by detecting marks recorded by hand in specific locations on the paper. The mark-sense reader is moderate in cost (from \$20,000 to \$40,000) and highly reliable. The disadvantages relate to a fixed pre-printed format and difficulty in human readability.

## OPTICAL CHARACTER READERS

The optical character reader (OCR) recognizes the character directly by its shape. Optical character readers are usually classified by their ability to read different types of characters. Most single font readers (selling at \$30,000 to \$100,000) are de-



Fig. 2 USASI OCR-A Font



Fig. 3 ISO OCR-B Font

signed to read the standard character font developed by the United States of America Standards Institute (USASI), shown in Fig. 2. Arguments on its aesthetics, however, have lead certain manufacturers to implement the International Standards Organization (ISO) font B as shown in Fig. 3.

Most multi-font readers can only recognize a limited number of specified fonts, of which one is the U.S. standard. These readers sell in the range of \$150,000 to \$400,000. Multi-font readers which can recognize a large variety of character fonts

(mainly from typewriters) sell in the one to three million dollar range. Multi-font OCR readers are used by banks, publications, the U.S. Post Office, and others. At present, all fonts must be defined to the reader. However, experimental OCR readers exist which read new fonts by a learning process.

Although handprinting readers may technically be classified under multi-font readers, their present development demands particular emphasis. Most commercially-available handprinting readers only read numerics. At present, handprinted character readers must be employed with caution in a highly controlled environment. The costs of handprinting readers vary from \$100,000 to \$300,000.

### REMOTE SCANNERS

A newer concept connected with optical readers has been the remote scanner terminal used to transmit optically read data over communication lines (usually telephone lines). The scanner terminal may contain only the scanning optics and transmit analog data to a central computer for recognition, or it may contain the complete scanner and recognition unit and transmit digitally coded data. Prices range from \$2,000 for a numeric-only terminal, to \$35,000 for an alphanumeric OCR reader terminal. Of course, completely self-contained terminals may also be used off-line as low-cost OCR readers.

### OPTICAL READERS VS KBT

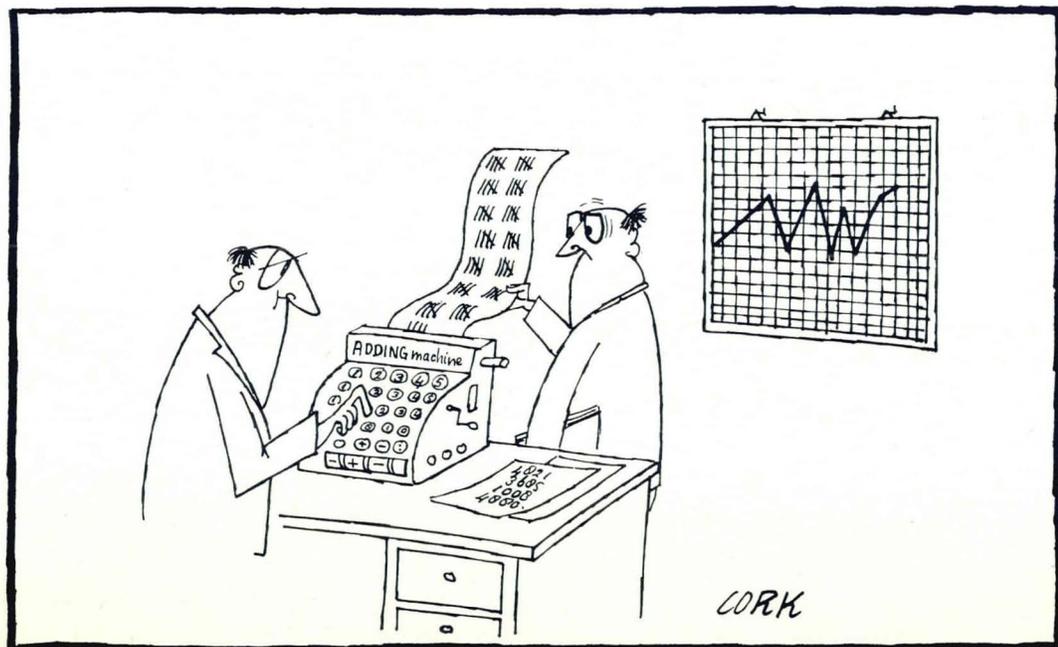
Since an optical reader is basically an alternative to a keyboard-to-tape (KBT) system, there are

common features of each type of equipment category that can be compared:

FACTOR	OPTICAL READER	KEYBOARD-TO-TAPE
Volume	Primarily for large volumes of document data	For smaller volumes (e.g., less than can be handled by 8 keypunch operators) and/or where data is not in document form
Training	Typist level	Keypunch level
Ease of Use	Special care required for initial data preparation	As easy or easier to use than standard keypunch equipment
On-line Capability	Remote scanner terminals	Remote KBT or pooler terminals
Verification	Proofreading	Visual verification or manual re-entry
Cost	High initial equipment and system costs; can provide lowest cost/document	Lower initial cost; cost/record largely dependent on number of keystrokes

### SUMMARY

The optical reader is an advanced SDA equipment permitting direct data reading and, thereby, elimination of keypunching. Due to its relatively high cost, a large volume of data is required to justify its utilization. Different types of optical readers exist to meet different reading applications, depending upon preparation controls, character set, volume, and on-line, real-time requirements. ▲





THE SYSTEMS SCENE

THE \$300 SALISBURY STEAK

REPORT TO INVESTORS

**BACKGROUND:** In our desperate search for profitability, the Datablank Corporation has moved in several different directions. Starting last year in our founder's garage, we went from contract programming to minicomputers to management consulting to receivership. Now that we are once more on our feet, still another direction seems in order: Corporate Education.

**OPINION:** It is the opinion of our task group that the company's proven inability in most areas of the computer field should not seriously affect efforts to sell educational seminars in these very same areas.

**RESULTS OF STUDY:** In a study of 25 trial seminars we made the following observations:

1. Attendance had little to do with either speakers or subject. Location was more relevant. The seminar on *Computer Methods for the Mail Room, Stock Room, and Wash Room* was offered both in Antigua and in Dayton. Four people from Dayton went to the Antigua session, but nobody from anywhere went to Dayton.
2. None of the speakers were paid, since they only came to sell their products.
3. In Post Mortems submitted by attendees it was found that no one in the afternoon sessions could remember anything that had been said in the morning. Attendees were more interested in speaking than listening.
4. The most popular session format was the one in which the afternoon coffee break was extended through to the cocktail party.
5. The use of audio visual aids was ineffective, since most people fell asleep when the lights were turned down.
6. Attendance was directly proportional to price.

Mr. DeMarco is a regular contributing editor.

**RECOMMENDATION:** The task group has recommended the company move immediately into the lucrative field of high-level executive education.

The first symposium will be given in New York on a general topic such as *Computers, Cobol Techniques, and Ecology*. Presentations will be arranged around a luncheon of Chicken a la King or Salisbury Steak served at room temperature.

Ideal speakers would be Dr. Herb Grosch, Ralph Nader, and Johnny Carson.

After the initial symposium, the company intends to offer a continuing series of exorbitantly priced seminars.

**SUBJECT MATTER:** One of the keys to success in the field of corporate education is the selection of topics closely attuned to the needs and interests of the market. To this end, the task group has performed an extensive market analysis. Results of the analysis indicate that the following seminars would be guaranteed successful:

- A. *Computers and the Human Sexual Response.* (New York Playboy Club)
- B. *Computers & Football.* (Superbowl at half time)
- C. *Finding Dumb Investors.* (Delmonico's)
- D. *How to Overcharge the Government.* (San Souci's, Washington)

**SPEAKERS:** Our study of the competition has indicated that most speakers are selected from lists of past attendees. We intend to follow this same judicious policy.

**PROGRAMMER EDUCATION:** As an adjunct to the corporate education program, the company plans to offer a series of courses on computer techniques for the underprivileged. Registration fees will be on the order of four thousand dollars for a full course including programming, operations, key-punching, and raised flooring. Programming work will be done in ATL (Absolute Trinary Language) on a machine donated to the company by the Air Force. ▲

the real  
\$39 a month  
CRT terminal  
from  
the real real-time people



Somebody promised you a \$39 computer terminal. Bunker-Ramo delivers — the 2210.

It breaks the \$\$\$ barrier for on-line terminals at bank teller stations, factory assembly points, hospital wards, credit departments, utilities, warehouses and countless other locations.

The 2210 has all the necessary features: tab, fixed format, skip, computer-call, variable lay-out, conversational mode, plus a special block keyboard

for easy operation by non-typists. Interfaces with present data processing systems without costly modifications.

Price includes maintenance by Bunker-Ramo's nationwide field service staff.

Before you install any — or buy more — CRT's, see the 2210 at the Fall Joint Computer Conference. Or write for information.

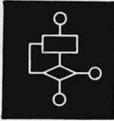
*The real real-time people*



**THE BUNKER-RAMO CORPORATION**

Business & Industry Division

445 Fairfield Avenue, Stamford, Connecticut 06904. Phone: (203) 348-4291



SOFTWARE FORUM

CRIMINAL JUSTICE—

## A CHALLENGE TO THE SOFTWARE INDUSTRY

**Alfred F. Lynch** is vice president of technical operations of Aries Corp., McLean, Va. Mr. Lynch's computer experience includes areas of systems and configuration analysis, software systems design and development, project control, and management. For the past three years, he has been a consultant to state and local governments in the areas of highway safety and criminal justice.

The Omnibus Crime Control and Safe Streets Act of 1968 provided funds to upgrade the operational efficiency of state and local criminal justice and law enforcement activities. One of the major provisions of the Act called for the development of statewide criminal information systems to provide for storage and rapid retrieval of records relating to the total criminal justice program.

Various criminal justice and law enforcement agencies in many states are not united in any systematic arrangement. In general, the major entities may be identified as the police, the courts, and correction activities. Each of these has an interrelationship to some degree with the other, but the degree of interplay is generally less than desired. The apparent benefits to a state under an automated system are myriad. In most states, the obstacle to this objective is the slow and burdensome manual methods employed to process the bulk of the data under present procedure. The speed and mass data handling capabilities of electronic computers seem to provide a specific counter to the obstacle. A well-devised system and attendant procedures should develop the sought-after improvements and provide an environment in which the most efficient and uniform application of law enforcement and criminal justice can be realized.

The Omnibus Crime Control and Safe Streets Act has not only challenged the states but the data processing industry as well. Many states are still

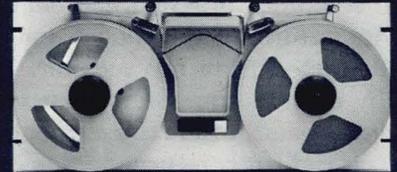
not equipped to meet the demands of the Omnibus Crime Bill in automating their records, and therefore must still use outside consultants.

The challenge to the software consultant is that he must develop a modular master plan or blueprint for the development of a computer-supported, integrated law enforcement and criminal justice information system. The plan must provide for collecting, processing, and outputting all information needed by the police, criminal courts, and criminal correction activities within a state. Such a plan cannot be created without carefully studying the existing court, correction, and police systems. In each of these areas, the primary and major document flow should be depicted in the form of a general-level flowchart. The total system must also be depicted showing the various interfaces or information exchanged between agencies. This requires the software consultant to examine work being done in automated systems by other state or local governments. Since no one agency or firm is acting as a "clearinghouse" of information in this area, this may be a little difficult.

Because the cost of software has continued to increase until, in many cases, it may be equal to or greater than the hardware cost, an outside consultant must carefully consider the long-range and comprehensive needs of a given state or local agency before offering a solution that only satisfies the parochialism of the individual client in question. The challenge is even greater because the interest of the Federal Government in the prevention of crime has led a number of firms and organizations to develop instant expertise and a raft of papers and proposed projects related to this area. As the data processing industry applies its manpower and advancements to a solution in the criminal justice area, it is absolutely essential that the industry avoid repeating the same mistake that has plagued the application of computers to other problem areas — "re-inventing the wheel."

The next several years will show how the software industry met this challenge. ▲

**Will  
your photo  
reader still  
work when you  
give it the  
"Oilcan  
Harry"  
treatment?  
The new  
Tally will.**



Here's a reader that doesn't care whether you feed it oily, dirty, or discolored tape. This low cost 500 char/sec Tally photo reader uses a new bifurcated fibre optic reading technique. Tapes with up to 70% transmissivity (30% opacity) are easily and accurately read. Ambient light doesn't affect reading reliability.

Price of the R-5000 Reader—with integral reeling and DTL/TTL compatible electronics—is a low \$1500.

There are only three moving parts in the bi-directional R-5000, the capstan servomotor and the two reeling motors. Fewer moving parts cut maintenance.

The R-5000 pinned sprocket capstan drive reduces edge guidance problems (skew). There are no pinch roller brakes to wear or slip the tape.

The Tally R-5000 reads 5, 6, 7, or 8 level punched tapes without adjustment. The unit reads up to 300 char/sec asynchronously, 500 continuously or 1200 in the wind or search mode.

For full data, please address Robert F. Smith, Tally Corporation, 8301 South 180th St., Kent, Washington 98031. Phone (206) 251-5500. In Europe and the U.K., address Tally House, 7 Cremyll Road, Reading RG1 8NQ, Berkshire, England. Phone READING 580-142.

**TALLY®**

See the new Tally line at FJCC, Houston  
CIRCLE NO. 33 ON INQUIRY CARD



## WHAT HATH BABBAGE WROUGHT DEPT.

### CRIME DOESN'T PAY BUT HONESTY CAN COST

Like many computerized checking account statements, mine has run into the usual "our computer made a mistake" explanation. One month I noticed that \$287.46 had been erroneously credited to my account. Being somewhat diligent in my book-keeping, I notified the bank clerk, who was overjoyed to find the missing sum — since once the transaction is complete, it is almost impossible to discover where the error has occurred. I have a small activity checking account for which I am charged \$0.15 per check. The next month's statement showed that the error had been corrected and \$287.46 had been withdrawn. However, the dutiful computer program had charged me fifteen cents for returning the money and this also had been deducted from my account. Not to be outdone by a mere computer, I pursued the matter relentlessly and after three months the fifteen cents was rightfully returned. "*Soc Et Teum*"

Submitted by: Wm. J. Lewis, Encino, Cal.

### CDP FLIPS MGR

This morning I received a "computer-printed" form letter addressed to: Mr. W.C. Bel Cdp, Eugene Talmadge Mem Hosp, Augusta, Ga 30902. The letter was an advertisement for a new "personal" service from the publisher of a prominent weekly business periodical to which I subscribe. I didn't really mind the omission of the second "l" in my last name, but when the letter began "Dear Mr. Cdp:" I nearly "flipped my lid."

I can appreciate a layman not knowing what the initials CDP (Certified Data Processor) represent. However, if we have personnel converting data files in this fashion, then this further illustrates why we need certification within the profession.

Submitted by:  
William C. Bell,  
CDP Mgr. of Standards  
Eugene Talmadge Memorial Hospital  
Augusta, Ga.

### YOU SHOULD'VE CANCELLED YOUR CHECK!

My previous employer asked me to take out a credit card. Another employee requested a card at about the same time, and when we each received the usual bill for the \$10 fee, a company check for \$20 was sent for the two of us.

When the next computer-generated statement came, the \$20 had all been credited to me, so I had a credit of \$10; the other fellow's statement said he still owed \$10. After calling the "customer representative" many times (because his number is almost always busy), he was finally reached, and said he'd take care of the problem.

In the next set of statements, the \$20 was credited to the other man, who was now ahead \$10,

and it was my turn to owe the \$10. After a dozen more calls, I finally got to the customer representative and explained it all again. He said that putting more than one \$10 fee on a check only "confused the computer," which he indicated was having trouble keeping track of "the great many cardholders." So I asked, "Do you mean that if a company has a dozen men all taking out credit cards at once, it should send twelve separate \$10 checks?" He answered, "Yes, that would be the best way." Shortly after that, I cancelled my card.

Submitted by:  
Stephen B. Gray, MIS Dept.  
American-Standard  
New York, N.Y.

**MODERN DATA** will pay \$10.00 for any computer- or EDP-related item worthy of publishing in our "WHAT HATH BABBAGE WROUGHT DEPT." Humorous "information" for consideration may include weird memos or operating instructions, unusually incongruous documentation, and off-beat items of a general nature (for review by our off-beat

editors). Send all submissions to:

**WHBW DEPT.**  
**MODERN DATA**  
3 Lockland Ave., Framingham, Mass. 01701  
Entries are the property of **MODERN DATA**.



## Our new CD drum remembers twice as much as it used to.

But you'd never know by looking at it. That's because we've doubled the storage capacity. This increases total storage capacity of this 10" drum to 38 million bits.

Along with the better memory, the drum has a bit transfer rate that's double what it was before. This gives the new unit a transfer rate of up to 4.4 mhz.

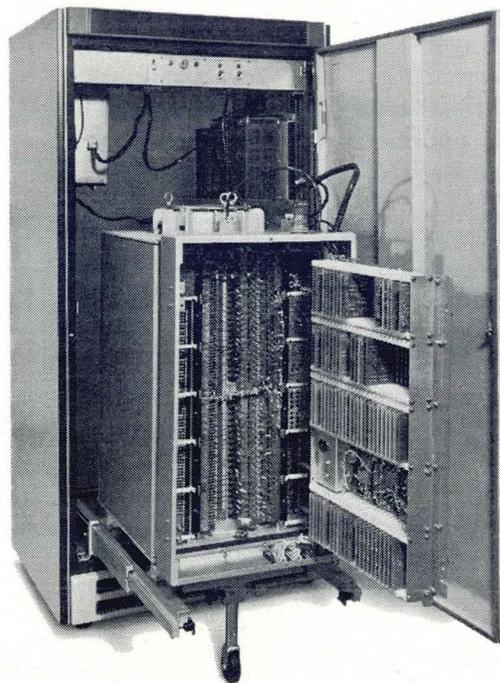
Nothing else has changed. This new drum continues to feature Bryant's

patented AUTO-LIFT® mechanism for reliability and long life. And average access time is still 8.5 milliseconds.

In addition, the interface can be easily designed to accept upward compatibility of our standard drum family. We've simply done our bit for progress. And doubled the bit capacity.

Like to know more about this brand new series? Interface with a Bryant representative, or drop us a line. Bryant Computer Products, 850 Ladd Road, Walled Lake, Michigan 48088.

Better yet, stop by our Booth (#2107) at the FJCC and get the information firsthand.



**BRYANT  
COMPUTER PRODUCTS**

A UNIT OF  
**XLO**  
EX-CELL-O CORPORATION



## I. THE SESSIONS AND MEETINGS

Billed as "the Unconventional Convention," this September's ACM meeting in N.Y.C. brought together approximately 2000 professional registrants and an equal number of the lay public for a "dialog" on the social consequences of an increasingly computerized society. General Chairman Sam Matsa voiced the mood of the ACM steering committee by stating that this 25th conference of the Association for Computer Machinery would break with tradition by addressing itself as much to the problems of the man on the street as to those of the computer professional. Matsa then introduced keynote speaker Ralph Nader, whose familiar presence on behalf of the consumer probably did more to focus public attention on ACM '70 than either Mayor Lindsay's proclaiming the week of the conference as "New York Computer Week," or any of the meetings and sessions which followed. Nader's enormous popular appeal had the Hilton's Grand Ballroom packed to the lobby.

### NADER'S ADDRESS

Nader argued that since buyer knowledge is essential to a free market, we should insist that product information generated by government procurement programs be released to the public. Computer professionals should also attempt to utilize the accident statistics compiled by insurance companies to develop "a major new mechanism of restraint on the technological pornography that is coming out of Detroit these days." The keynote speaker stressed that intrusion as well as secrecy was a common characteristic of government agencies and therefore required an "Information Bill of Rights" to guarantee individuals the right to examine government-maintained records on their personal matters. Nader stated that an adjudicatory mechanism, perhaps along ombudsman lines, was vital to enforce such an ethical code. Similar channels of redress, he said, should be made applicable to the private sector. Nader concluded his remarks with an invitation to persons

interested in developing a consumer product information utility to gather materials and meet with him for further discussion.

### PRIVACY A MAJOR ISSUE

The points made by Nader were developed further in the technical sessions as well as in the public "town hall" sessions which were held in the evenings. This was especially true of the data bank/privacy issue. A technical session on the FBI's National Crime Information Center (NCIC) drew several queries from the floor on safeguards to insure against misappropriation of information. The NCIC processes over 5 thousand requests daily and is interfaced directly with computers in every state except Alaska. Special agent Donald R. Broderick described the data as consisting only of warrants and "documented evidence." The system's 2 million records are continually updated, he said, and the fact that NCIC is averaging 600 "hits per day" is a significant measure of its success.

Heated and sometimes emotionally-charged questions to panel members during the evening "town hall" sessions reflected the concern of the general public for privacy considerations and giant data banks. Members of the audience rose to describe their past experiences with "the machine," and to express their fear of eventual enslavement to data bank manipulators. Panelist Dr. Herbert Grosch of the National Bureau of Standards assumed his familiar "devil's advocate" position by addressing himself to the more extreme arguments from the floor. Grosch illustrated several advantages that could result from intelligent use of data banks. Regarding their use by the Federal Government, he suggested that perhaps one carefully-watched central file would be better than the disorganized social spying that prevails at present.

Grosch's comments were generally approved by both the pro- and anti-databankers. An elderly lady who described herself to **MODERN DATA** as "not a programmer, but worried about what they (programmers) can do to us," summed up

*"The impact of ACM '70 was what it accomplished in bringing the computer closer to the general public that it affects."— Sam Matsa, ACM '70 General Chairman*

her reaction to Grosch: "I can't tell from how he talks whether he's on their side or ours — but I like what he says."

#### **OTHER ISSUES**

Privacy was far from being the only social issue to come under discussion. A meeting of the Special Interest Committee on Computers and the Physically Handicapped raised the interesting prospect that managers unwilling to consider hiring the physically handicapped may be handicapping themselves economically.

A "town hall" meeting heard several incensed individuals protest their alleged victimization by private data processing schools to Dr. Carl Hammer, head of the ACM's accreditation committee. The speakers complained that they had paid, in some cases, thousands of dollars for "education" and the promise that this would insure their immediate employment as programmers and operators.

ACM president Walter Carlson, a prime mover in shaping the convention into a forum for dissenters, ironically became a focal point for their grievances. Carlson admitted the shortcomings of the ACM (lack of effective enforcement policies, need for better communication, etc.), but described the work in progress that he hoped would correct these shortcomings. Such work, he said, included the development of standards for licensing companies which used computers to maintain credit and personnel records, and the development of a strong and enforceable code of ethics. Carlson, aware that his position made him subject to all criticisms directed at the ACM in general ("I realize I must necessarily be a catcher rather than a pitcher!"), fielded all of the fast balls thrown to him, dodged most of those thrown at him, and never lost his cool.

#### **THE TECHNICAL SESSIONS**

The scheduled technical sessions varied widely in fulfilling general chairman Sam Matsa's desire to have them "provide a forum for defining and expressing the known and expected user needs of the 'Seventies." This variance was no better illustrated than by the Medical Sector, which met in two sessions. The first session, "Computers and the Practice of Medicine," consisted of discussions on

"what we have," and "what we are doing." None of the three panelists made any effort to suggest how the non-medical, commercial community could contribute in developing needed equipment or software. Prodded, one representative of the medical profession commented privately, "they (the manufacturers) are only in it (the medical area) like flies in honey."

The second medical session, "Computers and Medical Research," consisted of discussions on "what we've done" and "what we need." Each of the three panelists, Dr. A. W. Pratt of N.I.H., H. W. Shipton of the State Univ. of Iowa, and Dr. B. M. McCormick of the Univ. of Iowa, ended his presentation by outlining what he believed the industry was capable of developing for his research. The medical researchers were also impressive in that they all were obviously experienced managers, well-grounded in computer technology, and result-oriented.

Following the discussion, **MODERN DATA** asked one of the second group of panelists if he could suggest any reasons for the marked difference in attitude between his panel and the previous one. His answer was inconclusive but significant: "I've found from experience that if I want something done, it's first necessary to get rid of all the M.D.'s." Without trying to imply some fundamental reason for why this may be so, we hope this seeming inability on the part of M.D.'s to work hand-in-hand with the outside world will heal itself soon.

The technical session on Computer Graphics in the 'Seventies had experts from five countries plumbing the reasons for the slow growth in graphic applications. High development costs were cited as the greatest factor in the failure of graphics to realize their predicted potential.

Transportation Sector Chm. R.M. Curry of the Assoc. of American Railroads sparked his formal presentation with some well-attended remarks on how computers fit into the Penn Central picture.

Those attending the Urban Sector meetings heard a number of interesting and relevant papers including one by Henry Bruck of the M.I.T. Urban Systems Laboratory entitled "He That Filches From Me My Good Name Makes Me Poor Indeed." Mr. Bruck discussed the "technology of oppression" and spoke against the creation of elaborate systems for keeping track of "social undesirables."

A major thrust of the Earth Resources Sector was directed at the use of satellites to gather terrestrial data. Current and future applications for this data range from directing fishermen to schools of shrimp in the Gulf of Mexico to predicting ground water levels. A very real problem is that the raw data recovered from satellites exceeds presently-available processing capabilities.

**"UNCONVENTIONAL?"**

How successful a convention ACM '70 actually was will depend on how aggressively it follows up on its plans and resolutions. Professional con-

ventions don't usually solicit public involvement, however, and in the sense that this one did, it was certainly unconventional. The invited "public" was present, was heard, and was involved. And if this wasn't made apparent by the fact that over 2,000 non-ACM members each paid \$2.00 to visit the convention exhibits, the computer art gallery, and the computer vs. computer chess tournament, it was by the crowds that showed up for Nader and the "town hall" meetings.

ACM '70 represented, in the words of Pres. Walter Carlson, "a giant step." In a closing statement to the press, Carlson said, "ACM has succeeded in being the technical conscience of our industry. It is now engaged in becoming its social conscience as well."

LOUIS J. BROCK • Assoc. Editor

**II. ISSUES CONFRONTING THE COMPUTER PROFESSIONAL**

Can a specialized elite collectively wield sufficient strength to uphold its members in transcending financial pressures and maintaining a high standard of integrity? Or, has professionalism been corrupted? Is it now a dessicated ideal; a desecrated banner, abused by venal careerists and manipulated by corporate power brokers? In his brilliant keynote address Ralph Nader posed these questions to ACM '70 this year's convention of the Association for Computing Machinery when he stated: ". . . the issue is whether employees . . . perform within the professional society as independent professionals . . . or as employers."

At the New York Hilton from Sept. 1-3 the ACM was blasted with the usual gamut of "hot" social issues—peace, poverty, environment, consumerism, and above all invasion of privacy by the computer. For the most part response was tepid. The ACM membership like the rest of American society is so polarized, demoralized, and numbed about these controversies that meaningful dialogue is virtually impossible. Moreover, the abrupt interjection of social issues at a professional convention is sufficiently unconventional that members feel their reticence is justified.

Nonetheless, suppression has its limits. The ACM is a professional organization bound together largely because each member cherishes his identity as a professional and is nurturing that identity by associating with his colleagues. An attack upon the professionalism of the group is an attack upon the rationale behind the convention to say nothing of the sponsoring organization. Such a challenge was, of course, implicit in Nader's address. How-

ever, it erupted with even greater resonance from dissidents directly involved in the convention—particularly the youthful splinter group which disclaimed a professional identity for itself by changing its name from "Computer Professionals for Peace" to "Computer People for Peace."

Against the ensuing drama the drone of the ACM technical sessions served merely a choral function. In the opinion of this observer the climax came in the Hilton Grand Ballroom when the issue was met head-on in a special panel session titled: "The Computer Professional in the 'Seventies: Responsibility and/or Dissent?" Here the panelists assailed much of what computer professionals are doing. Professor Stanley Miller of the University of Michigan spoke for a strong code of ethics to be socially-oriented rather than boss-oriented. He, also, scored professionals who would work on an improper data bank or credit file. Another panelist advocated transgression of security barriers to expose military-industrial misconduct. In addition, he attacked a pending ACM by-law which would lead to automatic expulsion of draft-resisters from ACM. Stan Robinson a CPP dropout from the military-industrial complex admonished the group that it was better to be blackballed by the Establishment—or more topically, data banked by the Army and the FBI—than to participate in immoral military research.

Of course, the military-industrial constituents could not and did not passively absorb the onslaught. A man on the left side of the room stood up and rejoined "What right do you have to undermine National Policy?" A midwesterner cited

prior conferences and discussion groups where military employees had conscientiously pondered the human consequences of their work. Finally, seizing the offensive from the critics a militant, middle-aged lady with a slight Southern drawl attacked the panelists' professionalism as being that of the World's Oldest Profession. Unquestionably, the convention participants' concern for professionalism is commendable. Yet ACM faces a real crisis. To be sure, it does not have to solve the world's problems, take an ideological position, or even provide a political forum (as CPP appears to want). Its public responsibility, however, goes beyond purging itself of unreconstructed felons (as one of its study groups proposed). Older professional groups have in the past recognized the need to offer educated comment on the specialized aspects of public issues. Increasingly, these issues are becoming involved with the technicalities of computer science, therefore, as the leading organization of computer professionals, the ACM must awaken to its obligation to educate the public, and, above all, to protest computer versions of the "technological pornography" which Nader has exposed in Detroit. This will be all the more difficult because ACM members are employees of powerful companies, whose interests may differ from the public's. Nonetheless, if ACM fails to meet the

challenge it will decline from a professional organization to a trade organization.

Moreover, the ACM members may have been prodded to wonder about their responsibilities to themselves as well as to the public. Again the CPP brought the point home with its poignant plea for Clark Squire who, CPP informs us, is a former \$17,000-a-year programmer, a Black Panther, and a victim of seventeen months pre-trial detention. Unfortunately, CPP's penchant for radical sloganeering (they "demanded" \$50,000) greatly undermined its effectiveness in Squire's behalf because it tended to make radical sympathy a prerequisite for sympathy with Squire. Yet not withstanding the radicalism of CPP and the Panthers, seventeen months detention without a trial is inexcusable\* whether or not constitutional (and even if the Panthers have been intentionally delaying the trial). If such an injustice can be perpetrated on one computer professional it can be perpetrated on any. Perhaps, someday all computer professionals will band together to assure that they actually do enjoy the security and dignity which they once complacently regarded as concomitants of their estimable vocation.

\*Contributions may be sent to Squire Committee, C.P.P., Box 1597, Brooklyn, N.Y. 11202

## More effective data and telecommunications start with Berglund Associates.

### Here's how we can raise efficiency, yet lower costs.

**What we do:** We're an organization of engineers and managers providing professional technical and management consulting services to users of data and telecommunications equipment, or to manufacturers of this equipment. Our experience encompasses all of applied data and telecommunications. Typical areas include:

Data transmission • voice services • network design • terminals • interconnection • private microwave • international communications • teletypewriter systems

As a user, you would utilize our services to implement a system, improve it, lower costs, or perhaps all three. Or request counseling, feasibility studies, systems design or communications management services. If you're a supplier, our services help you achieve more cost-effective product and business planning. Counseling and studies include market trends and needs, product concepts and technical design, regulatory matters, and the competitive environment.

**How we do it:** Because our client's people have to live with our results, we work closely with them. We reject textbook answers if an innovative approach is sound. We design computerized models to analyze and weigh all possibilities. We document our findings



so the client can test them. And we help our client's people follow through on our recommendations. Soundness and logic are consistent — whether we're recommending a new product, or configuring a nationwide message switching network.

**What we can do for you:** We can help you get more for your dollars, speed up your program, avoid costly mistakes, raise efficiency yet lower costs. How? Because we apply our knowledge of equipment, services and trends acquired through working for manufacturer clients; and because we do the same with knowledge of the needs, practices and applications acquired from user clients. But most of all, perhaps, operating independently of any equipment supplier or communications service affords us the privilege of being

completely objective in our approach to problem-solving. Which means we serve only one master: you.

**For more information . . .** Write or call us soon. We'll discuss your interests in depth, or provide literature on our U.S. or European services. Whether we can help you or not, there's one thing we'll maintain our reputation for: an honest answer.

**BERGLUND ASSOCIATES, INC.**

1060 Kings Highway North / Cherry Hill, New Jersey 08034  
Phone: (609) 667-4700



## A SMALL COMPANY AND A BIG SYSTEM

*Computer Operations, Inc. is undertaking the stiff challenge of launching a new company to develop and market large-scale systems at a time when the financial tide is at its lowest and IBM is in the process of giving birth to a new series.*

**B**ucking the trend didn't do much for the mid-hemline. But, trend-bucking has also been the label attached to what later turned out to be among history's most creative and successful enterprises. Computer Operations, Inc. of Costa Mesa, Cal. feels it will fall into the latter category.

### HISTORY OF THE COMPANY

**MODERN DATA** contacted Peter Warkenton, the president who explained the company's development as follows: "I had been founder and president of Information Development Co. We packaged that up in late '68 and sold it to Leasco. So I found myself at loose ends. I was with Leasco very briefly — only over the period of time that it took to transfer the business."

"I got together [with several other COI founders] and started talking about a viable way to attack the computer market — specifically the hardware market, over the next decade or so. Between us all, we thought we had a lot of ideas on what should not be done and what should probably be done. So, in January of '69 we incorporated and got started completely from our own resources. As you might expect, that didn't last an awful long time. In the Fall of '69 we did a round of private placement money that was negotiated to come in two stages of which the second has just been finalized."

"Last spring we had a design review of the system to which we invited a group of what we felt to be knowledgeable people from the user community. We invited the supplier representative principally to validate the technology, and we retained a group of outside consultants to sit in with us and look over our shoulder. The design review lasted for a week, eight hours a day, and we were, I guess it's fair to say, more than gratified at the results. The consultants were very impressed. We got some nice feedback from them. And we decided that they wanted and we wanted to continue some formal association. So we formed a Technical Advisory Board and these people were members of that board. In addition, we had retained a consulting firm out of Boston [Corporate-Tech Planning]."

The Technical Advisory Board consists of five

members: Mr. Lowell Amdahl, President, Com-pata, Inc.; Dr. Robert L. Ashehurst, University of Chicago; Dr. Sidney Fernback, Lawrence Radiation Lab; Dr. Martin Graham, University of California; and Mr. J. B. Wyatt, University of Texas.

### THE PRODUCT

Out of COI's group think emerged Gemini Systems, a new series of large-scale computers. These systems are true multiprocessors in that they incorporate a single, large homogeneous memory subsystem which is shared by three to six independent processors. The name "Gemini" is derived from the fact that communication, peripheral, and central processors are all duplexed in the maximum configuration. Prices start at \$3 million for a system with 2 million bytes of core memory. A configuration consisting of 8 million bytes of core memory, duplexed communication and peripheral subsystems, and two central processors capable of executing 12 million additions and over 3-½ million multiplications per second sells for just over \$6 million — exclusive of peripherals. Larger Gemini systems with more than 1,000 simultaneously active communication lines and 16 million bytes of memory are available.

### MARKETING STRATEGY

COI plans to sell \$100 million annually in 1974. To meet that objective marketing is aimed at the sophisticated IBM user. President Warkenton says that the customers will be "knowledgeable individuals . . . probably in a research type of organization . . . who won't insist on tires to be kicked." COI is offering the capability to handle IBM software to aid transition and a defiant orientation toward IBM is one of the hallmarks of COI strategy. Again, Mr. Warkenton comments: "We think it's logical because seventy per cent of the world looks like IBM — [on the other hand] I don't think any of the other manufacturers are competing with IBM. They're competing with each other. I suspect that some of the reasons [that other manufacturers don't] are that they are emotionally unable to make that agonizing decision, simply to say, that we're going to scrap the way we're going [especially if they] have in place installations that are revenue bases." ▲

# "n" Key Rollover. It remembers your every touch.

Our new "n" key rollover solid state keyboard has a memory like an elephant.

Data bits from the first key depressed are stored in our MOS memory until a second key is activated... even though the first key is still depressed. So any number of keys can be depressed without interfering with the sequence of data entry.

Which makes operator error practically nil. Tests have indicated up to 30% fewer errors than with two-key rollover keyboards.

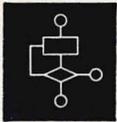
And no special training is needed to switch from an electric typewriter. In fact, most any secretary can sit down and start operating.

Our "n" key rollover is also more reliable. Because pulse output is part of the solid state chip within the key, rather than a pulse network of discrete components.

For even more things you'll want to remember for your next keyboard application, call or write your MICRO SWITCH Branch Office.

## **MICRO SWITCH**

FREEPORT, ILLINOIS 61032  
A DIVISION OF HONEYWELL



## THE FCC REPORT AND THE "THRESHOLD ISSUE"

*After years of data-gathering, behind-the-scenes wrangling, and just-over-the-horizon conjecture, the EDP community and the proposed microwave carriers are finally beginning to see the light at the end of the tunnel.*

Any lingering doubts regarding the Federal Communication Commission's position on opening up the common carrier market vanished on July 17, when the Commission released its "Notice of Inquiry to Formulate Policy, Notice of Proposed Rule Making, and Order" adopted two days previously. The formidably-titled document, issued in the form of a tentative decision rather than a final position, still offers the established carriers an opportunity to comment on the Commission's position before it takes final action. However, the FCC expressed the view that, on the "threshold" issue of general policy (whether the public interest would be served by permitting new carriers to enter the specialized communications field), entry of new carrier competition appeared "reasonably feasible." In the Commission's words (Paragraph 28):

*"The public interest would be best served by allowing the entry of new communications common carriers to serve the markets for special communications services, to the extent that such entry can be accommodated within the limitations of radio frequency availability. For the reasons set forth below, com-*

*petition in this area meets the long-established tests, i.e., that it is reasonably feasible and can be expected to have some beneficial effect. Indeed the advantages of such a policy appear to be manifold and to outweigh any risk that the public interest would be adversely affected."*

To the prospective carriers who have already filed more than 1700 applications for specialized microwave services with the FCC, "reasonably feasible" is being interpreted as "reasonably certain." Not only are such applicants as Microwave Communications of America, Inc. (MCI) and University Computing's Data Transmission Corp. (Datran) finally seeing the light at the end of the tunnel, but it's beginning to look as if the FCC is holding the lamp. Some of the best replies to the established carriers' arguments against competition have been articulated by the FCC. For example, when the established carriers argued that the geographical scope of the applicants' proposals was too small, the Commission pointed out that this was inconsistent with their previous claim that there was no need for specialized services. And if this fell as sweet music on the ears of the new applicants,

the FCC's response to the present carriers' well-publicized "cream-skimming" argument (that only the most profitable markets would be sought by the new applicants) must have sounded like the Hallelujah Chorus. In a follow-up press release, the Commission said they "saw no merit" in this argument since "the applicants are seeking to develop new communications markets rather than exploiting existing markets now being served adequately by the established carriers." The FCC also reminded the present carriers that "When AT&T developed its audio and video services during the 1948-58 period, it chose to serve only the larger population centers and not outlying areas."

(AT&T's history caught up with it again when, in connection with the question of "whether the existing carriers can meet the requirements in the specialized [data] markets promptly, efficiently, and effectively" without compromising present voice service, the Commission footnoted a section from an article [brought to their attention by Datran] entitled "Transmission Aspects of Data Transmission Service by Using Private Line Voice Telephone Channels" in the Bell System Technical Journal, Nov. 1957:)

*"The telephone network was developed for speech transmission, and its characteristics were designed to fit that objective. Hence, it is recognized that the use of it for a distinctly different purpose, such as data transmission, may impose compromises both in the medium and in the special service contemplated."*

#### **LESS THAN POLICY: MORE THAN POSSIBILITY**

Consequently, even though the Commission's report was something less than a final statement of policy, the arguments and recommendations contained in it promise of a hard battle in the courts for the existing carriers. The Commission is solidly behind the idea of opening up the communications market to competition, and their unanimity in concurring with the report's treatment of the "threshold issue" is further indicated by the fact that three of the FCC's six commissioners even went so far as to urge that it be issued as formal policy. The split decision to do otherwise probably stemmed out of a concern that a formal policy decisions at this time could open the door to additional delay, e.g., a possible court challenge by the existing carriers based on denial of due process.

It was for this reason also that the procedural and rule-making

proposals contained in the remainder of the 42-page report were described by the Commission as "predicated, in large measure, upon the Bureau's position on the threshold issue and were subject to modification in light of its ultimate determination on that issue." In view of 1) the importance of the threshold issue and 2) the data processing community's need for a speedy final determination, the Commission's decision to accept comments on its proposals until October 1 and allow up to November 2 for replies to these comments is hard to fault.

#### **FCC'S TENTATIVE CONCLUSIONS**

The Commission's tentative conclusions were also hard to fault. As summarized in the follow-up news release:

*1) The Commission tentatively declined to hold comparative hearings on issues of economic exclusivity among the applicants, principally on the grounds that the market potential appears sufficient to support more than one applicant in the same area and that users should have a wide choice as to how they may best satisfy their expanding and changing specialized requirements.*

*2) The Commission stated that Datran's proposed system should, in any event, be considered separately from the other*

*applications because of its singular characteristics as an all-digital, switched network dedicated exclusively to data transmission service.*

*3) The Commission proposed to require applicants to amend their proposals to remove frequency conflicts with existing common carrier stations and to avoid blocking expansion of existing common carrier routes (to the extent practicable), as well as to avoid frequency conflicts with previously-filed applications. New applications involving radio interference to existing or authorized common carrier stations would not be processed. Applications involving frequency conflicts with a previously-filed application would not be set for comparative hearing unless they were filed within the applicable cut-off period and the Commission is persuaded that the conflict cannot be removed by reasonable measures by the later-filing applicant. Rules designed to avoid harmful interference to domestic satellites and to conserve spectrum were proposed.*

*4) All carriers would be required to inform their customers as to the quality and reliability of the specialized services offered, to make refunds on a reasonable proportionate basis where the service rendered fails to meet the promised standard, and to make quarterly reports to the Commission concerning the*

reliability achieved, service complaints, and refunds.

5) *The Commission invited applicants and other interested persons to submit comments on the most appropriate means for local or intra-city distribution of the proposed services, including such questions as interconnection with existing local carriers, whether new construction would be required and, if so, of what nature and by whom.*

6) *The Commission stated that once these issues have been determined, it will consider each system proposed on its individual merits and follow such procedures as may be necessary to resolve any remaining questions pertinent to the particular set of applications. It said that each applicant "will, of course, be required to make a satisfactory showing that it is qualified and that the service it seeks to offer is technically and economically sound and would otherwise serve the public interest."*

7) *Finally, noting that the specialized common carrier applications have caused a "tremendous number" of opposition and reply pleading, with more anticipated, the Commission ordered a moratorium on the filing of further pleadings. When it has resolved the policy and rule-making issues, or when it is prepared to consider any set of applications that might require further pleadings, the Commission stated, it will issue an order specifying a schedule for filing the pleadings.*

#### THE APPLICANT'S REACTIONS

The events which followed the FCC analysis/report have been both dramatic and predictable. Datran, not the first but certainly the most ambitious of the

new applicants, announced the implementation of a \$7 million system integration program "to ensure the compatibility of all elements in the company's nationwide common carrier data transmission network." Datran plans to pump upwards of \$350 million into its end-to-end network, which is planned to link subscribers in 35 major cities. The company also recently announced the appointment of John M. Scorce, a former regulatory attorney for the Western Union Telegraph Co., as its new Secretary and General Counsel. Datran is obviously not about to take any legal chances at this advanced stage.

MCI's John D. Goeken, whose 1969 victory in securing permission to operate a Chicago-to-St. Louis microwave system marked the beginning of the new common carrier struggle, also praised the Commission's report. MCI plans a nationwide series of independent microwave carriers made up of local ownership interests. Although the MCI network would provide "customized communications channels, tailored to the exact requirements of subscribers needing inter-office and intra-company communications . . ." it differs from the Datran system largely in that its original proposals are based on the use of presently-existent local subscriber facilities.

#### WHAT'S AHEAD?

Strong as the ripples that have resulted from the July FCC report have been, they will probably pale into insignificance with the waves yet to be generated. After all, the Commission has been extremely careful to avoid endowing their report with anything resembling the stamp of fi-

nality. Still, the report is bound to have a lasting effect on all future carrier proceedings — regardless of their final outcome. For the first time, the prospect of opening up the common carrier "market" has become more than just a topic for discussion; major issues have been legally defined, and battle lines have been clearly drawn.

Whatever the future holds, it is obvious that the EDP user will certainly benefit. Less obvious, however, is the prospect that even the established carriers could substantially benefit by an open market and, conversely, harm themselves by deliberately delaying the issue in the courts. Commissioner Nicholas Johnson focused on this point in a section of his concurring statement to the FCC report, entitled "Competition for Bell:"

*"Delaying tactics of this sort can have only the most serious impact on communications users, and additionally, I believe, in the long run best interests of the established carriers. The present situation is roughly analogous to the Carterfone case where Bell's intransigent opposition to flexible attachment and interconnection for over 13 years is now recognized even within the Bell System as an unwise policy from the company's point of view. Carterfone will mean better service, more flexible and responsive service, and will mean that the Bell System will find more customers who, with more useful equipment and communications systems, will use the Bell network. Bell's policy in Carterfone, in short, was terribly shortsighted. Its present policy on competition is equally defective."*

MODERN DATA heartily concurs with Commissioner Johnson's concurring statement. ▲

# Take a lesson in EDP efficiency from some California school kids.

The boy in the picture isn't one of those computer prodigies.

Yet he routinely prepares documents for computer processing. With the simplest data-entry device imaginable: an ordinary, everyday pencil.

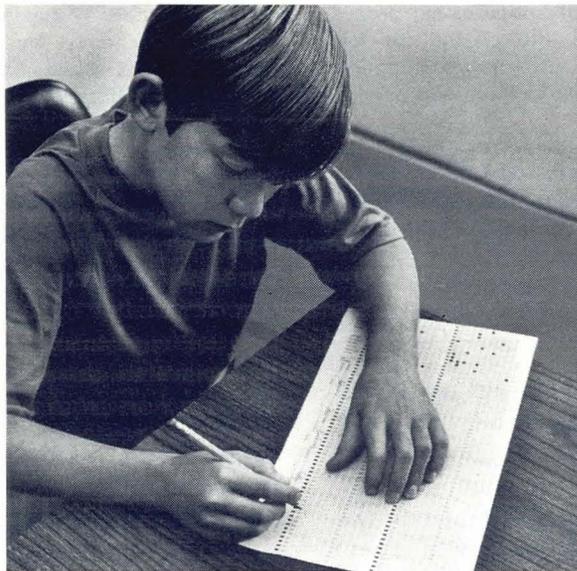
A unique machine reads those documents (they're tests) and automatically translates the pencil marks to computer language. The machine also automates attendance record-keeping and report-card preparation.

The machine is the Motorola MDR optical mark reader.

If you were to put an MDR to work, you'd get information into and out of your computer a whole lot faster. And much more economically.

Because you wouldn't have the bottleneck and the cost of keypunching. Or any other kind of keyboard data conversion.

With the MDR, anyone who can operate a pencil can prepare



computer-usable data as a routine part of his job.

You could have "instant" inventory control. Super-speed order entry. Self-updating quality assurance data. Fully automated payroll accounting.

It sounds blue-sky, of course. But the logic of our approach becomes quite clear when you consider that most of the data you process by computer originates at the end of a pencil.

Which is precisely where our MDR collects it.

With nothing lost in translation.

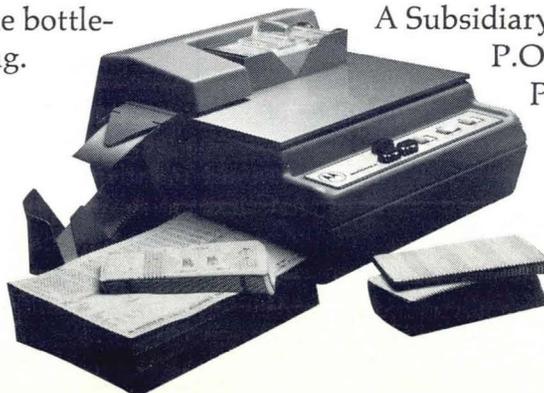
Have us send you a copy of our MDR brochure. It's a source book of ideas on source data automation.

Motorola Instrumentation and Control Inc.

A Subsidiary of Motorola Inc.

P.O. Box 5409

Phoenix, Arizona 85010.



**MOTOROLA**  
**Information**  
**Systems**



## UNBUNDLING THE UNBUNDLER

### *Recent congressional hearings on governmental EDP procurement*

**EDITOR'S NOTE:** Past hearings of the Joint Congressional Subcommittee on Economy in Government have disclosed that Federal EDP procurement procedures forced the Government into paying far too much for EDP services, and restricted competition from the small peripherals manufacturer and service organization.

Suggestions on improving procurement policies to give consideration to the independents, made by Dan Bowers, Chief Editorial Consultant to **MODERN DATA**, to a Bureau of Budget conference, were published in our December 1969 issue.

The following article summarizes recent testimony

before the Subcommittee and points out areas where large savings were gained by purchases from smaller EDP companies. Witnesses appearing before the Subcommittee, chaired by Senator William Proxmire, were: Elmer B. Staats, Comptroller General, General Accounting Office (GAO); Dwight A. Ink, Assistant Director, Office of Management and Budget (OMB/BoB); Heinz A. Abersfeller, Commissioner, General Services Administration (GSA); Col. Joseph B. Warren, Deputy Comptroller, Dept. of Defense (DoD); L. Richard Caveney, President, Computer Peripheral Manufacturers Association (CPMA); and George O. Harmon, President, Comma Corp.

Senator Proxmire opened the hearings by stating that the Government's annual bill for EDP purchases and rentals was about \$3 billion. He reviewed the past policy of procuring computer systems and peripherals almost entirely from the large systems producers, and praised a GAO study<sup>1</sup> that indicated very large savings were possible by utilizing smaller sources of supply.

He cited the Subcommittee's Report of April 1968 which recommended: (1) Including smaller manufacturers in Government procurements and preventing the design of specifications around the products of certain large companies; and (2) An inventory of Government-owned EDP equipment to be completed as soon as possible and kept current to prevent unneeded purchases.

#### **REPORT OF THE COMPTROLLER GENERAL**

Comptroller General Elmer B. Staats reported on GAO activities relating to the EDP inventory, and to procurement procedures and specifications. He began his report with statistics on the number of Government computers in use (2,412 in 1965 to approximately 5,000 in 1970), and on in-house use costs (\$1 billion in 1965 to over \$2 billion in 1970).

GAO believed that improvements could be made with regard to: • The need for realistic and timely projections of EDP acquisitions and releases by Federal agencies to improve reutilization efforts, to provide assistance for use in contract

negotiations, and to prevent unneeded purchases. • The need for inclusion of information regarding software and its use in Government operations to reduce duplication effort and unnecessary costs.

During the review of Government EDP activities, GAO found that agencies had made only limited use of the management information systems due to the lack of current and reliable output. An example cited involved computer printouts of June 1969 that were not available to GSA until Dec. 1969 and were not distributed to the agencies until Feb. 1970.

#### **CPMA REPORTS ON NAVY PURCHASES**

Shortly after this article was prepared, the Computer Peripheral Manufacturers Association (CPMA) reported that U.S. Navy awards to computer peripheral manufacturers totaled over \$15 million during the month of August. Recipients of the Navy's awards included California Computer Products (\$4,443,595), Ampex (\$1,334,088), Potter (\$5,811,635), Memorex (\$3,669,480), and Telex (\$607,478). In a subsequent press release, CPMA president L. Richard Caveney praised Capt. W. F. Weihrich of the ADPE Selection Office, Dept. of the Navy, and J. Cunningham of BoB for their part in effecting the order, which represented "the largest peripheral purchase from other than an original equipment manufacturer ever made by any branch of the Executive, and will, over a three-year period, save the U.S. taxpayer over 8 million dollars."

## PERIPHERALS SAVINGS

A GAO study<sup>1</sup> on peripheral acquisition indicated that it had been common practice for Government EDP managers to obtain all equipment from the systems manufacturers, even though certain items of equipment could be procured more economically from alternate sources of supply.

A few instances were noted where aggressive managers of Government EDP facilities saved significant sums by purchasing parts from the actual [original] manufacturers or from other supply sources, rather than from the computer [systems] manufacturers.

A particular instance involved the purchase of two drum storage units and their related controllers. The OEM's price was \$1,375,500, whereas that of an independent was \$900,300.

Selected computer components were identified as being directly interchangeable (plug-to-plug compatible) with other components of the systems manufacturer, and were found to cost considerably less. However, the Federal agencies had availed themselves of this economical source of components in only a few instances.

It was estimated that, if plug-to-plug compatible systems components were rented from the peripherals manufacturer rather than from the systems manufacturers, annual savings would be at least \$5 million. If components were purchased, the savings would amount to \$23 million.

Estimates on the acquisition of non-plug-to-plug compatible equipment, involving equipment now leased at a cost of \$50 million a year, indicated that the purchase cost from the systems manufacturers would be \$250 million, whereas similar equipment could be obtained from alternate sources for \$150 million.

The study recommended that:

- Federal agency heads replace leased computer equipment with the more economical plug-to-plug compatible units.
- BoB and GSA provide specific guidelines for the evaluation and selection of plug-to-plug and other equipment.
- Pending issuance of such guidelines, factors described in the study should be used for Government evaluations.
- Federal agency heads should consider third-party leasing arrangements when direct purchase of EDP equipment is deemed not advantageous.

## REPORT OF OMB (BoB)

Dwight A. Ink of the Office of Management and Budget (formerly Bureau of Budget) reported on OMB/BoB activities. He stated that the diffi-

culties involved in establishing a perpetual inventory system, and the effort and time required to rectify errors, had been underestimated when BoB initiated the inventory system. Difficulties in the accuracy and timeliness of the data input were still being experienced.

OMB and GSA were instituting new procedures for validating inventory information, which would be used for the inventory as of June 1970, to be published in Sept. 1970. Statistics from that inventory were: (1) **Total Federal Inventory** — There were 4,666 EDP systems in the Federal inventory as of June 30th of which 2,910 (62%) were owned by the Government, 3,039 were employed in general data processing, and the remaining 1,629 were in special or complex applications such as control systems, classified installation systems (exempt from reporting), and mobile systems (ships, planes, vehicles). (2) **Distribution** — Inventory by supplier listed IBM at 28.1%, Univac at 20.4%, CDC at 8.7%, DEC at 7.1%, Honeywell at 5.8%, NCR at 5.7%, XDS at 4.5%, Burroughs at 4.2%, RCA at 4.1%, GE at 1.6%, and "Other" at 9.8%. (3) **Contractor Equipment** — There were 875 computers in contractor facilities that are leased on a cost-reimbursement basis, purchased by the contractor for the Government, furnished to the contractor by the Government, or installed in Government-owned, contractor-run operations.

BoB sponsored a conference on the selection and procurement of computer systems in Sept. 1969.<sup>2</sup> Recommendations of the conference were:

- (1) Each element of the computer system should be separately priced to capitalize on the benefits obtainable from such pricing;
- (2) The Government should retain the use of the "systems integrator" concept for acquisition until other methods are defined and evaluated;
- (3) Intensive work should begin on interface standards to become effective with the next generation of equipment;
- (4) Leased equipment should be replaced by purchased equipment;
- (5) A catalog of information about hardware, software, and related items should be developed;
- (6) Time and cost involved in selection and procurement should be reduced.

Mr. Ink also remarked on the savings that should be possible in the procurement of software packages. If savings can be made in purchasing peripheral hardware from the independent, then software could be procured in much the same manner from the independent software suppliers.

## TECHNOLOGY PROFILE REPRINTS

A 32-page reprint of MODERN DATA's recent 3-part Technology Profile of Interactive CRT Display Terminals is available.

This series, appearing in the May, June, and July issues, covered:

### PART 1

- PRESENT AND FUTURE OF THE TERMINAL MARKET
- TERMINAL INTERFACING TECHNIQUES
- SOFTWARE REQUIREMENTS

### PART 2

- HARDWARE CHARACTERISTICS OF ALPHANUMERIC AND LIMITED-GRAPHIC TERMINALS
- TABULAR COMPARISON OF COMMERCIALY-AVAILABLE UNITS

### PART 3

- HARDWARE CHARACTERISTICS OF GRAPHIC CRT DISPLAY TERMINALS
- TABULAR COMPARISON OF COMMERCIALY-AVAILABLE UNITS

**SEND FOR YOUR COPY NOW!**

**LIMITED SUPPLY AVAILABLE**

PRICE: \$2.00 PER COPY (*Prepaid orders only — No billing orders accepted.*)

REPRINT DEPT.  
MODERN DATA  
3 LOCKLAND AVE.  
FRAMINGHAM, MASS. 01701

I am enclosing \$\_\_\_\_\_ for \_\_\_\_\_ copie (s) of  
TECHNOLOGY PROFILE - CRT TERMINALS:

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ST. ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

## GSA TESTIMONY

Commissioner Heinz A. Abersfeller discussed GSA's role in Government EDP activities. He stated that during fiscal years 1969 and 1970, GSA was able to reduce costs on EDP supplies by \$43 million and on systems procurement by \$50.5 million. A cost reduction of \$19.5 million was achieved in the procurement of magnetic tape.

Federal supply contracts with independent manufacturers of peripherals and accessory equipment increased to 71 in number in 1970 from 42 in 1969; dollar volume in 1970 was \$12 million compared to \$10.7 million in 1969.

## DoD STATEMENTS

Col. Joseph B. Warren, USAF, spoke on the functions of the DoD ADP Policy Office. This office was established to develop policies concerning the selection, acquisition, utilization, and management of EDP equipment and services for the DoD.

Col. Warren reviewed DoD procurement procedures and outlined activities to ensure that the independent peripherals manufacturer received consideration in future contract negotiations.

A total of 1227 tape and disk drives are to be competitively selected for DoD; this activity will result in a savings of \$4.4 million per year. Punched card equipment replacement, involving 940 units, will realize a savings of \$650,000.

## CPMA COMMENTS AND CRITICISMS

L. Richard Caveney, President of the Computer Peripheral Manufacturers Association, commented on the sizable savings achieved by the Government in peripherals procurement, even though the penetration of the peripherals manufacturer into the Government market has been limited. Peripherals manufacturers who formerly could not even receive the correct time of day from the Executive Branch were now being treated, in the majority of cases, as equal competitors and receiving some contract awards, he said.

Caveney praised the Navy as the one major department that is doing an outstanding job of evaluating peripheral equipment on an industry-wide basis and purchasing peripherals from various suppliers at reduced cost.

The experience of the peripherals manufacturer with the GSA EDP group was likened to climbing Mt. Everest without equipment or assistance. CPMA felt that GSA could be more flexible in its negotiations, should stop trying to make the per-

ipherals manufacturer fit the total systems manufacturers' requirements, and stop giving the impression that they (GSA) wished the independents would go away.

Mr. Caveney pointed out that GSA has only given the peripherals manufacturer token contract awards over the last two years, and that a few awards were achieved reluctantly from GSA only after Congressional pressure was applied.

A document written by a highly qualified Federal employee was presented to illustrate current mismanagement in Government peripheral procurement. A waste of \$160 million had been incurred in the award of one contract for EDP equipment. This award was made even after Congressional testimony, suggestion awards, and personal conversations had pinpointed the waste for Administration officials.

Another suggestion concerning a \$700 million to \$1 billion savings on tape drives had been submitted over two and one-half years ago; it was finally disapproved by BoB on "reasoning bordering on pure stupidity."

Caveney cited dual procurement policies involving peripherals manufacturers and IBM. Previous GSA statements assured peripherals manufacturers that they would be considered for awards once they had been issued a Federal supply contract, Caveney said. Yet, in fiscal year 1970, GSA had waited for IBM to be approved, then awarded IBM a \$330 million contract — even though peripherals manufacturers had been issued approval at an earlier date.

Caveney also mentioned the need for economy within the software area. Responsible estimates placed potential savings in software at \$3 billion, effected by reducing the great redundancy that exists in software development throughout the Government. At present, said Caveney, no Federal policy has been enunciated that would eliminate the great waste in personnel and funds.

#### COMMA CORP. STATEMENT

George G. Harmon, President of Comma Corp., closed the hearing by telling the Subcommittee that the Government could realize additional savings in maintenance by employing independent companies. Such savings could amount to \$9.4 million, with no degradation of service, he said. ▲

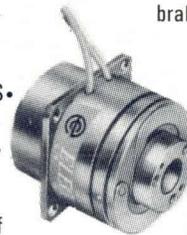
#### References

- 1 "Study of the Acquisition of Peripheral Equipment for Use with Automatic Data Processing Systems" GAO Report (B-115369) June 24, 1960
- 2 "Unbundling Government Procurement of Computer Systems" D. Bowers, MODERN DATA, p. 64, Dec. 1969

## NEW ROTARY MOTION CONTROL FOR EDP SYSTEMS

### selections in miniature electromagnetic clutches and brakes

Provide high performance and low maintenance in COPIERS • READERS • PRINTERS • TAPE TRANSPORTS • OPTICAL SCANNERS • TELEWRITERS and RECORDERS



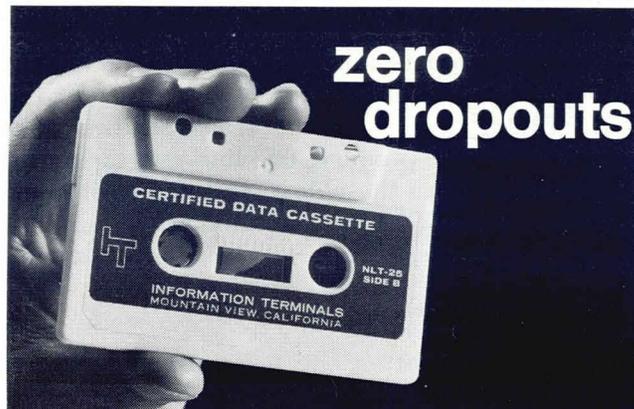
brakes, the smallest highest torque for size in the industry feature: Zero Backlash Instant Spring Release Positive Tensioning Continuous or Variable Drag Torque No Erratic Action Galling or Rusting.

Write today for FREE engineering catalog No. 700A-EDP

**ELECTROID**  
COMPANY

119 Progress Street, Union, N.J. 07083 • (201) 686-8290  
A Division of Valcor Engineering Corp.

CIRCLE NO. 38 ON INQUIRY CARD



#### For terminals... mini-computers... Wang 700 calculators

This precision cassette is the only one certified after final assembly. That's why we guarantee zero dropouts for every precision cassette: each is certified for 800 fci on two 0.056" tracks at 20 ips. 1600 fci optional.

More features: Hub design prevents tape damage, eliminates breakage and tape pullout during rapid stops and reverses, allows leaderless construction where desirable. Slip-sheet design for smooth winding and minimum static. Spring-loaded machined idlers for exact tape-position control. Dependable high-output operation with computer-grade tape. Quiet and smooth-running.

We ship your order the same day it arrives.



**INFORMATION TERMINALS CORP.**  
1160 Terra Bella Ave., Mountain View, CA 94040  
415/964-3600

CIRCLE NO. 39 ON INQUIRY CARD



## COMPUTER OUTPUT MICROFILM SYSTEMS

It has become apparent that a bottleneck has developed in the generation of output information from a computer system. Although the internal computer speed has increased significantly, output is still primarily limited by the speed of the line printer. An alternate solution to the printer which has been gaining favor is the use of Computer Output Microfilm (COM).

In a computer system utilizing COM, information is outputted by means of a microfilm process using a COM recorder. Information is outputted directly on-line from the computer, or off-line from tape drives, many times faster than the highest speed line printer.

When viewed by a microfilm reader, the information on each frame (page) appears exactly as it would on a regular printed page. In addition, various retrieval and indexing codes may be automatically generated by the COM onto mi-

crofilm. Through the use of these codes, information may be located faster than on a comparable paper information system.

Storage and mailing costs are greatly reduced by using COM, since microfilm requires only 2% of the space of an equivalent paper report. Additional copies of the microfilm have practically the same quality of the original, and many times the quality of a third, fourth, or fifth carbon paper copy. Since information can be outputted from the computer rapidly and inexpensively, many companies find it economically feasible to "print out" data base information and other detailed reports much more frequently.

Computer Output Microfilm provides for the rapid output of information from a computer system at significant cost savings, while increasing the total thruput capabilities of the computer and the accessibility of the data.

## COM RECORDERS

Three techniques, employing cathode ray tubes (CRT), electron beam recording (EBR), and fiber optics, are employed in COM recorders. CRT and EBR produce one page of information at a time; fiber optics produces one line at a time. The CRT technique is the oldest, and the most commonly used in COM recorders today.

## Cathode Ray Tube

Information is written one page at a time by an electron beam exciting the phosphor face of a CRT. The image from the face of the tube is passed through a semi-reflective mirror and a lens onto the unexposed film. After exposure to the image, the film is advanced, and the next page is displayed on the face of the CRT. Simultaneously, as the data is exposed on the film, a flash can occur behind a glass or film slide on which a form of the paper report has been etched. The form image is reflected by a semi-reflective mirror, and is superimposed on the image of the data on the film (Fig. 1).

## Electron Beam Recording

In this technique, characters are written by an electron beam directly onto the unexposed film. The process is performed in a vacuum. The unex-

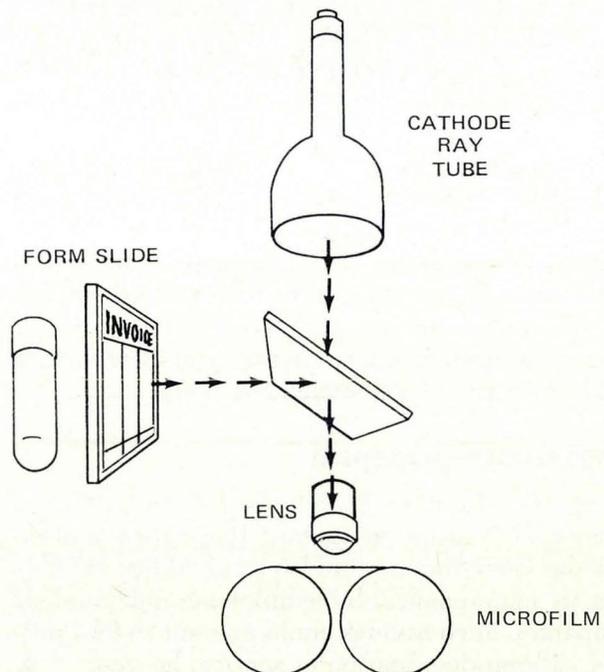


Fig. 1 CRT Recording on Microfilm

posed film is drawn into the vacuum chamber and the page written one character at a time onto the film. After the information is written by the electron beam, the film is incremented, and the next page written. If a forms overlay is desired, it is placed on the film through the use of a second lens system (Fig. 2).

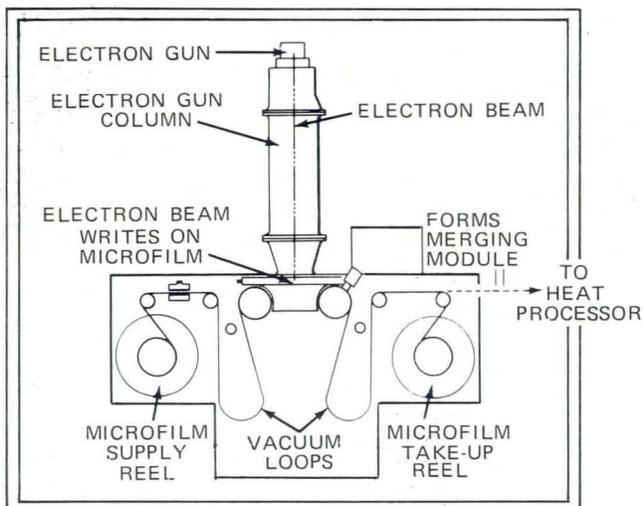


Fig. 2 Electron Beam Recording on Microfilm

### Fiber Optics

The selective illumination of a matrix of luminous fibers forms the characters in a single line of data. After being exposed, the film is slightly incremented to permit the next line of characters to be exposed onto the film. As in EBR, if a forms overlay is desired, a second lens system is employed (Fig. 3).

The above techniques are the most commonly employed in COM recording devices on the market today. CRT technologically, was the easiest to perfect. EBR requires the passing of the film into and out of a vacuum chamber, with the precise formation of individual characters with an electron beam. Naturally, this more exacting technique required more time to perfect. However, because

the film is directly exposed to the electron beam, the use of EBR permits the dry processing of the film, as opposed to the wet processing most commonly associated with microfilm. The fiber optics technique would appear to have been the simplest to perfect. Although the electronics are less complex, the exacting tolerances required for moving the film at a line increment required time to perfect. Also, if the fibers retain the image of the character as the film is advanced, a smearing effect could occur.

All three are offered on the market today. Since figures are not available to compare the reliability of these approaches in detail, care should be taken by a prospective COM recorder purchaser to talk

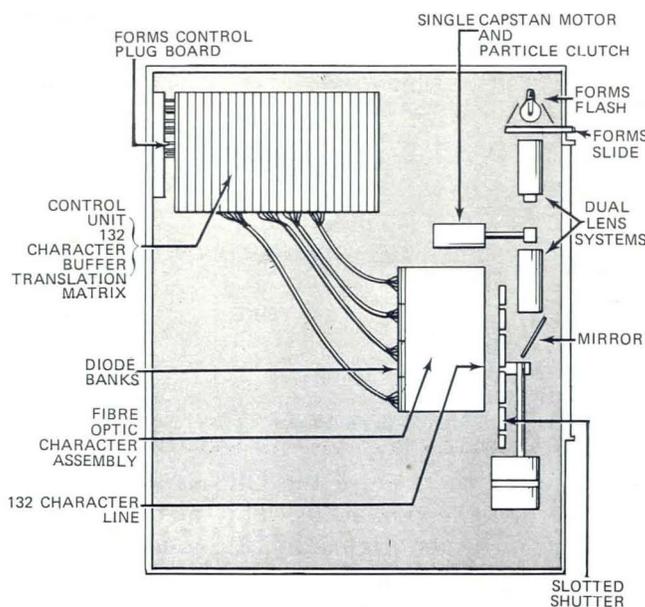
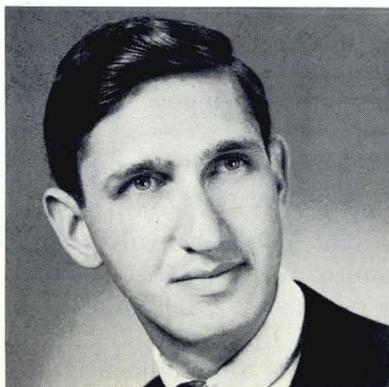


Fig. 3 Fiber Optics Recording on Microfilm



Mr. Gildenberg, currently with Bowne Time Sharing, was formerly Executive Vice President of C.O.M. Systems, Inc., a COM service bureau in N.Y.C. Prior to this, Mr. Gildenberg was Sr. Analyst in IBM's Data Processing Group.

Mr. Gildenberg has directed the design and implementation of numerous computer and com-

puter-microfilm systems. He was also responsible for the presentation of a series of seminars on the development of microfilm information systems.

Mr. Gildenberg has been a guest speaker for the Association for Systems Management, and is a member of the American Management Association.

with existing customers to ascertain what problems, do exist with the implementation of any of these techniques in a particular COM device.

### CHARACTER GENERATION

The major methods used to generate characters in COM devices are stenciling, stroke generation, or dot generation.

#### Stenciling

A stenciled wafer, approximately the size of a quarter, is enclosed in the neck of the CRT (Fig. 4). To form a character, the electron beam in the CRT is directed to the appropriate point (character) on the wafer. The proper placement of the

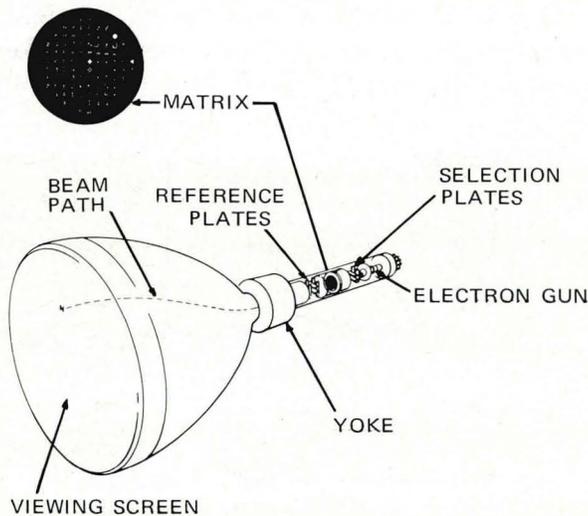


Fig. 4 Use of a Stencil-Type Wafer

character on the face of the CRT is achieved by the use of deflection fields. This method, called Charactron by its originators, Stromberg-Carlson, has worked well for many years. The character set is, however, limited to the number of characters etched in the stenciled wafer.

#### Stroke Generation

In this method, the characters are literally "stroked" onto the face of the CRT by an electron beam. Stroke generation requires more electronics than either the Charactron or the dot generation methods. The additional electronics are required to shape and place the page of characters on the face of the CRT, or onto the film directly. A major advantage is the ability to introduce additional characters and character sets by merely changing or adding circuitry to redirect the electron beam. The quality of the characters, in general, also tends to be better.

### DOT GENERATION

In dot generation the selective activation of dots in a matrix forms the individual characters. Unlike the stroke generation of characters, the electron beam is always directed at discreet points on the face of the CRT. Therefore, electronics tend to be simpler, with a general reduction in cost. A disadvantage is the difficulty some manufacturers have in achieving as high a quality character as can be achieved by the Charactron or stroke generation methods.

Dot generated characters are also used in COM recorders utilizing fiber optics. In these devices the characters are formed by the selective activation of a matrix of luminous fibers. By eliminating CRT electronics, cost, once again, can be reduced.

### FORMS OVERLAYS

Many reports and documents require the use of certain page formats. Company logos, headings, column designators and tabulations are sometimes required in displaying data on a page.

The most commonly used method of forms generation in COM recorders employs film or glass slides. In a less commonly used method the form is drawn by the electron beam according to specification encoded in a program stored in the COM computer, or in the data tape. This method is used by COM recorders with "graphic" capabilities.

#### Film Slides

Film slides have the advantages of being inexpensive and easy to prepare. Disadvantages are the adjustments required for proper forms placement and handling degradation of the slide.

#### Glass Slides

Advantages in using glass slides for forms overlay are ease of forms placement and good resolution, while disadvantages are the cost and time involved in glass slide preparation.

#### Programmed Merge

Programmed merging has the advantages of ease of placement and excellent resolution; disadvantages are a reduction in thruput rate when forms are complex, and the need for programming lines and text, and to digitize logos.

#### Overlay Exposure

Three methods are used to superimpose the form onto the page of data. The first involves the use of a semireflective mirror (Fig. 1). As the data is reflected from the face of the CRT onto the film, a bulb is flashed behind the form slide. Its image, along with the data, is simultaneously exposed onto the film. The second overlay method involves

the use of a second lens system to place the form onto the film on which the data has already been placed (Figs. 2 and 3). The third involves the tracing of the form directly on the face of the CRT around the image of the data.

### CHOOSING A COM SYSTEM

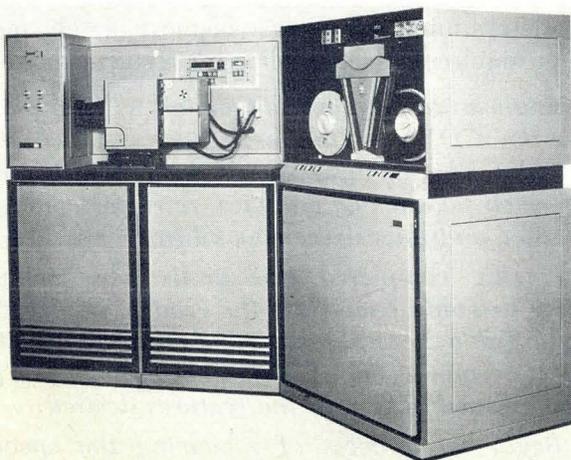
Most COM systems offer a variety of features and options. Some of these may be important for particular applications. However, options on the recorder are obtained only by additional cash outlay. Therefore, a thoughtful preliminary study of immediate and short-range COM applications is warranted before choosing a COM system. This type of analysis will lead to a decision in choosing a system with sufficient options for growth, but without those options for which there will be little, if any, need.

#### Graphics Capability

For most companies, the likelihood of placing graphics onto microfilm via COM are months, if not years, away. If this is the case, why insist on getting a COM with graphic capability? As an alternative, if 98% of the COM recording will be alphanumeric, why not use a service bureau to produce the 2% of the work that will be graphic? This is not meant to imply that no one should purchase a COM system with graphic capability. The importance of the presence or absence of graphic capability should be considered in light of the job mix to be placed on COM.

#### Character Quality

The quality of the characters (and graphs) will vary dramatically from one COM to another. When considering various COM recorders, insist on seeing a complete set of characters and samples of graphics. Study them carefully. Don't forget

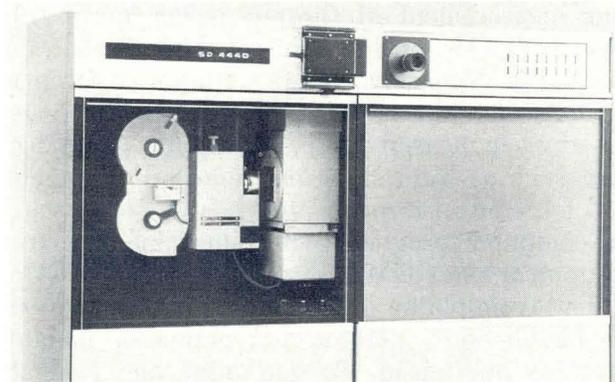


UCC-Graphic Systems Division Model 300-3 microfilm printer/plotter with companion tape drive.

that operators and other personnel may be looking at these characters eight hours a day, five days a week. Saving a few hundred dollars in rental is never sufficient reason to have unhappy personnel, some of whom may unintentionally, or otherwise, begin to undermine your plans for placing further applications onto microfilm.

#### Servicing

No feature, or savings in rental, can give sufficient reason to sacrifice the speedy servicing of the COM recorder. This point cannot be over-emphasized. A COM recorder in New York City, with parts and servicemen readily available only on the West Coast, is useless. If possible, talk with other customers using the recorder you are considering to determine the quality of servicing by the manufacturer.



The Datagraphix 4440 Micromation Printer shown with the F230 Universal camera exposed.

#### On- vs. Off-line

Few questions are generating as much discussion as the advantages and disadvantages of having the COM recorder attached to the computer directly (on-line), or away from the computer, using a magnetic tape or disk as the recorder's input (off-line).

Basically, some of the advantages of each are as follows.

##### On-line

- Many times the thruput over the fastest line printers.
- The job is run from input through final output as one operation.
- Less expensive, generally, than off-line COM.
- No special programming changes required. To the computer, the on-line COM recorder is just like any other output device.

##### Off-line

- Information can leave the computer at tape speed, which can be significantly faster than on-line COM operation.

- If the job must be rerun for any reason (poor developing of the film, operator error in loading proper form slide, etc.), no additional computer time need be used.
- COM recorder can be physically located away from the computer room. Since all on-line COM recorders currently require wet-film processing, this may be of some significance in determining which operations staff will perform the microfilm processing.
- Wider selection of options. On-line COM recorders generally have fewer options in font size, image rotation, etc. than do off-line COM recorders.

### Thruput

One of the fundamental measurements of thruput is lines/minute or pages/minute. However, the true measurement of thruput is not necessarily directly proportional to either of these. Rather, the manual problems involved in setting up a job may far outweigh the advantages of a slightly faster speed when measured in pages/minute. Many factors, such as form slide insertion and alignment, and job control through plug board, punch card, or computer program, will determine the true thruput of the COM system. Also, when a COM system is simple for an operator to set up and use, the likelihood of operator intervention, or operator error, is minimized. To determine and evaluate this type of factor, attempt to see a demonstration of the COM in operation—not for one job, but a series of varied jobs.

### Input Operations

Naturally, on-line and off-line defines the major option for input for a COM. For off-line devices, however, a number of other considerations are important to recognize and evaluate. One of the more important is the bpi options for the COM. Why get a recorder unable to read 1600 bpi magnetic tapes if that is the primary output media from your computer? Also, if you are currently using "print-image" tapes for a number of computer applications, the ability of the COM to accept this type of tape format is a factor in making your choice. It should be understood, however, that the use of a print-image tape has two major disadvantages when used on a COM system. First, the thruput of the COM is generally poorer than that of a tape specifically formatted for the COM recorder. Second, many of the retrieval codes, so valuable in designing an effective microfilm system, are unavailable if a print-image tape is used as input.

### Orientation

Comic rotation (0 degrees) is similar to the manner in which comic strip pictures are oriented. Cine rotation (90 degrees) is similar to the manner in which the images on motion picture film are oriented. The advantages of cine or comic rotation lie in the ability to pack more images (frames) onto each roll of microfilm. Comic rotation can be effectively utilized when the page of information is narrower than normal, but with a normal depth. Cine rotation is used when the page of information is  $\frac{1}{3}$  to  $\frac{1}{2}$  the normal depth of a computer size page, but of normal width. By advantageously using cine and comic rotation, some COM recorders provide the ability of packing up to three times the number of frames on a roll of microfilm.

### Character Sets

The number of characters, sizes of fonts, italics, and lower case letters are some of the variations in character sets offered by COM manufacturers. However, it should not be assumed that, because two COM systems appear to have the same capabilities on paper, the output from both will appear identical when viewed on a microfilm reader.

### Oversize Pages

Applications exist where more than 132 characters per line, and more than 64 lines per page would be desirable. Some COM recorders can provide this type of capability. Examination of the potential COM applications will determine the importance of this feature.

### Summary

Many differences exist between the various COM systems on the market today. Table 1 attempts to summarize some of the features of these devices. In determining which system most closely meets your requirements, the following is suggested.

- *Analyze the applications which will be placed on the COM for the next twelve to eighteen months. This analysis should focus on the need for such features as graphics, retrieval code generation, and lower case capability.*
- *Having completed this preliminary analysis, refer to Table 1, and use the reader inquiry card (and Table 2) to obtain manufacturers' literature for determining which recorders provide the particular combination of the features desired.*
- *Begin the process of reviewing the specifics of each COM system, including output quality, reliability and serviceability, and, finally, price.*

# KEY-EDIT

(The Incredible Reducing Machine)

VS.

# 23 MILLION PUNCH CARDS



London Life, one of the world's largest and most progressive insurance companies, had a massive data preparation problem: they were using about 23 million key-punch cards a year, and the outlook was for a continuing increase in years to come. The company had to reduce its data preparation problems. So they called on "The Incredible Reducing Machine" — KEY-EDIT.

A 16 Keyboard KEY-EDIT system was installed in London Life's Computer Operations Centre in April, 1970.

Since then, London Life has found that KEY-EDIT is, indeed, "The Incredible Reducing Machine". Automatic Bank Cheque changes, health claims cheques, and other ordinary transactions are now transcribed directly on to magnetic tape by KEY-EDIT and then fed into London Life's IBM 360 for processing. By reducing usage of punched cards, KEY-EDIT has also reduced London Life's key-stroke errors, need for verification, personnel overtime, job turn-around time, elapsed time and scheduling problems, and floor space requirements.

Today, London Life has 32 KEY-EDIT stations in operation.



Expect more from  
**CONSOLIDATED COMPUTER**  
makers of the famous Key-Edit

BOSTON  
235 Wyman Street  
Waltham, Massachusetts, 02154  
617-891-0210

TORONTO, CANADA  
48 Yonge Street  
Toronto, Ontario  
416-366-7643

LONDON, ENGLAND  
Northdale House  
North Circular Road  
London N.W. 10, England

Chicago Cleveland Detroit Los Angeles New York Philadelphia San Francisco Washington, D.C. Ottawa Montreal

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS**

COMPANY	Alpha-Vector	Beta Instruments/Recognition Equipment*		Burroughs
<b>MODEL</b>	AV-2000, -3000	Beta Com 400, 500	Beta Com 600, 700	BCOM
<b>IMAGE PARAMETERS</b>				
Characters per Basic Set	96	64	128	64-96
Character Sizes	2	1	3	3
Max. Characters per Line	144	132	264	135
Max. Lines per Page	76	64	218	108
Character Generation	Stroke	Dot	Dot	Stroke
Fonts	Regular; OCR-A, -B	Regular	Regular; Bold; Italics; Other (opt)	Regular; Bold
Types	Upper/Lower Case	Upper Case	Upper/Lower Case	Upper/Lower Case
Orientation	0°; 90°; 180°	0°; 270°	0°; 270°; other	90°
Retrieval Codes	Image Count; Miracode; A Vector Code	Image Count	Image Count; Miracode	Image Count
Forms Overlay	Optical; Glass Etched; Film Cart.	Optical; Glass Etched; Film Slide	Optical & Prog. Merge; Glass Etched; Film Slide	Optical; Glass Etched
Overlays on Line	20 (cart.)	1	1-Optical	—
Film Size	16mm; 105mm (opt \$5,000)	16, 35mm (Com 400, 500); 70, 105mm (Com 500)	16, 35mm (Com 600, 700); 70, 105mm (Com 700)	16, 105mm
Min. Line Width	.0005 inches	—	.002 inches (CRT)	—
Addressable Points	576x304	—	4,096x4,096	945x960
Resolvable Elements	131,328	—	1,024	—
Density Levels	1 (adjust.)	—	4	∞
<b>PLOTTING RATES</b>	—	—	100K pt/sec; 500 v/sec Incremental; Sweep (opt)	—
<b>ON-LINE OPERATION</b>				
Interfaces with	(AV-2000 only) IBM 360/25 & up; RCA Spectra 70; other	—	—	Under Development
Max. Transfer Rate (char/sec)	500K	—	—	—
Thru-Put Rate (132 char/line & 64 lines/page)	91,200 lines/min; 1,200 pp/min	—	—	—
<b>OFF-LINE OPERATION</b>				
Max. Transfer Rate (char/sec)	(AV-3000 only) 120K	36K	36K	96K
Thru-Put Rate (132 char/line & 64 lines/page)	26,550 lines/min; 350 pp/min	11,390 lines/min; 178 pp/min	18,000 lines/min; 295 pp/min	28,800 lines/min; 360 pp/min
<b>INPUTS</b>				
Magnetic Tape	(AV-3000 only) 556/800/1,600 bpi (opt \$7,500)	556/800 bpi (std)	556/800 bpi (std)	200/556/800 bpi (opt)
Print Image Tapes	Accepts	Accepts	Accepts	—
Other	Paper Tape (opt)	1,600 bpi Input	TTY (std); 1,600 bpi (opt)	—
<b>IMAGE MONITOR</b>	Projected Image	—	—	Polaroid Camera
<b>ON-LINE FILM PROCESSING</b>	Dry (opt \$5,000)	—	—	—
<b>INTERNAL CONTROLLER</b>				
Type	(AV-2000 only) —	—	DEC PDP-8/L	—
Memory	12K @ 12 bits	—	4 to 8K @ 12 bits	—
Disk Storage	—	—	32 to 128K (opt \$13,500)	—
<b>SOFTWARE</b>	std (AV-3000)	Std (Com 500)	std	Opt-Burroughs; IBM 360-1403
<b>COMPATIBILITY</b>	SD 4360, 4440 (AV-3000)	SD 4360, 4440; 3M "F"	SD Printer; Plotters; Kodak KOM-90; 3M "F"	—
<b>ANCILLARY EQUIPMENT</b>	—	Film Processor & Duplicator	Film Processor & Duplicator	Film Processor & Duplicator
<b>PRICE</b>				
Purchase	\$45,750 (AV-3000) \$49,750 (AV-2000)	\$68,000 (Com 400) \$94,000 (Com 500)	\$130,000 (Com 600); \$150,000 (Com 700)	\$85,000
Lease	\$1,000/mo (AV-2000)	\$2,015/mo (Com 400) \$2,740/mo (Com 500)	\$3,715/mo (Com 600); \$4,370/mo (Com 700)	Use-Time Rate
<b>OTHER FEATURES</b>	Under/Overlining; Line Annotation	*Marketed by REI	Under/Overlining; Sub/Superscripts; Proportional Spacing	—

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS . . . . . Cont'd**

COMPANY	California Computer Products		Canon	Computer Micro-Image Systems	
MODEL	Cal Comp 835	Cal Comp 1670	J-COM 202	CMS-5000	CMS-7000
<b>IMAGE PARAMETERS</b>					
Characters per Basic Set	—	96	192	64	64
Character Sizes	∞	∞	—	1	3
Max Characters per Line	136	144	132	145	255
Max. Lines per Page	66	66	64	80	128
Character Generation	Dot	Stroke; Dot	Flying Spot	Stroke	Stroke
Fonts	Regular; Bold; Italics; Other	Regular; Bold; Italics; Other	Regular; Japanese; Chinese	Regular	Regular; Bold; Italics; Japanese
Types	Upper/Lower Case	Upper/Lower Case	Upper/Lower Case	Upper/Lower Case	Upper/Lower Case
Orientation	0°; 45°; 90°; 180°; 270°; 315°	0°; 45°; 90°; 180°; 270°; 315°	0°	0°; 90°	0°; 90°
Retrieval Codes	Image Count; Codeline	Image Count; Codeline; Miracode	Image Count	Image Count; Codeline	Image Count; Codeline; Miracode; Eyeball
Forms Overlay	Prog. Merge	Optical & Prog. Merge; Glass Etched; Film Slide	Optical; Film Slide	Optical; Film Slide	Optical; Film Slide
Overlays on Line	—	16	—	1	8
Film Size	16, 35mm	16, 35, 105mm	16mm	16, 105mm	16, 35, 105mm; Tab Card
Min. Line Width	—	.0008 inches	0.5mm	—	—
Addressable Points	3,000x4,000	16,384x16,384	—	145x80	—
Resolvable Elements	3,000x4,000	4,096x4,096	—	1,400x1,400	2,000x2,000
Density Levels	32	32	—	1	16
<b>PLOTTING RATES</b>	100K pt/sec	500K pt/sec	—	—	—
<b>ON-LINE OPERATION</b>					
Interfaces with	—	—	IBM 729/2400	IBM 360/25 & up	IBM 360/25 & up
Max. Transfer Rate (char/sec)	500K	500K	25K	500K	300K
Thru-Put Rate (132 char/line & 64 lines/page)	1,200 lines/min; 18 pp/min	15,000 lines/min; 235 pp/min	9,300 lines/min; 145 pp/min	15,000 lines/min; 240 pp/min	50,000 lines/min; 900 pp/min
<b>OFF-LINE OPERATION</b>					
Max. Transfer Rate (char/sec)	60K	60K	—	60K	240K
Thru-Put Rate (132 char/line & 64 lines/page)	1,200 lines/min; 18 pp/min	12,000 lines/min; 192 pp/min	—	15,000 lines/min; 240 pp/min	50,000 lines/min; 900 pp/min
<b>INPUTS</b>					
Magnetic Tape	200/556/800 bpi (opt)	1,600 bpi (std)	566/800 bpi (opt)	800/1,600 bpi (std)	200/556/800/1,600 bpi (opt)
Print Image Tapes	Accepts	Accepts	—	Accepts	Accepts
Other	—	Paper Tape; TTY; Card (opt)	—	—	—
<b>IMAGE MONITOR</b>	CRT	CRT	Projected Image	Projected Image	CRT
<b>ON-LINE FILM PROCESSING</b>	—	—	Wet (std)	Wet (opt \$10,000)	—
<b>INTERNAL CONTROLLER</b>					
Type	Cal Comp 900	Cal Comp 900	Canon	CMS	CMS
Memory	4 to 32K @ 9 bits	8 to 32K @ 9 bits	840	4K @ 8 bits	8K @ 8 bits
Disk Storage	7.25M (opt)	7.25M (opt)	—	—	—
<b>SOFTWARE</b>	std	std	opt	—	—
<b>COMPATIBILITY</b>	—	—	—	—	—
<b>ANCILLARY EQUIPMENT</b>	—	—	Film Duplicator	Film Duplicator	Film Processor
<b>PRICE</b>					
Purchase	—	—	\$100,000	\$49,000	\$125,000
Lease	—	—	—	—	—
<b>OTHER FEATURES</b>	Under/Overlining Sub/Superscripts	Under/Overlining Sub/Superscripts	—	—	Underlining

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS ..... Cont'd**

COMPANY	Eastman-Kodak	Information International	3M	Memorex
<b>MODEL</b>	KOM-90	FR-80	Series F	1603
<b>IMAGE PARAMETERS</b>				
Characters per Basic Set	64-121	128	60	64
Character Sizes	2	64	4	1
Max. Characters per Line	132	500	136	132
Max. Lines per Page	64	300	64	64
Character Generation	Stroke	Stroke	Stroke	Dot
Fonts	Regular; Bold; Italics; Bold-Italics	Regular; Bold; Italics	Regular; Bold; Japanese	Dot Matrix
Types	Upper/Lower Case	Upper/Lower Case	Upper/Lower Case	Upper Case
Orientation	0°; 90°; 180°; 270°	0°; 45°; 90°; 180°; 270°; 315°	0°	0°
Retrieval Codes	Image Count; Codeline; Miracode; Eyeball	Image Count; Codeline; Miracode	Image Count	Image Count; Codeline
Forms Overlay	Optical & Prog. Merge; Film Plate	Prog. Merge	Optical; Film Clip; Loop; Reel	Optical
Overlays on Line	1	16	30 random*	1
Film Size	16mm	16, 35, 105mm	16mm	16mm
Min. Line Width	—	.00025 inches	7.5 microns	—
Addressable Points	—	16,384x16,384	—	—
Resolvable Elements	—	4096	—	—
Density Levels	10	8	2	—
<b>PLOTTING RATES</b>	—	90K pt/sec; 3,400 v/sec; stroke	—	—
<b>ON-LINE OPERATION</b>				
Interfaces with	—	IBM 360	—	IBM 360/25 & up; 370
Max. Transfer Rate (char/sec)	—	100K	—	500K
Thru-Put Rate (132 char/line & 64 lines/page)	—	3,600 lines/min; 194 pp/min	—	10,000 lines/min; 145 pp/min
<b>OFF-LINE OPERATION</b>				
Max. Transfer Rate (char/sec)	120K	60K	60K	—
Thru-Put Rate (132 char/line & 64 lines/page)	19,200 lines/min; 300 pp/min	3,600 lines/min; 194 pp/min	18,300 lines/min; 255 pp/min	—
<b>INPUTS</b>				
Magnetic Tape	200/556/800/1,600 bpi (opt \$21000)	800/1,600 bpi (std)	200/556/800/1,600 bpi (opt)	—
Print Image Tapes	—	Accepts	Accepts	—
Other	—	ASR-33 (std)	—	—
<b>IMAGE MONITOR</b>	Projected Image; CRT	CRT	Projected Image	—
<b>ON-LINE FILM PROCESSING</b>	—	—	Dry (std)	—
<b>INTERNAL CONTROLLER</b>				
Type	—	DEC PDP-15	—	—
Memory	—	4 to 32K @ 18 bits	—	—
Disk Storage	—	256K (opt \$1,200/mo)	—	—
<b>SOFTWARE</b>	std-IBM 360; RCA Spectra 70	std	opt-IBM 360; GE 400 & 600	—
<b>COMPATIBILITY</b>	—	—	—	—
<b>ANCILLARY EQUIPMENT</b>	Film Processor & Duplicator	—	—	Film Processor & Duplicator
<b>PRICE</b>				
Purchase	\$89,000	\$225,000	\$86,600	\$44,250
Lease	\$2,200/mo	\$7,500/mo	\$3,000/mo	\$895/mo
<b>OTHER FEATURES</b>	Under/Overlining; Overprinting	Under/Overlining Sub/Superscripts	*1,600 sequential	—

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS . . . . . Cont'd**

COMPANY	Peripheral Technology		Quantor	Scan Graphics
<b>MODEL</b>	PTI-1300	PTI-2600	100	Graphi COM
<b>IMAGE PARAMETERS</b>				
Characters per Basic Set	64	64	64	128
Character Sizes	1	1	1	8
Max. Characters per Line	143	143	136	—
Max. Lines per Page	86	86	64	—
Character Generation	Dot	Dot	Dot	Stroke; Dot
Fonts	Gothic Sanserif; Bold	Gothic Sanserif; Bold	OCR-B	Regular; Bold; Italics; Other
Types	Upper/Lower Case	Upper/Lower Case	Upper Case	Upper/Lower Case
Orientation	0°; 90°	0°; 90°	0°; 90°	0°; 45°; 90°; 180°; 270°; 315°
Retrieval Codes	Image Count; Codeline; Miracode	Image Count; Codeline; Miracode	Image Count	Image Count; Codeline; Miracode
Forms Overlay	Optical; Film Slide	Optical; Film Slide	Optical; Litho Plate	Optical & Prog. Merge; Glass Etched
Overlays on Line	1	—	1	1
Film Size	16, 105mm	16, 105mm	16mm	16, 35, 70, 105mm
Min. Line Width	—	—	—	.0006 inches
Addressable Points	—	—	—	4,000x4,000
Resolvable Elements	—	—	—	16,000x16,000
Density Levels	—	—	1	8
<b>PLOTTING RATES</b>	—	—	—	50K pt/sec
<b>ON-LINE OPERATION</b>				
Interfaces with	—	IBM 360 & 370	—	—
Max. Transfer Rate (char/sec)	—	70K	—	100K
Thru-Put Rate (132 char/line & 64 lines/page)	—	27,000 lines/min; 350 pp/min	—	342 pp/min
<b>OFF-LINE OPERATION</b>				
Max. Transfer Rate (char/sec)	30K	60K	19.2K	96K
Thru-Put Rate (132 char/line & 64 lines/page)	13,000 lines/min; 180 pp/min	26,000 lines/min; 300 pp/min	325 pp/min	342 pp/min
<b>INPUTS</b>				
Magnetic Tape	556/800 bpi (std)	556/800/1,600 bpi (opt \$325/mo)	800 bpi (std)	556/800/1,600 bpi (std)
Print Image Tapes	Accepts	Accepts	Accepts	Accepts
Other	Card Reader (opt)	—	—	TTY (std)
<b>IMAGE MONITOR</b>	CRT	—	Projected Image	CRT
<b>ON-LINE FILM PROCESSING</b>	—	—	Wet (opt \$250/mo)	—
<b>INTERNAL CONTROLLER</b>				
Type	—	—	—	DEC PDP-15
Memory	—	—	—	8K @ 18 bits
Disk Storage	—	—	—	opt
<b>SOFTWARE</b>	opt-IBM 360	opt-IBM 360	std	opt
<b>COMPATIBILITY</b>	SD 4360, 4440	SD 4360, 4440	SD 4360, 4440	—
<b>ANCILLARY EQUIPMENT</b>	—	—	Film Duplicator	—
<b>PRICE</b>				
Purchase	\$49,000	\$46,950	\$49,950	\$215,000
Lease	\$1,650/mo	\$1,450/mo	\$1,750/mo	\$6,200/mo
<b>OTHER FEATURES</b>	—	—	—	—

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS ..... Cont'd**

COMPANY	Seaco Computer Display	Singer-Micrographic	Stromberg Datagraphix		
MODEL	401	MS-5000, -6000	4020	4060	4200
IMAGE PARAMETERS					
Characters per Basic Set	73	64	64	119	64
Character Sizes	—	—	1	4	1
Max. Characters per Line	140	—	128	171	132
Max. Lines per Page	80	—	64	76	64
Character Generation	Stroke	Stroke	Charactron	Charactron	Charactron
Fonts	Bold	—	Sanserif	Regular; Sanserif	Sanserif
Types	Upper Case	—	Upper Case	Upper/Lower Case	Upper Case
Orientation	0°; 90°	0°; 90°	0°; 90°; 270°	0°; 90°; 270°	0°; 90°; 270°
Retrieval Codes	Image Count; Codeline; Miracode	Miracode	FMA	SRM	SRM
Forms Overlay	Optical; Glass Etched; Film Slide	Optical; Prog. Merge; Film Slide	Optical; Glass Etched	Optical; Glass Etched	Optical; Glass Etched
Overlays on Line	—	64	1	1	1
Film Size	16, 35, 70, 105mm 3.25 inches	16, 35, 105mm	16, 35mm	16, 35mm	16, 35, 105mm
Min. Line Width	—	—	2 raster units	16 raster units	—
Addressable Points	—	16,384x12,288	1,024x1,024	4,096x3,072	—
Resolvable Elements	—	12x10 <sup>6</sup>	324	—	—
Density Levels	—	8	16	2	1
PLOTTING RATES	—	100K pt/sec	3000 v/sec; Sweep	60K pt/sec; Sweep	—
ON-LINE OPERATION					
Interfaces with	—	—	IBM 7090	IBM 360	IBM 360/25 & up
Max. Transfer Rate (char/sec)	—	100K	17.5K	250K	60K
Thru-Put Rate (132 char/line & 64 lines/page)	16,000 lines/min; 250 pp/min	9,000 lines/min; 110 pp/min	8,000 lines/min; 125 pp/min	10,000 lines/min; 156 pp/min	15,000 lines/min; 233 pp/min
OFF-LINE OPERATION					
Max. Transfer Rate (char/sec)	36K	120K	90K	60K	—
Thru-Put Rate (132 char/line & 64 lines/page)	15,360 lines/min; 240 pp/min	9,000 lines/min; 110 pp/min	7,000 lines/min; 110 pp/min	10,000 lines/min; 156 pp/min	—
INPUTS					
Magnetic Tape	556/800/1,600 bpi (std)	200/556/800 bpi (opt)	200/556/800 bpi (std)	556/800/1,600 bpi (std)	—
Print Image Tapes	Accepts	—	Accepts	Accepts	—
Other	Paper Tape (opt)	—	—	ASR 33 (std); Card & Paper T. (opt)	—
IMAGE MONITOR	—	CRT	—	—	Projected Image
ON-LINE FILM PROCESSING	—	—	—	Wet (opt \$790/mo)	—
INTERNAL CONTROLLER		(MS-6000 only)			
Type	—	—	—	HON DDP-516	—
Memory	—	4 to 64K	—	8K @ 16 bits	—
Disk Storage	—	—	—	—	—
SOFTWARE	opt	std	std	std	std
COMPATIBILITY	—	—	—	—	Memorex 1603
ANCILLARY EQUIPMENT	Film Processor & Duplicator	Microfilm OCR	Film Processor & Duplicator	Film Processor & Duplicator	Film Processor & Duplicator
PRICE					
Purchase	\$39,850	\$135,000 (MS-5000)	\$80,000	\$275,000	\$49,000
Lease	—	\$4,400/mo (MS-5000)	\$5,575/mo	\$6,920/mo	\$1,589/mo
OTHER FEATURES	—	—	—	Super/Subscript; 57 Special Symbols	—

**TABLE 1 • COMPUTER OUTPUT MICROFILM SYSTEMS . . . . . Cont'd**

COMPANY	Stromberg DatagraphiX (cont'd)		University Computing-Graphic Systems Division		
MODEL	4360	4440	300-1	300-2	300-3
<b>IMAGE PARAMETERS</b>					
Characters per Basic Set	64-76	128	62	62	62
Character Sizes	1	1	—	—	—
Max. Characters per Line	132	132	132	132	132
Max. Lines per Page	64	76	79	79	79
Character Generation	Charactron	Charactron	Dot	Dot	Dot
Fonts	Sanserif	Sanserif	—	—	—
Types	Upper Case	Upper/Lower Case	Upper Case	Upper Case	Upper Case
Orientation	0°; 90°; 270°	0°; 90°; 270°	0°; 90°	0°; 90°	0°; 90°
Retrieval Codes	SRM	Image Count; Codeline; Miracode; SRM	Image Count; Codeline; Miracode	Image Count; Codeline; Miracode	Image Count; Codeline; Miracode
Forms Overlay	Optical; Glass Etched	Optical; Glass Etched	Optical; Film Slides	Optical; Film Slides	Optical; Film Slides
Overlays on Line	1	1	—	—	—
Film Size	16, 35, 105mm	16, 35, 105mm	16, 35, 70 105mm; 3.25 inches	16, 35, 70, 105mm; 3.25 inches	16, 35, 70, 105mm; 3.25 inches
Min. Line Width	—	—	.0015 inches	.0015 inches	.0015 inches
Addressable Points	—	—	—	—	1,024x1,024
Resolvable Elements	—	—	—	—	1,024x1,024
Density Levels	—	1	—	—	1
<b>PLOTTING RATES</b>	—	—	—	—	50K pt/sec
<b>ON-LINE OPERATION</b>					
Interfaces with	—	IBM 360/30 & up	—	—	—
Max. Transfer Rate (char/sec)	—	120K	—	—	—
Thru-Put Rate (132 char/line & 64 lines/page)	—	30,000 lines/min; 468 pp/min	—	—	—
<b>OFF-LINE OPERATION</b>					
Max. Transfer Rate (char/sec)	60K	120K	18K	36K	36K
Thru-Put Rate (132 char/line & 64 lines/page)	10,000 lines/min; 156 pp/min	30,000 lines/min; 468 pp/min	6,000 lines/min; 90 pp/min	12,000 lines/min; 180 pp/min	12,000 lines/min; 180 pp/min
<b>INPUTS</b>					
Magnetic Tape	556/800/1,600 bpi (std)	556/800/1,600 bpi (std)	556/800/1,600 bpi (std)	556/800/1,600 bpi (std)	556/800/1,600 bpi (std)
Print Image Tapes	Accepts	Accepts	Accepts	Accepts	Accepts
Other	—	—	—	—	—
<b>IMAGE MONITOR</b>	Projected Image	Polaroid Camera	—	—	—
<b>ON LINE FILM PROCESSING</b>	—	—	—	—	—
<b>INTERNAL CONTROLLER</b>					
Type	—	—	—	—	—
Memory	—	—	—	—	—
Disk Storage	—	—	—	—	—
<b>SOFTWARE</b>	std	std	std	std	std
<b>COMPATIBILITY</b>	—	—	SD 4440, 4360, 4020	SD 4440, 4360, 4020	SD 4440, 4360, 4020
<b>ANCILLARY EQUIPMENT</b>	Film Processor & Duplicator	Film Processor & Duplicator	Film Processor & Duplicator	Film Processor & Duplicator	Film Processor & Duplicator
<b>PRICE</b>					
Purchase	\$78,000	\$102,500	\$85,000	\$115,000	\$139,000
Lease	\$1,925/mo	\$3,120/mo	\$2,540/mo	\$3,175/mo	\$4,560/mo
<b>OTHER FEATURES</b>	—	—	On-Line Hard Copy Output (opt \$19,375)	On-Line Hard Copy Output (opt \$19,375)	On-Line Hard Copy Output (opt \$19,375)

**TABLE 2 • REFERENCE LITERATURE**

For additional information on the **COM Systems** covered in Table 1, circle on the Reader Service Card the appropriate number listed below.

Company	Reader Service Card Number
Alpha-Vector, New York, N.Y. ....	200
Beta Instruments/Recognition Equipment, Dallas, Texas .....	201
Burroughs, Detroit, Mich. ....	202
California Computer Products, Anaheim, Cal. ...	203
Canon, Queens, N.Y. ....	204
Computer Micro-Image Systems, Chatsworth, Cal. 205	
Eastman-Kodak, Rochester, N.Y. ....	206
Information International, Los Angeles, Cal. ....	207
3M, St. Paul, Minn. ....	208
Memorex, Santa Clara, Cal. ....	209
Peripheral Technology, Sunnyvale, Cal. ....	210
Quantor, Cupertino, Cal. ....	211
Scan Graphics, Stamford, Conn. ....	212
Seaco Computer Display, Garland, Texas ....	213
Singer-Micrographic Systems, Sunnyvale, Cal. ...	214
Stromberg DatagraphiX, San Diego, Cal. ....	215
University Computing — Graphic Systems, Van Nuys, Cal. ....	216

**TABLE 3 • REFERENCE LITERATURE**

Most COM installations employ equipment to provide multiple film copies of the microfilm output for additional storage or distribution. For information on **Microfilm Roll Duplicators**, circle the appropriate number on the Reader Service Card.

Company	Reader Service Card Number
Beta Instrument/Recognition Equipment, Dallas, Texas .....	217
Burroughs, Detroit, Mich. ....	218
Canon, Queens, N.Y. ....	219
Oscar S. Carlson Co., Chicago, Ill. ....	220
CBS Laboratories, Stamford, Conn. ....	221
Computer Micro-Image Systems, Chatsworth, Cal. 222	
Eastman-Kodak, Rochester, N.Y. ....	223
B. K. Elliott, Pittsburgh, Pa. ....	224
Extek Microsystems, Van Nuys, Cal. ....	225
GAF, New York, N.Y. ....	226
Itek Business Products, Rochester, N.Y. ....	227
Memorex, Santa Clara, Cal. ....	228
Quantor, Cupertino, Cal. ....	229
Seaco Computer Display, Garland, Texas ....	230
Stromberg DatagraphiX, San Diego, Cal. ....	231
Tecifax-Scott, Holyoke, Mass. ....	232
Teledyne-Post, Chicago, Ill. ....	233
University Computing — Graphic Systems, Van Nuys, Cal. ....	234

**COM GLOSSARY**

Most of the terms listed in this glossary were taken from a first draft of COM definitions, supplied by the National Microfilm Association (NMA). MODERN DATA has deleted NMA terms that would be known to EDP personnel, and has revised or added others that are considered to be of value to this same audience. Suggestions for changes or additions to this COM Glossary would be welcomed by the NMA or MODERN DATA for possible inclusion in future editions.

**ACUITY:** The sharpness of a microfilm image.

**ADDRESSABILITY:** The number of addressable positions, within a specified image, as follows: Addressable Horizontal Positions x Addressable Vertical Positions.

**ADDRESSABLE HORIZONTAL POSITIONS:** The number of positions, within a specified image, at which a full length vertical line can be placed.

**ADDRESSABLE VERTICAL POSITIONS:** The number of positions, within a specified image, at which a full length horizontal line can be placed.

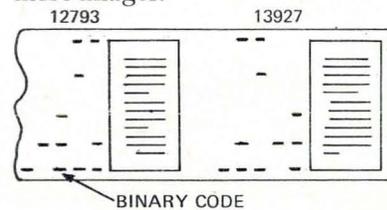
**ALPHANUMERIC (ALPHAMERIC):** Pertaining to a character set that contains letters, numerals, and other characters.

**APERTURE CARD:** A tab size card with a rectangular hole(s) designed to hold frame(s) of microfilm.

**AUTOMATIC CODING:** Index methods that are machine readable (i.e., digital or bit code).

**BINARY DIGITAL CODE:** An optical pattern of clear and

opaque rectangles, machine coded for random access retrieval, used to index one or more images.



**BLACK LINE:** When referring to CRT COM, polarity of the image should be specified. Black line is considered to be positive, and produced by the CRT utilizing standard development procedures.

**BLIP:** See Document Mark.

**BLOWBACK:** The enlargement of micro-images to readable form. Blowback ratios are expressed in diameters of magnification (a 20 X image would be magnified 20 diameters).

## COM GLOSSARY . . . . . Cont'd

**BOLD OR BOLDFACE:** Characters that have been printed to look darker than other characters.

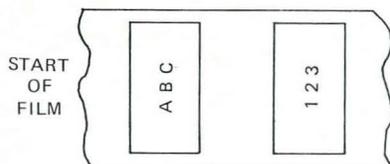
**CHARACTER:** One of a set of elements which may be arranged in ordered groups to express information. Each character has two forms: (1) Human-readable, graphic alphanumeric; (2) Machine readable, coded alphanumerics.

**CHARACTER GENERATOR:** The electronic portion of a device (such as COM) which converts electrical signals to visible characters. (See also Character; Dot Matrix; Monoscope; Stroke Generator.)

**CHARACTER TRANSFER RATE:** The rate at which characters are transferred from one place to another (e.g., magnetic tape to computer, computer to microfilm, etc).

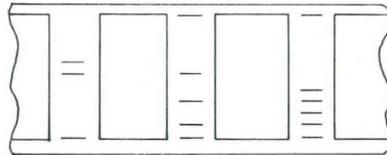
**CHARACTRON:** Registered name for a type of CRT containing a matrix (disk with alphanumeric and symbolic characters etched in it) placed in the electron gun of the tube; each character is stenciled onto the face of the tube after being formed at the matrix.

**CINE (MOTION PICTURE 90°) ORIENTATION:** Images recorded onto film in a vertical manner, one over the other.



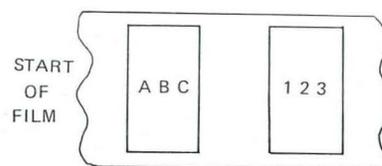
**CODE AREA:** Part of the recording area reserved for retrieval coding.

**CODE LINE:** A visual index technique where an optical pattern of clear and opaque bars, parallel with the long edge of the microfilm and located between the image areas, are used in retrieval.



**COM:** (1) Computer Output Microfilm – Microfilm containing data produced by computer generated signals. (2) Computer Output Microfilmer – A recorder which converts computer data into readable language and records it onto microfilm. (3) Computer Output Microfilming – Method of converting computer data into readable language onto microfilm.

**COMIC STRIP (0°) ORIENTATION:** Images recorded onto film in a horizontal manner, one next to the other.



**COMPUTER ANIMATION:** Movies produced by COMs onto microfilm.

**COMPUTER GRAPHICS:** Drawings, patterns, and graphs produced by a computer on paper, microfilm, or CRT screen.

**CONTROL CHARACTER:** A character whose occurrence in a particular context initiates, modifies, or stops a control operation.

**CONVENTIONAL PROCESSING:** For silver halide films, conventional processing denotes a sequence of development, fix, wash, and dry. For diazo films, alkaline processing; for vesicular film, heat processing.

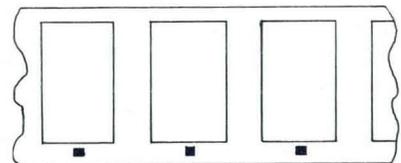
**DACOMATIC:** A registered family of films used in the microfilming of images displayed by CRTs.

**DATA FILM:** 16mm microfilm that has been produced by a COM.

**DIAZO FILM:** Copy film used to duplicate original microfilm, requiring ultraviolet light for exposure and ammonia for development.

**DIRECT IMAGE FILM:** A type of film which produces a negative from a negative and a positive from a positive without the need for reversal processing.

**DOCUMENT MARK (BLIP):** An optical mark, usually rectangular and below the image, used for counting images or frames automatically.



**DOT MATRIX (GENERATOR):** A method of generating characters utilizing a matrix of dots, each of which may be independently turned on or off, and the combination thereof producing an eye-readable character.

**EBR:** (1) Electron Beam Recorder – A type of COM designed to generate images, via an electron beam, directly onto

## COM GLOSSARY ..... Cont'd

**EBR microfilm.** (2) Electron Beam Recording — a COM method which directs a beam of electrons onto the energy-sensitive surface of EBR film.

**EBR FILM:** Microfilm sensitive to electron beam energy and used in EBR.

**EDITING SYMBOLS:** Alphanumeric and geometric symbols on microfilm which are readable with the unaided eye and are used to provide cutting, loading, and other preparation instructions.

**EFFECTIVE REDUCTION:** A measure of the number of times an imaginary document would have been reduced to equal the size of the COM generated microimage, expressed as 24X, 30X, etc. (See also Reduction).

**FILM FRAME:** See Frame.

**FILM-REVERSAL PROCESSING:** See Reversal Processing.

**FILM MEASURE INDEXING:** A method of image location using a film footage index (i.e., odometer).

**FLASH CARD:** A microfilm retrieval technique used to label film with eye-readable characters so that cut, splice, or duplicating operations may be carried out without the aid of a viewer.

**FLASH INDEX:** A target used to facilitate visual indexing of film.

**FONT:** A family of compatible assortment of characters of given size and style.

**FORMS FLASH (FORMS OVERLAY):** A method by which document formats are su-

perimposed on a frame of COM data. The forms overlay is accomplished either by an optical flash technique, where a film or glass slide is flashed onto the microfilm, or by programmed merge, where software generated formats are used.

**FRAME (FILM FRAME; PAGE):** See Code Area; Image Area; Recording Area.

**GENERATION:** A measure of the remoteness of the copy from the original material. First generation film (copy) would be the COM recorded microfilm; copies of first generation film are termed second generation, and copies of second generation are termed third generation, etc.

**GEOMETRIC DISTORTION:** The positional inaccuracies of information over the entire recording area.

**GRAPHIC:** Of, or pertaining to, data in the form of pictorial communications (drawings, charts, plots, schematics, etc.).

**IMAGE AREA:** Part of recording area reserved for image.

**IMAGE CONTROL:** A microfilm retrieval technique where pages are counted from the beginning of a film cartridge via the optical sensing of marks placed at the base of each image.

**IMAGE MARK RETRIEVAL CODE:** A document mark (blip) associated with an image used to count and locate images automatically.

**IMAGE REVERSING FILM:** A film that will reverse the polarity and tonal scale of the previous generation film or mate-

rial (i.e., whites from blacks, blacks from whites, negatives from positives, and positives from negatives).

**ITALICS:** A slanted character font.

**JACKETS:** Transparent envelopes used to simulate microfiche formatting.

**KALVAR FILM:** Registered name of a type of copy film used to duplicate original microfilm, requiring ultraviolet light for exposure and heat for development.

**KEYSTONING:** Distortion that occurs when the lens used in photographing the CRT is off axis and the image so formed is larger on one side than the other.

**KODAMATIC:** Registered name for a version of codeline film coding.

**LIGHT OR LIGHTFACE:** Normal character intensity as opposed to bold or boldface.

**MICROFICHE:** A unit record of film containing microfilm images recorded in rows or columns.

**MICROFONT:** An upper case font designed by the NMA for microfilm applications.

**MIRACODE:** Registered acronym (Microfilm Information Retrieval Access Code) for a binary digital coding technique utilizing up to 15-, 14-bar, code columns. (See also Binary Digital Code.)

**MONOSCOPE:** A special-purpose CRT used to generate video signals for a display CRT. The Monoscope contains char-

## COM GLOSSARY . . . . . Cont'd

acter shapes which have been etched into a stencil-like plate. An electron beam scans a specified character on the plate and generates scan voltages; these signals are applied to a display CRT, causing the electron beam in the display to follow the same scan patterns as the Monoscope.

**MOTION PICTURE ORIENTATION:** See Cine Orientation.

**NEGATIVE APPEARING IMAGE:** A photographic image with light lines, characters, and neutral tones on a dark background.

**OPTICAL AXIS:** The center axis of a lens.

**OPTICAL CENTER:** A reference location (point) on the film about which the image area is centered with respect to length and width.

**PAGE (FRAME):** See Code Area; Image Area; Recording Area.

**POLARITY:** The tonal relationship of an image, with respect to the original, that is either positive or negative.

**POSITIVE APPEARING IMAGE:** A photographic image with dark lines, characters, and neutral tones on a light background.

**POSITIVE FILM:** Film having the same polarity as the original.

**PULL-DOWN:** The distance film is advanced after each exposure.

**RECORDING AREA:** The maximum useful area containing all the recorded information, including the image and retrieval codes.

**REDUCTION:** An index of the size of the microfilm image as it relates to the original or blown-back image. Reduction is referenced as an X number (20X denotes an image reduced 20 diameters).

**REDUCTION RATIO:** The ratio of reduction units to one (20:1 reduction ratio is equivalent to 20X).

**REPEATABILITY:** The accuracy with which a system may be made to record successively in the same geometric location within a frame.

**RESOLVABLE HORIZONTAL LINES:** The maximum number of visually distinguishable horizontal lines which can be recorded within a specified image.

**RESOLVABLE LINE PITCH:** The ratio of the number of resolvable lines to the image dimension (in mm) perpendicular to the resolvable lines, and equal to lines per mm.

**RESOLVABLE VERTICAL LINES:** The maximum number of visually distinguishable vertical lines which can be recorded within a specified image.

**RETRIEVAL CODING:** Indexing methods for manual or automatic retrieval of images. (See also Binary Digital Code; Codeline; Document Mark; Image Mark Retrieval Code; Kodamatic; Miracode.)

**REVERSAL PROCESSING:** A microfilm processing technique by which the polarity of the microfilm image is reversed as compared with conventional processing (See also Polarity; Direct Image Film).

**ROMAN:** The non-italic, regular vertical form of a character.

**ROTATED IMAGE:** See Cine Orientation.

**SANS-SERIF:** A typeface or character set with no serifs.

**SERIF:** The short line, cross-bar or embellishment stemming from or at an angle to the upper and lower ends of a character.

**SILVER FILM:** Film utilizing light-sensitive silver halide salts which are normally processed by wet solutions.

**STROKE:** A straight line or arc used as a segment of a graphic character.

**STROKE GENERATOR:** A method of generating characters using short strokes in a manner similar to that used in ordinary handwriting.

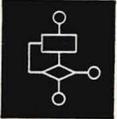
**TEXTURE CHARACTERS:** Graphic characters having a standard shape that may be joined together to produce bar charts or plots.

**VECTOR GENERATOR:** A method of generating graphical information using direction and line length.

**VESICULAR FILM:** Film sensitive to ultraviolet light and developed by heat (See also Kalvar Film; Xidex HD Film).

**WHITE LINE:** Dark film with information carried as white clear lines. Reversal processed COM film is white line.

**XIDEX HD FILM:** Type of copy film used to duplicate original microfilm, requiring ultraviolet light for exposure and heat for development.



## HOW TO INVEST IN SMALL COMPANIES or, "What the World Looks Like From Where I Stand"

*A proposal for the development of a Federal Agency Review Commission for Enterprises (FARCE).*

Before I expose you to the real truths of today, I must establish a few generally-accepted premises. (Just so there won't be any misunderstandings later).

1. People (contrary to popular rumor, this does include investment bankers) invest money in companies in the hope of getting back more than they invested.
2. Some companies offer more potential return than others.
3. Somewhere in the world (probably Zurich), there is a man that has always picked the right companies to invest in, and therefore is very rich.
4. Money is good and its possession is not harmful.
5. Some people (here investment bankers must be excluded) have money and personal satisfaction.
6. We are living in a high technology world today.
7. Your brother-in-law always makes better investments than you.

Most small companies are sold to investors today on the basis of their people or their people's dream. It is very hard to distinguish between them. This is because if you were sold on their plant or their production or their actual after taxes profit, you would be buying IBM or UCC stock.

Since Xerox, IBM, T.I., and EGG were once small companies with a dream or a new product idea, it is logical to conclude that history will repeat itself. Therefore, an investment in the right small company today should yield huge profits tomorrow.

Several theories exist on how to select "the right company." The most common, or at least the most popular, theories are:

1. Invest in any company that wants to do something you don't know anything about. They are obviously smarter than you and, therefore, are right. (I call this the "Lemming Approach.")
2. Hedge your bet by putting a little money in several similar companies. The odds are that one of them will hit and pay for all your losses. (This one labeled the "Newton Spiral" — it keeps getting smaller and smaller but never reaches the center.)

3. Play the odds by investing in any company that has a contemporary name. Since everyone else is getting rich, how can you miss? And after all, have you ever met a poor stockbroker? (This is similar to the Lemming Approach but different enough for its own name: "The Camp Follower.")

4. Read the *New York Times* and the *Wall Street Journal*, and invest in any company that is just slightly mentioned after page four. Other journals can be used, but they will just take up more of your time. (I call this the "Sherlock Holmes Method.")

5. Read the "Who Is In The News" section of several newspapers and invest in any company that has people listed (directors, engineers, salesmen, janitors, etc.). The really sophisticated investor keeps a score card of how many times he can find one man's name. (This is the "Second Coming of the Messiah Method.")

6. Look at cash flow projections and buy stock in the company that has the highest profits in the shortest time, or the company that has the greatest sales rise curve. (I call this "Doing Xerox One Better.")

There are some other less-used, exotic methods that involve investigating market potentials, related experiences of founders, product feasibility, present competition (there usually isn't any), and future capital requirements. These methods usually just take up a lot of time and cause you to miss the really good ones. The rear-visioned non-investors that use these more exotic techniques can be grouped into a new class that just appeared last November. They are called the "I told you so" sages of Wall Street. The less said about them the better.



When Mr. Peddie first submitted this article, he described himself as "the president of a small company that is developing a technique to convert environmental contaminants (smog, trash, detergents) into either a fried chicken franchise or an electronic computer." Actually, **John G. Peddie** is president of Data Graphics Corp., a very real company that manufactures data transfer systems for time-sharing terminals. Mr. Peddie has been involved with various data reduction and acquisition systems since 1962, and is the author of several published articles. He attended Penn State University and Drexel Institute of Technology, and is a member of the IEEE and AMA.

I propose a new technique that will revolutionize the entire small issue, small company buying rules. It involves a drastic departure from the old tried and true methods. No doubt there will be those who disagree with me, but I am prepared for that. After all, it is rumored that some people still don't believe in the Wharton Model.

The system I propose is obvious once some well-published, but uncollected, facts are listed.

1. There is a finite amount of capital available in the world. This statement takes into consideration Euro-dollars and Chamber of Commerce "multiple hands" theories.
2. There is an infinite amount of imagination available in the world, and it is universally acknowledged that most of it is in the U.S., concentrated on our East and West coasts. (Evidence of Nature's Plan to keep everything in balance).
3. Market fluctuations are not a necessary evil and can be avoided by an enlightened administration and firm laws against inflation.
4. It is political suicide to suggest population controls on people or new companies.
5. Most of the really good companies never get the support they need and are usually misunderstood (a sequel to this article is being planned on this topic).

With these facts collated and presented for the first time together, I am sure you will agree with my proposed solution, which I call the Nixionian Theory.

Under the Nixionian Theory, the government immediately would set up a new department to be headed by a cabinet level secretary. It should be designated the Federal Agency Review Commission for Enterprises (FARCE). This agency will register and license all "sophisticated investors" along with their capital resources. (Substantiation of resources will not be necessary as it would be a violation of privacy and human rights.) All entrepreneurs or potential entrepreneurs will also be registered by this agency. A separate study group will be established to evaluate the recommendation of setting an age limit of 32 years old or younger. Extensive advertisements will be run by the government to apprise citizen entrepreneurs of their obligation to register by February 1 at their local post office.

On the first Tuesday of every month, the regional

FARCE agency heads will conduct a lottery based on age, physical condition, and graduate school status to determine who will be selected as "Entrepreneurs of the Month." A special board will hear appeals.

On the first Wednesday of each month, a national committee will conduct a lottery (in Washington or Palm Springs) to select the "Investors of the Month." Because of the obvious desirability of being an investor rather than an entrepreneur, no appeals board is envisioned. However, entrepreneurs will be prohibited from being investors during the same time.

Entrepreneurs whose last four numbers of their social security number are the same as, or an even multiple of, the first four numbers of the selected investors may contact those investors. The investors will then buy stock in those companies that belong to the entrepreneurs. If for any reason an investor feels the price of the stock is too low, he may call in one of the FARCE arbitrators.

Any investor may be an "Investor of the Month" more than one time, but not two months in a row. Since there are more entrepreneurs than investors, an entrepreneur may only be "Entrepreneur of the Month" once. (No going back to the well.)

This new system will remove all the inequities from investing and alleviate the following problems.

1. Stockholders' resentment due to missed projections. (No projections will be given.)
2. Founders' resentment due to lack of additional capital just when the company was going to make it. (Since you can only be "Entrepreneur of the Month" once, no follow-on capital can be promised, hence no broken promises.)
3. In-law fighting. Although your brother-in-law may be luckier than you ("Investor of the Month" every other month), he can never prove he is smarter.
4. Harassment by neo-Calvinistic "I told you so" sages of Wall Street.
5. Alcoholism in young, hot-shot stockbrokers.

In order to get the lethargic wheels of government moving on this program, I encourage all of you to write your local congressman and send me your names in petition. Once I can convince the federal government that the lives of few entrepreneurs are important to the masses, I am sure they will move. ▲



## NEW PRODUCTS

### TIME DIVISION MULTIPLEXER

A time division multiplexer featuring built-in status and test panels has been introduced by Infotron Systems. The Timeline 220 multiplexer enables data to be transmitted simultaneously from multiple, low-speed terminals over a single, leased telephone line. Capacities of 56/110 baud; 43/135 baud; 38/150 baud; or 19/300 baud channels permit the user to buy only the configuration he needs with the option of adding channels as he updates his requirements. The 220 system has speed-mixing capability and can operate either as a character multiplexer, a bit-interleaved multiplexer, or both, simultaneously. The 220's built-in diagnostic panel is designed to permit the user to pinpoint quickly the source of a problem in any part of the total communications network. The panel contains appropriate test jacks, switches, indicator lights, and meters to permit close examination of data sets and telephone lines as well as the 220 multiplexer itself. Prices for the Timeline 220 begin at \$4860 (four channels). *Infotron Systems Corporation, Pennsauken, N.J.*

Circle No. 338 on Inquiry Card.

### CARTRIDGE TRANSPORT FOR PDP-11

The TP-1351 provides mass storage capabilities of up to 256K words and has the ability to simulate a four-track disk by means of a programmable track select option. The cartridge transport comes completely assembled and may be installed within the PDP-11 cabinet. A Uni-bus jumper provides for power and signal interconnections between the TP-1351 and the computer. *Tennecomp Systems, Oak Ridge, Tenn.*

Circle No. 286 on Inquiry Card.

### MACHINE CONTROL SYSTEM

The Ex-Cell-O Multi-Machine Control System can be linked to any N/C machine tool that is prepared to accept computer interface control. Basic units of the system are a MAC-16 minicomputer, a Bryant memory drum, and a teleprinter I/O device. The basic system can control 16 machines, is expandable, and can be adapted to control transfer lines. The Multi-Machine Control System is compatible with present N/C tapes and accepts data in either EIA or ASCII codes. *Ex-Cell-O Corp., Detroit, Mich.*

Circle No. 314 on Inquiry Card.

### DOCUMENT READER

A document reader which combines the functions of optical mark reading and optical character reading and accepts various sized documents is available from ICL. The reading functions can be performed either separately or simultaneously. Designed to provide original-document input, and eliminate error-prone intermediate steps, the reader enables users to increase both handling speed and accuracy on either turnaround or open-ended data processing systems. Principal advantage to the systems designer is that forms can be structured to suit the people who fill them out, thus cutting down costly and time-consuming stages of data preparation. The unit reads characters printed in the ECMA "B" font. Characters can be printed by high-speed line printers, typewriters, encoders, or embossed plates. The optical mark reader can identify marks made by hand, embossed plates, output printers, or letterpress machines in specified positions on a document, and will also identify holes punched in cards. *ICL, New York, New York*

Circle No. 285 on Inquiry Card.

### COMPUTER PROCESSING SYSTEM

The ASC 1100 Computer Processing System is designed specifically for improving input/output efficiency in data center volume peripheral operations. The ASC 1100 features a powerful micro-programmed computer processor together with a complement of reliable high-speed peripheral devices, including multiple high-speed line printers, IBM-compatible magnetic tape units, and optional card readers, for implementation in computing center input/output operations. The system permits independent processing of high-volume Output Printing operations at rates up to 2000 lpm and optionally provides for Tape-to-Tape file updating functions or Card-to-Tape input editing and processing. The ASC 1100 processor incorporates MSI monolithic integrated circuitry and features both high speed read-only storage for dedicated system control functions, and magnetic core memory for data buffering or programming. A wide complement of supporting system software is available, including: input/output utility routines, data conversion programs, diagnostic routines, cross assembly programs, and the symbolic programming language. Optional configurations permit addition of data communications adapters for on-line data transfer to central computer systems at rates up to 9600 baud over Bell Telephone facilities or of 50 KB for direct channel interconnections. *Applied Systems, Detroit, Mich.*

Circle No. 297 on Inquiry Card.

### COMPUTER MEDIA DATA SAFE

The Data Safe is designed to protect computer media from damage due to heat and humidity. The safe bears the UL Four Hour Label, awarded after withstanding four hours of 2,000°F heat. The interior of the safe may be changed to accommodate various configurations of magnetic tape or disk arrangements. *Diebold Inc., Canton, Ohio*

Circle No. 295 on Inquiry Card.

## EMBOSSSED CARD READER

The reader is designed for use by terminal manufacturers in a variety of systems which will accept standard plastic embossed credit cards. The unit reads all 18 characters on a credit card simultaneously by means of sensors which convert the depressions on the back of card to a seven-bit binary code. The displacement of a magnetized pin is sensed for transmission over telephone lines to a central computer. In a second version, the displaced pin reads data onto magnetic tape contained on a cassette for later processing. The reading device is being marketed to credit terminal and cash register manufacturers, and major credit card distributors at a price of \$99 per unit. *Athena Systems, Bedford, Mass.*

Circle No. 294 on Inquiry Card.

## MAGNETIC READER/WRITER

The General Electric Magnetic Reader/Writer is designed to encode and read data on plastic credit cards or paper tickets which have been prepared with magnetic recording areas. Available in two models, designated the MWA001 and MWA002, the devices feature read/write rates of 4620 and 9240 bpi respectively. The units are priced at \$2425 in quantity orders, including control electronics. *General Electric Co., Information Devices Dept., Oklahoma City, Okla.*

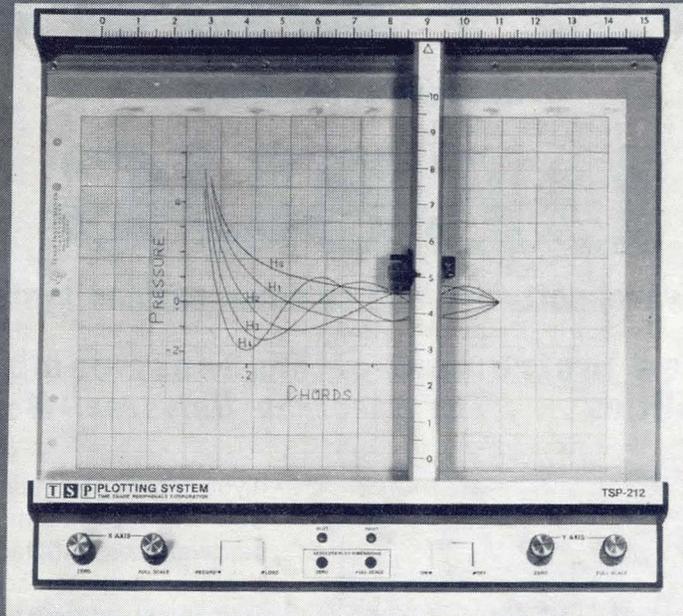
Circle No. 321 on Inquiry Card.

## DATA LOGGER

The Model 220 Data Logger digitizes four channels of analog data (0-199 mv), and records the data on eight level punch paper tape in ASCII code along with elapsed times from start of run. Variable scan rates from 1-10 minutes are provided. The Model 220 comes complete with paper tape punch, variable scan rate, panel meter, and elapsed time generator (up to 39 days) for a price of \$4950. *Digital Products Corp., Ft. Lauderdale, Fla.*

Circle No. 298 on Inquiry Card.

# GO AHEAD, THROW 'EM A GOOD, FAST CURVE—With The TSP-212 Plotting System



When you need high-speed, time-share plotting at low cost for:

- Engineering
- Education
- Science
- Business and Finance
- Numerical Control
- Or Any Application Where Graphics May Be Utilized —

— get the TSP-212. The TSP-212 Plotting System reduces initial cost and operating cost, and draws excellent conclusions in minutes from columns of digital data that could otherwise take many tedious hours to interpret. It interfaces with IBM 2741's and most Teletype terminals, and is readily compatible with almost all systems. The TSP-212 comes with sub-routines in FORTRAN, BASIC, APL, and PL1 that include curve smoothing, alpha-numerics, and symbols. You can now have big performance and service back-up in a system that is reasonably priced: \$3,300.00 complete with sub-routines; lease terms available. Come on, ask us for Bulletin 00-000.

**P.S.** Welcome aboard to another TSP representative: NOAKES ENGINEERING, 1006 N. Britain Road, Box 968, Irving, Texas 75060

**T S P** CORP.

**TIME SHARE PERIPHERALS CORPORATION**  
Box 361, Wilton, Connecticut 06897 (203) 762-3348



**NEW TIME-SAVING DATA COMMUNICATIONS TOOL:**

# DESIGN

Hardware

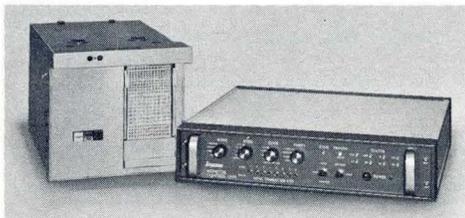
# DEVELOP

Hardware, software

# DEBUG

**Hardware, software and communications systems**

**One new instrument offers these combined capabilities . . . *The Spectron Universal Monitor***



If you produce, install or service data communications hardware or software, our Universal Monitor could be your most helpful tool. It will save time and help you

increase accuracy, regardless of your particular area of interest.

The Universal Monitor offers these advantages because it provides a character-by-character hard copy record of everything that is sent and received over the data link. Which means it not only points out errors in hardware, software or lines, but also enables you to determine precisely what is causing these errors, and why. So less time is spent tracing problems, and higher accuracy is far easier to come by.

The Universal Monitor is the only transmission test set that can be conveniently operated on-line. As an aid to field service technicians, for example, you'll find it a dramatic improvement over present trial-and-error methods of trouble-shooting.

Other features include the ability to: accommodate all line coordination systems; monitor any code and speed up to 7200 bps; work with synchronous or start-stop transmissions; and operate full- or half-duplex. That's the Universal Monitor from Spectron. We made it do more, so you'd have to do less. Write or call (609) 667-5700 for information or demonstration.

**SPECTRON**  
CORPORATION

1060 Kings Highway North  
Cherry Hill, New Jersey 08034

Please send technical bulletin on Universal Monitor.

Please arrange Universal Monitor demonstration at my convenience.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_ Telephone \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

## NEW PRODUCTS



**COAXIAL REEL MAG TAPE RECORDER**

Borg-Warner Controls' Acculog 2460 coaxial magnetic instrumentation recorder is said to be less than one-fourth the volume of competitive models. The recorders offer six speeds and 10-½ inch reels. They are available in bandwidths of 500 Hz to 1 MHz direct and dc to 40 kHz FM at 60 ips, and sell in the range of \$9000 to \$23,000. *Borg-Warner Controls, Santa Ana, Cal.*

Circle No. 318 on Inquiry Card.

## MINICOMPUTER MACHINE CONTROLS

The controller is designed to operate complex metal-cutting tools, groups of simpler machine tools, and other manufacturing processes requiring accurate position or velocity control. The controller comprises a small processor-computer, operator controls, and electronic and electromechanical hardware that links the computer to a machine. Modularity is achieved in the hardware design by using a single input bus and a single output bus (common connection wires) between the computer and various system components. Additional devices can be connected to the buses at any time. The controller's software is divided into five program segments: input, code conversion, storage, calculation, and machine service. Through this segmentation only one-fifth of a program has to be serviced at a time, instead of rewriting an entire program just to correct or modify only one portion of it. *Xenex Corp., Waltham, Mass.*

Circle No. 347 on Inquiry Card.

## ALL-MONOLITHIC COMPUTER

The IBM System/370 Model 145 uses silicon memory chips, rather than magnetic cores, to store its data and instructions. Monolithic circuitry also is used throughout the 145's central processor to perform all of the system's arithmetic and logic functions. The Model 145's internal operating speed is up to five times faster than that of the System/360 Model 40, and up to 11 times faster than the Model 30's. Users have a choice of six main storage capacities, from 112,000 to 512,000 characters. The ability to run programs written for earlier IBM computers, including the 1400 Series and 7010, is provided at no additional charge. Users can also run Disk Operating System programs under control of the more powerful Operating System with-



out reprogramming. The Model 145's efficiency is enhanced by a reloadable section of monolithic memory that augments the main memory, called Reloadable Control Storage (RCS). The code for the basic System/370 instruction set is stored in the RCS. Users will be supplied with a prewritten disk cartridge containing all needed instructions, as well as those for selected optional functions. Monthly rental for typical configurations of the 145 will range from about \$14,950 to \$37,330 with purchase prices ranging from about \$705,775 to \$1,783,000. Initial customer shipments will be scheduled for late next summer. *IBM, White Plains, N.Y.*

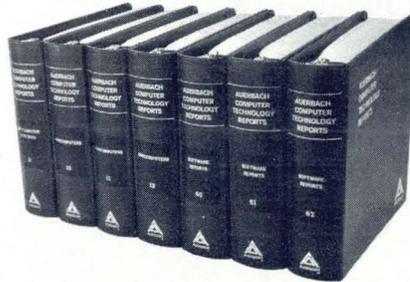
Circle No. 308 of Inquiry Card.

*Buying hardware... software?*

# You need all the help you can get!

*AUERBACH Computer Technology Reports* are the *only* services that cover the entire EDP field in both *depth* and *breadth*. AUERBACH reports are the fastest, easiest way to get the information you need to make accurate evaluations and avoid costly mistakes. Complete facts and figures—even those often neglected troublesome details that can stall a critical decision—are compiled in a standardized format that saves weeks of agonizing research.

Thousands of computer "pros" rely on AUERBACH Reports to cut through the morass of conflicting literature and provide the information they need. Put AUERBACH's large full-time staff of EDP analysts and editors to work for you... *now*.



## Take advantage of this special trial offer.

The coupon below is your opportunity to try *AUERBACH Reports* for *one whole month, for only \$25*. Examine the valuable, time-saving features that put all the facts you need at your fingertips.

- **Tutorial Reports** on the state-of-the-art
- **Comparison Charts** listing equipment characteristics
- **Price Information** includes rental and service fees
- **Bench Mark Studies** relate cost to performance
- **Frequent Updates** keep you current on new developments
- **Attractive**, durable looseleaf binders are easy to use

## For authoritative answers to all EDP questions...



**AUERBACH Info, Inc.** 121 North Broad St., Phila., Pa. 19107

I am interested in the subjects checked and would like complete details on your \$25 thirty-day trial offer.

<input type="checkbox"/> Communications Equipment	<input type="checkbox"/> Time Sharing	Name _____ (Please Print)
<input type="checkbox"/> Digital Computer Systems	<input type="checkbox"/> Display & Plotters	Title _____
<input type="checkbox"/> Software	<input type="checkbox"/> Foreign Computers	Company _____
<input type="checkbox"/> Data Sets	<input type="checkbox"/> Minicomputers	Address _____
<input type="checkbox"/> OCR Equipment	<input type="checkbox"/> COM Equipment	City _____
		State _____ Zip _____
		Telephone _____

Affiliated with AUERBACH Associates, Inc.,  
Consultants in the Management and Information Sciences

# CANON INTRODUCES HIGH-SPEED C.O.M.M.M.M.M.M.



The new Canon Roll Duplicator 800 produces ready-for-use microfilm duplicates at the astonishing rate of 85 feet per minute. Without tying up an expensive Computer-Output-Microfilm system for simple film duplication.

Using thermal film that's sensitive only to ultra-violet light, and is developed solely by heat, the desk-top (17x22x33") Roll Duplicator 800 never needs darkrooms, water, chemicals or gas. Or special wiring, either. It operates on regular 117 V AC current.

In about 7 minutes, you can duplicate a 660-foot roll of 16mm or 35mm microfilm. Or make dozens of copies from an

endless-loop original up to five feet long. A tone control, incorporating a pre-exposure unit, duplicates exactly the original line- or continuous-tone images, while Gallium mercury arc lamps provide low cost, efficient light for perfect exposure.

From start to finish, the entire process is virtually automatic.

C.O.M. is one of the great breakthroughs in computer technology. Don't get bogged down trying to copy it.

## Canon

For more information, write:  
Micrographics  
Canon U.S.A., Inc.  
64-10 Queens Boulevard  
Woodside, N.Y. 11377.

## NEW PRODUCTS

### COMMUNICATIONS CONCENTRATOR

GE's DigiNet 1600 concentrator combines stored program capability with the functions of multiplexers and modems. The 1600 has a core memory of 4 to 32K, 16 bit words and can address up to 256 lines. Modularity allows up to 60, 300 baud, line terminations including modems to be mounted in the same cabinet with the CPU and memory. The DigiNet 1600 is designed to interface with all modes of voice-grade transmission and is easily expandable. It can be configured to include expandable memory, high and low speed channels, buffering, polling and selecting terminals, code and speed conversion, party lines, usage accounting, and format and control character generation. *GE Telecommunications Dept., Lynchburg, Va.*

Circle No. 310 on Inquiry Card.

### CRT DATA SYSTEM

Designed for data entry and retrieval to and from data bases and computer systems, System IV/70— itself a computer— is an all MOS/LSI system. System IV/70 comprises a CPU, up to 96K bytes of semiconductor memory, and up to 32 keyboards and CRT terminals. Peripherals include a line printer, card punch and reader, disk, IBM-compatible magnetic tape, and paper tape. System IV/70 has the computing power of an IBM 360/30. A combination of 16 \$980 terminals and a 6K CPU would result in a per-terminal price of \$1450. A complete 32-terminal system with a 24K CPU, disk drive, communications interface, and printer would cost \$1950 per terminal. Foreground video-display control packages include a 2848/2260 simulator package, terminal communications software compatible with IBM OS/DOS (BTAM and QTAM), a disk operating system with sort routines, and basic operational software. *Four-Phase Syst., Cupertino, Cal.*

Circle No. 333 on Inquiry Card.

## COMPUTER ROOM FIRE PROTECTION

The systems are designed to detect and extinguish fires that might occur in a computer room environment. Each system utilizes high speed combustion detectors and Halon 1301 gas as an extinguishant. Halon 1301 is odorless, colorless, and electrically non-conducting, leaves no residue, and does not react with delicate electrical or mechanical equipment. Typical protection systems are designed to operate in tape storage areas, ceiling and under-floor computer room areas, and within the individual equipment cabinet of the computer processor or peripheral. *Fenwal, Ashland, Mass.*

Circle No. 288 on Inquiry Card.



## DATA ACQUISITION SYSTEM

The Model 8015 System provides for acquisition rates greater than 80,000 8-bit characters per second, using a high-speed output device. Output devices include a choice of digital magnetic tape recorders ranging in tape speeds from 10 to 150 ips, a paper tape perforator, a line printer, and a data set for remote data transmission. Input devices include a digital clock, a digital voltmeter and fixed data thumbwheel switches. The system, with a 1K buffer memory and 16 analog channels is priced at \$6,000. *Datacom, Fort Walton Beach, Fla.*

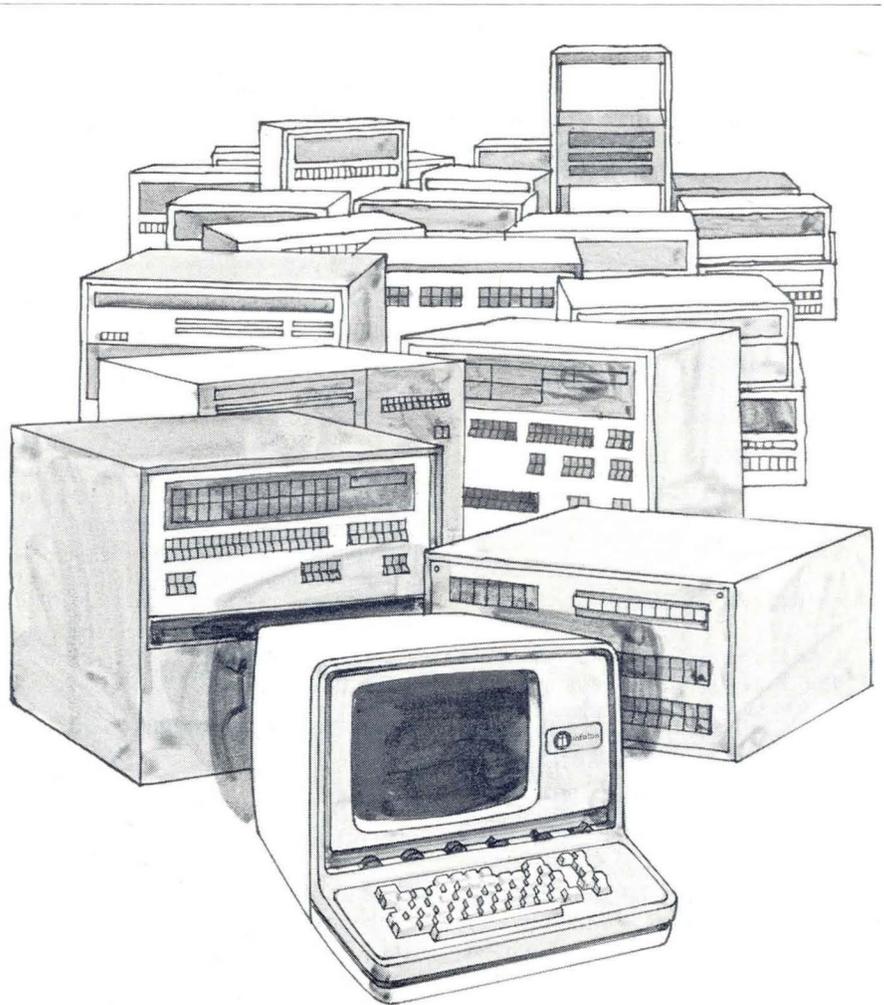
Circle No. 292 on Inquiry Card.

## COMPLETE COM SYSTEM

The Quantor 1-2-3 is a complete, self-contained, off-line COM system capable of converting mag tape computer output to microfilm cartridges in an EDP environment. The Quantor 100 COM unit comes with an integral tape drive as standard equipment, and is software supported. Microfilm development is on-line, with no on-site plumbing required. Typical throughput

rates are 325 pages/min from mag tape-to-microfilm master, and a thermal film duplicate cartridge can be produced in 3 minutes, using the 200 microfilm duplicator. The Quantor 300 cartridge viewer is the third unit in the Quantor 1-2-3 system. Prices start at \$49,950 for the 100 COM unit, \$6,950 for the 200 duplicator, and \$695 for the 300 viewer. *Quantor Corp., Cupertino, Cal.*

Circle No. 307 on Inquiry Card.



## Fussy, she ain't.

### Vista is making it big with mini-computers

Vista is a low cost/high performance alphanumeric display terminal that's fast, silent, easy to read. Far more efficient than antiquated 33/35 teletypes. And completely compatible with whatever mini-computer you're using.

Just unplug your teletype, plug in your Vista, and operate at speeds up to 4800 baud. A completely self-contained, stand alone unit, Vista comes with keyboard, video presentation of up to 80 characters per line, control and refresh electronics and power supply. Plus your choice of RS 232 or current loop interfaces with switchable baud rates from 110 to 4800. In addition, parallel interface, hard copy and tape cassette options are also available.

Vista, the total terminal, is available for immediate delivery.



Infoton Incorporated: Second Avenue, Burlington, Massachusetts 01803 (617) 272-6660

560 San Antonio Road, Palo Alto, California 94306 (415) 493-0615

15 Spinning Wheel Road, Hinsdale, Illinois 60521 (312) 325-8988

Sales and Service in United States and Canada represented by MAI



## NEW SOFTWARE AND SERVICES

### INTEGER PROGRAMMING ALGORITHM

Solutions to large pure integer programming problems are possible with a recently developed linear integer programming code based on a group theoretic approach. The code has been used to solve problems of advertising media selection, airline crew scheduling, capital investments, personnel scheduling, and CPM type problems. Computation times for problems in the 20 to 80 row by 50 to 200 variables size have varied from 0.5 to 3 minutes on an IBM 360/67. Input to the code is standard LP format and output report writers are designed to customer's specifications. The system works on a wide range of hardware configurations of 150K bytes upward and is programmed in Fortran IV. *Optimization Systems, Cambridge, Mass.*

Circle No. 358 on Inquiry Card.

### SECURITIES SERVICE

SQUARE (Stock Query and Analysis in the Rush Environment) uses an IBM 360 system to provide an interactive service with both immediate response over ordinary telephone lines and remote batch capabilities. The data base contains price, volume, earnings, and dividend information for all New York and American Stock Exchange stocks, and for selected NYSE bonds and Over-the-Counter issues. Daily reports may be obtained by specifying combinations of the data items to be printed out for the securities selected. Several standard report formats are available, including a search for securities which meet the user's screening criteria. SQUARE contains many functions for the administration and management of portfolios which can be either permanently stored, or entered from the keyboard of a remote terminal. Transactions data will be stored on file for a length of time as determined by the user. File data for an existing portfolio can be overridden to permit experimentation and testing of "paper transactions," and "paper portfolios." *Allen-Babcock Computing, N.Y.C.*

Circle No. 361 on Inquiry Card.

### PL/I COMPILER

The OS PL/I checkout compiler can be used in time-sharing as well as batch processing environments, and will run under the Operating System on the 360 and 370. The compiler provides diagnostic information during test runs, thus reducing the number of runs required before a program is ready for productive use. Features include diagnostics that pinpoint errors by statement number and print messages in full or short form, and new checking aids that allow tracing to be turned on and off as desired during execution. In conjunction with IBM's Time-Sharing Option (TSO) program, the checkout compiler allows monitoring of PL/I programs from remote terminals during development. The OS PL/I checkout compiler can be independently used to develop and run a fully debugged program. It can also be used with the output from IBM's OS PL/I optimizing compiler. The compiler requires 100,000 bytes of main storage (total for compiler and user program) and a related subroutine, the OS PL/I transient library. The compiler is available at \$340 a month; the PL/I transient library is available at \$25 a month. *IBM, White Plains, N.Y.*

Circle No. 360 on Inquiry Card.

### BROKERAGE SERVICE

Security I is a comprehensive and fast analysis/reporting service that provides brokers with the basic tools to turn back offices. It also has an advanced capability to manage and plan entire businesses. The system is designed to accommodate every back office function of a brokerage firm, including purchase and sales, stock records, confirmations, margin accounting, broker statements, commission reporting, general ledger, dividend and proxy reporting, customer statements, inventory analysis, and daily blotter. A broker can buy or lease Security I for use on his own computer, obtain the system as a service from a Honeywell DataCenter, or obtain it as part of a facility management contract. *Honeywell Information Services, Minneapolis, Minn.*

Circle No. 359 on Inquiry Card.

### BRAILLER AIDS BLIND PROGRAMMERS

A more efficient computer Braille, designed to increase the speed and efficiency of blind computer programmers, is available to any blind programmer or training facility. Called the Vertical Braille, this IBM 360 DOS program is unusual in its variety of possible input and output formats. The input to the program can be records of any length, from either tape or disk, and the output can appear in either of two different formats. Normal output is the standard 40-character Braille cell line, repeated as many times as is necessary to complete one input record translation. The optional output is the vertical or "Chinese" output, which streams the records down as many pages as are required until the lines are complete. Thus, the tabulation of printed columns is available in Braille. Among eight options available from the program are a hexadecimal dump, truncation of redundant characters, and alteration of the standard program stop to allow for short test data dumps or for extended Braille printouts. *Bradford Computer and Systems, N.Y., N.Y.*

Circle No. 351 on Inquiry Card.

### EXECUTIVE FOR MINIS

IDEX (Information Design EXecutive) is an executive program aimed at testing, research, and other applications where real-time control of equipment and apparatus is required. IDEX controls the execution of user-written program modules, allowing the user to concentrate on the job to be done, rather than on operating the computer. The user may generate his own applications language using combinations of program modules. IDEX is available for most small and medium scale computers, and in a wide spectrum of capabilities and price ranges. All versions are upward compatible from one to the next. The price for the basic IDEX is about \$500, while an advanced version including macro definitions, loops, conditional statements, index registers, and program storage on tape or disk costs under \$7000. *Information Design Inc., Lexington, Mass.*

Circle No. 357 on Inquiry Card.



## NEW LITERATURE

### MIDI-COMPUTERS

Stand-alone, mag tape and disk oriented configurations of the RC 70 midi-computer are described in a 12-page brochure. *Redcor Corp., Woodland Hills, Cal.*

Circle No. 407 on Inquiry Card.

### PRINTER/PLOTTERS

Literature and data sheets on the Matrix Series of non-impact printers and plotters are available. *Versatec, Cupertino, Cal.*

Circle No. 406 on Inquiry Card.

### SDA

Brochures outlining Series 3000 and 4000 source data collection systems are available. *Colorado Instruments, Broomfield, Colo.*

Circle No. 411 on Inquiry Card.

### CALCULATING SYSTEMS

A six page brochure describing the 700 Series of programmable calculating systems is available. The brochure describes problem solutions rather than the equipment. *Wang Labs, Tewksbury, Mass.*

Circle No. 412 on Inquiry Card.

### EDP ACCESSORIES

A 56-page data processing accessories catalog containing basic information on utilization, handling, installation and systems applications, as well as product prices and descriptions, is available. *Engineered Data Products, Ferndale, Mich.*

Circle No. 405 on Inquiry Card.

### PRINTOUT/TAB CARD FILES

A four-page, full-color brochure describes company's line of printout and tab card files. *Corry Jamestown Div., The Singer Co., Corry, Pa.*

Circle No. 435 on Inquiry Card.

### AIR CONDITIONING

This eight page booklet outlines the special problems of environmental control in the computer room and the types of packaged air conditioning equipment available to handle these problems. *RG Products, Germantown, Md.*

Circle No. 404 on Inquiry Card.

### COMPUTERIZED ECG

Designed as a basic primer on the understanding of computerized ECG interpretation, the publication outlines in non-technical language why cardiologists are looking to the computer for assistance, how computers compute, how ECG interpretations are obtained from the computer, and how they are used. *Beckman Instruments, Fullerton, Cal.*

Circle No. 402 on Inquiry Card.

### REAL-TIME SYSTEMS

The selection of real-time computer systems for production testing is described in an information packet. *Systems Engineering Labs, Ft. Lauderdale, Fla.*

Circle No. 410 on Inquiry Card.

### INQUIRY AND REPORTING SYSTEM

"Programming to Tighten Your Corporate Belt" is the title of a 16-page booklet which describes an advanced general-purpose information management system. *Sigma Data Computing Corp., Bethesda, Md.*

Circle No. 427 on Inquiry Card.

### KEY-TO-TAPE

Literature describing the features of the Libra 1, a stand-alone, key-to-tape, data entry terminal, is available. *International Data Sciences, Providence, R.I.*

Circle No. 421 on Inquiry Card.

## EDP SUPPLIES AND ACCESSORIES

Catalog describes a full range of items for mini, midi, and maxi computer systems, terminals, and numerical control applications. The items include computer room furniture, magnetic tape, disk packs, paper type and related supplies, magnetic tape cleaners and evaluators, and much more. *Original Computer Products, Inc., Wellesley Hills, Mass.*

Circle No. 417 on Inquiry Card.

### COMMUNICATIONS PROCESSOR

A 20-page brochure describes the Micro 812 Communications Processor, a dedicated, microprogrammed mini-computer. Its beginning price of \$10,890 includes a 4K X 8 core memory, 1,024 words of pre-programmed read-only storage, a communications processor option board, basic panel, and power supply. *MicroSystems, Santa Ana, Cal.*

Circle No. 433 on Inquiry Card.

### POWER SYSTEMS

AC power systems for computers, available in 40 standard ratings of from 10 to 120 KVA, are described in a 4-page product bulletin. Two basic systems are available. The continuous system, which provides uninterrupted AC power and can condition line power by stabilizing voltage and frequency; and the static switching bypass system, which has the additional ability to transfer the protected load to accommodate overloads. *Cyberex, Willoughby, Ohio*

Circle No. 425 on Inquiry Card.

### OPTICAL MARK READER BULLETIN

The use of the Motorola MDR optical mark reader (OMR) to obtain data for a computer directly at the source, eliminating the delay and costs of keyboarding, is featured in an eight-page bulletin. The bulletin stresses applications and advantages of OMR techniques, and describes the wide range of forms and data formats which can be handled by the MDR. Several MDR-based data collection systems are briefly described, and the MDR design features and options are highlighted. *Motorola Instrumentation and Control, Phoenix, Ariz.*

Circle No. 419 on Inquiry Card.

**MINICOMPUTER REPORT**

A survey report that summarizes the characteristics of 77 minicomputers from 40 different manufacturers is available from Datapro Research Corp. at a price of \$10.00 per copy. The report features comparison charts describing the data formats, processing facilities, peripheral equipment, software, pricing, and availability status of computers that can be purchased for less than \$100,000. The report also describes the general characteristics, features, and limitations of the current minicomputers and provides guidance in selecting the most suitable machine for a particular application. *Datapro Research Corp., Philadelphia, Pa.*

Circle No. 403 on Inquiry Card.

**PRINTERS**

Satellite printers and how satellite printing can save money while providing high print quality and high volume are described in a six page booklet. *Data Products, Woodland Hills, Cal.*

Circle No. 400 on Inquiry Card.

**VOICE RESPONSE SYSTEM**

A six page brochure is available which describes the CS-1400, a touch-tone input and voice response system incorporating a dedicated minicomputer. *Datatrol, Hudson, Mass.*

Circle No. 401 on Inquiry Card.

**COM PRINTERS**

A booklet dealing with off-line reproduction of COM microfilm onto page copies is available. *Xerox Business Products, Rochester, N.Y.*

Circle No. 408 on Inquiry Card.

**MICROFILM MARKETS**

A research study on the microfilm retrieval market, which treats COM automatic retrieval devices in depth, is available at a price of \$300. *Creative Strategies, Los Altos, Cal.*

Circle No. 409 on Inquiry Card.

**INDEX TO ADVERTISERS**

<b>AMERICAN TELEPHONE &amp; TELEGRAPH CO.</b> .....	26, 27
Agency: N. W. Ayer	
<b>AUERBACH INFO, INC.</b> .....	99
Agency: Arndt Preston Chapin Lamb & Keen Inc.	
<b>BERGLUND ASSOCIATES, INC.</b> .....	67
Agency: Perceptive Marketers	
<b>BRYANT COMPUTER PRODUCTS</b>	
EX-CELL-O DIV. ....	63
Agency: Campbell-Ewald Co.	
<b>THE BUNKER-RAMO CORP.</b>	
BUSINESS & INDUSTRY DIV. ....	59
Agency: James A. Ford	
<b>CANON</b> .....	100
Agency: Dentsu Corp. of America	
<b>CENTRONICS DATA COMPUTER CORP.</b> .....	Cover 4
Agency: The Strayton Corp.	
<b>COMPUTER AUTOMATION, INC.</b> .....	5
Agency: Cochrane Chase & Co., Inc.	
<b>CONSOLIDATED COMPUTER</b> .....	83
Agency: James Lovick, Ltd.	
<b>CONTROL DATA CORP.</b> .....	24, 25
Agency: Klau-Van Pietersom-Dunlap, Inc.	
<b>CONTROL DATA CORP.</b>	
BUSINESS PRODUCTS GROUP .....	55
Agency: The Phillips Agency of Cal., Inc.	
<b>DATA GENERAL CORP.</b> .....	8, 9
Agency: Quinn & Johnson, Inc.	
<b>A. B. DICK CO.</b> .....	20, 21
Agency: Marsteller Inc.	
<b>DIGITAL EQUIPMENT CORP.</b> .....	31
Agency: Kalb & Schneider, Inc.	
<b>EMR COMPUTER</b> .....	16
Agency: Industrial Communications	
<b>ELECTROID CO.</b> .....	77
Agency: Coggswell & Coggswell Associates, Inc.	
<b>FLORES ASSOCIATES</b> .....	39
<b>GENERAL DATACOMM INDUSTRIES</b> .....	37
Agency: CCM, Inc.	
<b>GENERAL ELECTRIC</b>	
TELECOMMUNICATION PRODUCTS DEPT. ....	29
Agency: Ross Roy of New York, Inc.	
<b>HEWLETT-PACKARD</b> .....	33
Agency: Lennen & Newell/Pacific	
<b>HONEYWELL</b>	
COMPUTER CONTROL DIV. ....	6
Agency: Creamer, Trowbridge, Case & Basford Inc.	
<b>IBM</b>	
DATA PROCESSING DIV. ....	22, 23
Agency: Marsteller Inc.	
<b>INCOTERM CORP.</b> .....	2
Agency: Sage Advertising, Inc.	
<b>INFORMATION CONTROL CORP.</b> .....	40
Agency: Larry Courtney Co.	
<b>INFORMATION TERMINALS CORP.</b> .....	77
Agency: Bill Fisher Advertising	
<b>INFOTON, INC.</b> .....	101
Agency: Maslow, Gold & Rothschild, Inc.	
<b>INTERDATA</b> .....	Cover 3
Agency: Grafik II	
<b>MICRO SWITCH</b>	
A DIV. OF HONEYWELL .....	69
Agency: N. W. Ayer & Son, Inc.	
<b>MODERN DATA</b> .....	12, 13, 76
<b>MOORE BUSINESS FORMS, INC.</b> .....	7
Agency: Rumrill-Hoyt, Inc.	
<b>MOTOROLA INSTRUMENTATION &amp; CONTROL, INC.</b> .....	73
Agency: Thomas R. Sundheim, Inc.	
<b>OMEGA-T SYSTEMS, INC.</b> .....	53
Agency: Eddie Davis Advertising, Inc. of Dallas	
<b>PERIPHERAL EQUIPMENT CORP.</b> .....	4
Agency: Durel Advertising	
<b>RAYTHEON COMPUTER</b> .....	41
Durel Advertising	
<b>SANGAMO ELECTRIC CO.</b>	
COMMUNICATION SYSTEMS DIV. ....	19
Agency: Winius-Brandon Co.	
<b>SCAN-OPTICS, INC.</b> .....	34
Agency: Singer & Cole	
<b>SINGER</b>	
FRIDEN DIV. ....	47
Agency: Meltzer, Aron & Lemen, Inc.	
<b>SPECTRON CORP.</b> .....	98
Agency: Perceptive Marketers Agency	
<b>STROMBERG DATAGRAPHIX, INC.</b> .....	17
Agency: Management Communication Consultants, Inc.	
<b>SYNER-DATA, INC.</b> .....	52
Agency: John Donlan Advertising	
<b>SYSTEMS ENGINEERING LABORATORIES</b> .....	10, 11
Agency: Shaw Elliott, Inc.	
<b>TALLY CORP.</b> .....	61
Agency: Bonfield Associates	
<b>TEKTRONICS INC.</b> .....	1
Agency: Dawson, Inc.	
<b>TELETYPE CORP.</b> .....	50, 51
Agency: Fensholt Advertising, Inc.	
<b>TEL-TECH CORP.</b> .....	43
Agency: Communications Unlimited, Inc.	
<b>TIME SHARE PERIPHERALS CORP.</b> .....	97
Agency: A. B. W. Toft and Co.	
<b>UNIVERSAL DATA ACQUISITION CO.</b>	
AN MCA TECH. DIV. ....	32
Agency: S. Michelson Advertising	
<b>UNIVERSITY COMPUTING CO.</b> .....	14, 15
Agency: Management Communication Consultants, Inc.	
<b>VARIAN</b>	
GRAPHICS & DATA SYSTEMS DIV. ....	35
Agency: Botsford Ketchum, Inc.	
<b>VARIAN DATA MACHINES</b> .....	Cover 2
Agency: N. W. Ayer/Jorgensen/MacDonald, Inc.	

# Take a hard look

## Interdata has an eye-opener of an OEM control computer

We took a hard look at the needs of the OEM market before we designed the MODEL ONE.

We knew price was important, so we made it simple and economical—as low as \$2,790 in quantity.

We knew performance was vital, so we designed it with the specifications you need. Like:

49 instructions, 8 and 16 bits long, with conditional skips and 1 to 2 usec execution time

8 hardware priority interrupt lines

4 usec interrupt response

Direct Memory Access

Read Only Memory Modules

Pulsed or request response I/O

As well as a complete set of peripherals, including a dual tape cassette, mini disc, I/O modules and a digital multiplexor to handle thousands of inputs and outputs.

If you're looking hard at control computers, take a hard look at us, we're in volume production right now. Interdata, 2 Crescent Place, Oceanport, N. J. 07757, 201-229-4040.



**INTERDATA®**  
The Forthcoming—Now!

CIRCLE NO. 46 ON INQUIRY CARD

# LINE PRINTER. \$2400.

The Centronics Model 101.

It's economical because of the matrix printing and simple design.

It's practical because of the multiple copies, easy interface and communications options.  
Just look at the Model 101 as something that acts like a line printer and costs like a teleprinter.

Centronics Data Computer Corp., Hudson, N.H. 03051

**centronics**

Because you don't want to spend more than you have to.

CIRCLE NO. 47 ON INQUIRY CARD

FJCC Booth  
No. 1308-1310

