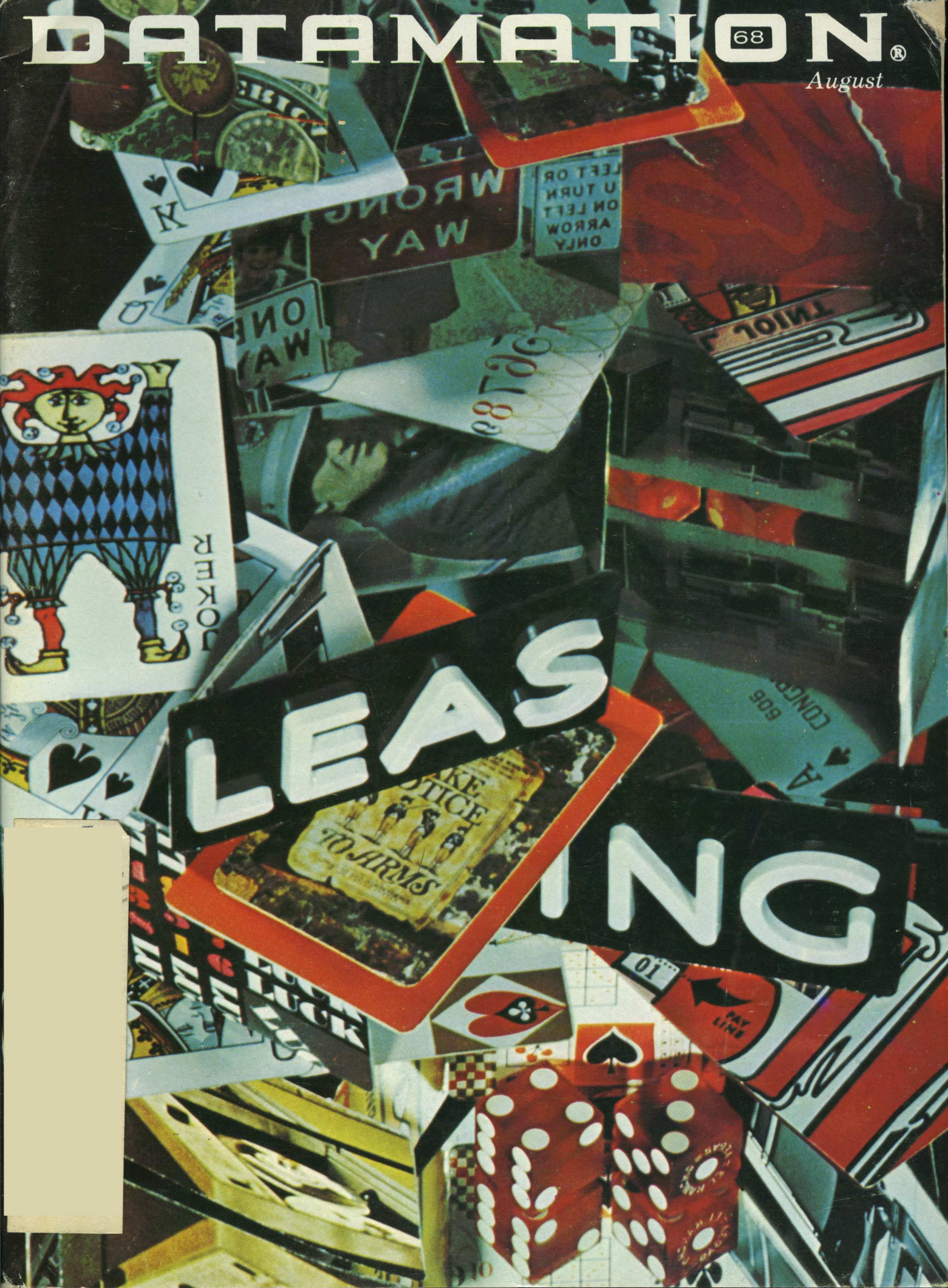
DATAMATION® 68
August



Bob Thomason is your answer-man on the Varian Data 620/i.

And on his nickel.

Bob Thomason knows more about the Varian Data 620/i systems computer and its use in systems than any other man in the company. He should—he's our engineering vice president. And now he is your personal answer-man, with our most authoritative answers on the 620/i and your application.

And he'll get you *immediate delivery on 620/i standard configurations*, a new availability resulting from the expanded production at our brand new plant.

Just to give you a base for talking to Bob Thomason, here are a few facts to start with:

The Varian Data 620/i is designed strictly for systems work, fully IC'd for reliability and small size. It is fast (1.8 usec cycle time, with hardware registers and our unique Micro-Exec addressing), capable (16- and 18-bit words, 4K to 32K word memory, 100-plus basic commands), versatile (Party Line I/O, proven software, complete peripherals and options), and low price ($13,900, in standard configuration, with teletypewriter).

We've delivered more than 150 620/i's already, so, we've had lots of experience in interfacing the 620/i with all types of systems, and we're currently filling orders for 400 more.

That's why Bob Thomason is ready for you. Phone him at (714) 833-2400. *Collect.*

varian data machines
a varian subsidiary

2722 Michelson Drive ○ Irvine, California 92664
(714) 833-2400 ○ TWX (910) 595-1358

SALES OFFICES: U. S., Santa Monica and San Francisco, California, Vernon and Westport, Connecticut, Chicago, Illinois, Houston, Texas, Fort Washington, Pennsylvania, Washington, D. C. INTERNATIONAL: Australia, France, Germany, Sweden, Switzerland, United Kingdom and Ireland

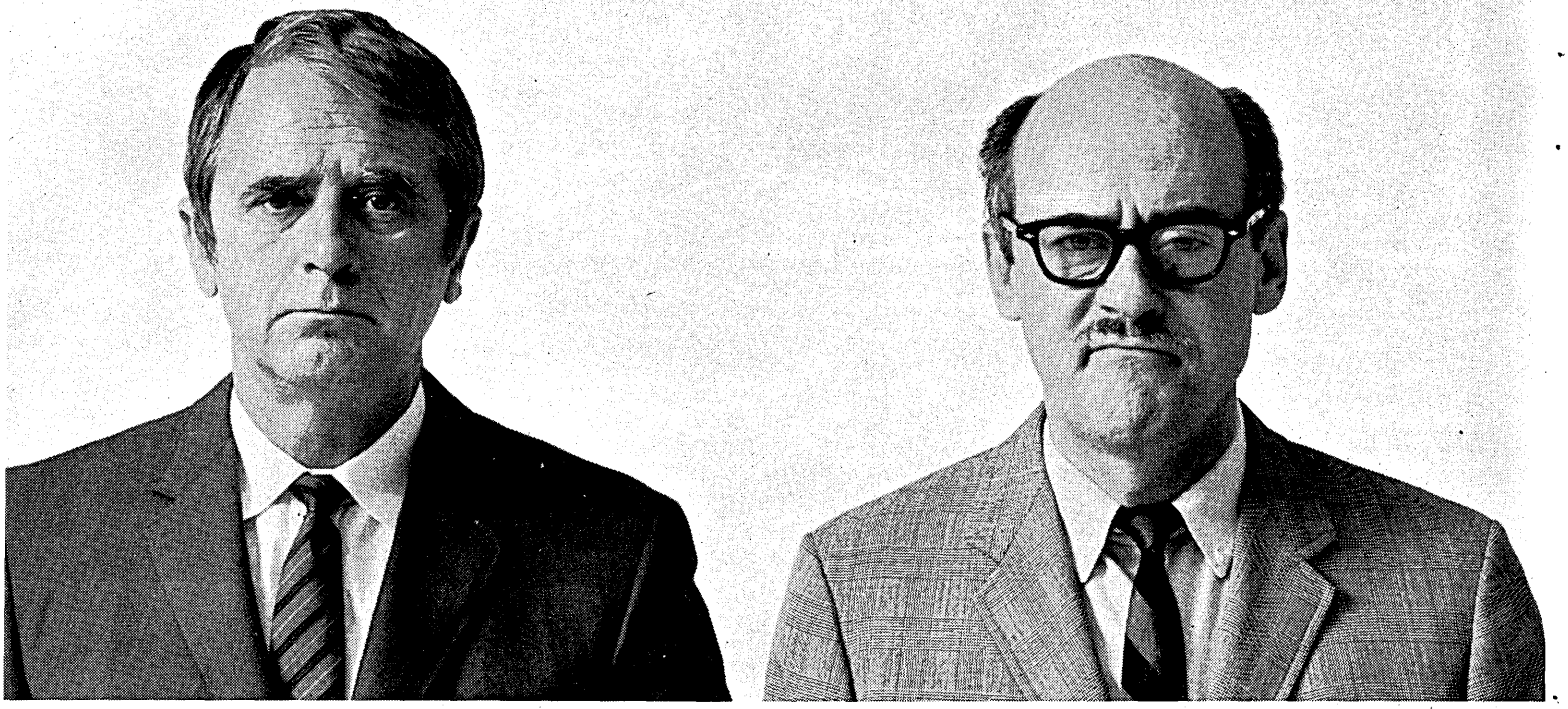
CIRCLE 1 ON READER CARD

Transmits 6 times the data as TWX for the same line charge. Leases for less than $25 per month. Why not put one in every branch office?

This low cost Tally transmitter sends business data over ordinary dial-up phone lines at 600 words per minute. That's six times as fast as a TWX or Telex. ▫ Tally designs simple, economical transmitters like this for branch offices that must make daily reports to a central accounting or computing facility. ▫ The Tally transmitter shown leases for $23.76 per month on a 36-month contract. For a few dollars more you can get an option that answers calls automatically. Thus, a tape may be loaded at the end of each business day to await a call during the night whenever the central terminal is ready to receive. ▫ Another optional version not only answers calls automatically but corrects transmitting errors by re-transmitting automatically whenever the receiving terminal detects a parity error. It leases for $33.33 per month on a 36-month contract. ▫ These transmitting terminals are only two out of twenty different data communication systems offered by Tally. ▫ **More information.** For full information, please write or call Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Phone: 206-624-0760. Or contact the Tally factory branch office nearest you.

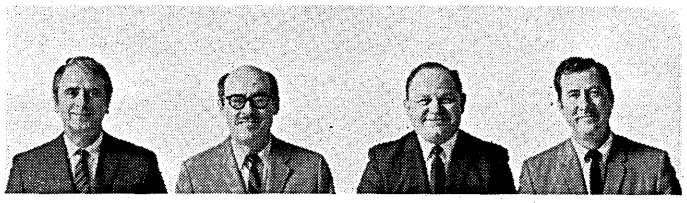
New York: 45 N. Village, Rockville Centre 516-678-4220
Chicago: 33 N. Addison Rd., Addison, Ill. 312-279-9200
Washington, D. C.: 1901 Ft. Myer Dr., Arlington, Va. 703-525-8500
San Francisco: 420 Market St., San Francisco, Calif. 415-989-5375
England: 6a George St., Croydon, Surrey MUN-6838

CIRCLE 4 ON READER CARD



You can't make a time-sharing computer

So we make four.



When it comes to conversational time-sharing systems, we give you a choice of four. Which is just about four times better than what most manufacturers offer. To find the system that's best for you, simply identify yourself in one of the following groups.

1. If you're in the service bureau business, or if you're a large company where hundreds of engineers, scientists and programmers need access to the system, get our 940 computer. It accommodates more than 500 users, up to 40 at one time, it has mass storage for information files and comes with the most extensive time-sharing software package in the industry. Prices are in the $25,000 to $30,000 a month range.

2. If you have only a few dozen users, or are an educational or scientific institution, get our 945 computer. To an individual using it, it's identical to the 940. Same comprehensive, proven, software. Same capabilities. But it handles only 64 users, up to 24 at one time, it has less mass storage for information files and costs less money. Price is under $15,000 a month.

3. If you would like to use time-sharing while taking care of your batch problems, get

to please everyone.

a Sigma 5. Sigma 5 is a third-generation computer built for real-time and batch work. Now we've added time-sharing software which will handle eight users at the same time it runs batch programs. When not in a time-sharing mode the Sigma 5 can be used as a real-time computer. And whenever you're ready for much, much more, you can easily upgrade your system to a Sigma 7. All the software and peripherals are compatible. Simply add a 7 CPU. Sigma 5 prices are in the $12,000 to $15,000 a month range.

4. Finally, if you're a man who wants everything, get our Sigma 7. It's the only third-generation computer now working which is designed for time-sharing and incorporates such important hardware features as a memory map, rapid context switching, multiple register blocks, and push-pull instructions for stacking. Sigma 7 will accommodate simultaneous time-sharing users while doing batch work. Soon it will run batch programs and do real-time work as well as time-sharing, all at the same time. It's the only computer that can do all three. Prices start at $17,000 a month.

We'll be glad to give you more details on any or all of these four. But if you don't find what you want here, call us anyway. We might just build you a fifth.

SDS

Scientific Data Systems, Santa Monica, California

CIRCLE 5 ON READER CARD

You can read us like a book.

Wouldn't it be great if everything that came out of your computer could be read as easily as your favorite book?

If you're presently making copies from line printer output it's no pleasure to read. Or to handle.

If you're using traditional typesetting methods you're concerned with turn-around time, human error and costs.

Now, Alphanumeric offers the solution with a brand new service that combines the speed and accuracy of the computer with the graphic arts quality of type. We call it TAPE-TO-TYPE™.

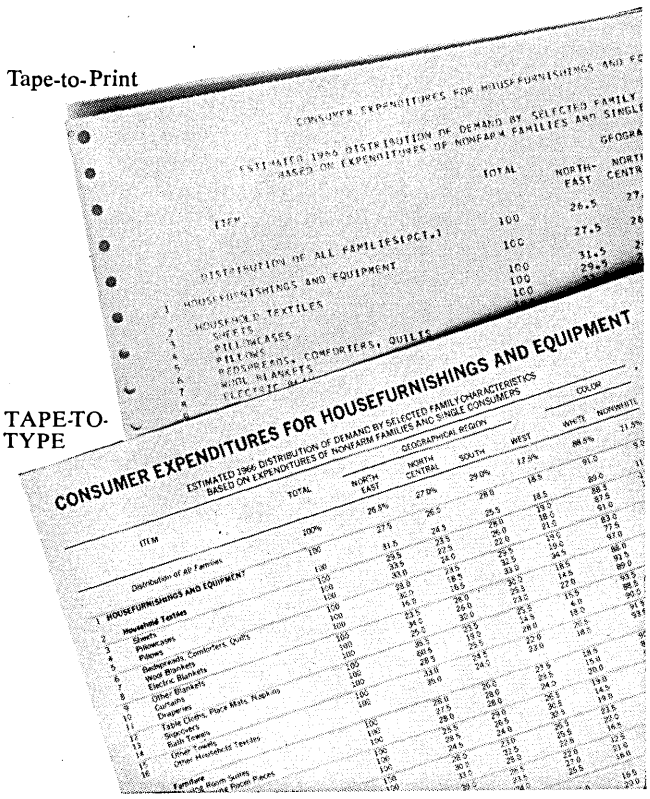
Now you can add a new dimension of communications effectiveness to your computer generated data. The greatest choice of type styles and sizes. Bold type. Light type. Italics. And you'll save in page count. Time. And printing costs. The risk of typesetting errors is virtually eliminated because data goes from tape to type within the computer.

TAPE-TO-TYPE operating procedures are just as easy as the Tape-to-Print procedures you presently use. Find out for yourself. Write for the Alphanumeric TAPE-TO-TYPE Users Guide. It's free. See how your output tapes can be used to generate graphic arts quality type. Seeing is believing.

Alphanumeric
INCORPORATED
10 Nevada Drive, Lake Success, N.Y. 11040 (516) 437-9000

Tape-to-Print

TAPE-TO-TYPE


CONSUMER EXPENDITURES FOR HOUSEFURNISHINGS AND EQUIPMENT

ESTIMATED 1966 DISTRIBUTION OF DEMAND BY SELECTED FAMILY CHARACTERISTICS BASED ON EXPENDITURES OF NONFARM FAMILIES AND SINGLE CONSUMERS

ITEM	TOTAL	GEOGRAPHICAL REGION: NORTH EAST	NORTH CENTRAL	SOUTH	WEST	COLOR: WHITE	NONWHITE
Distribution of all Families	100%	26.5%	27.5%	29.0%	17.0%	88.5%	11.5%
1 HOUSEFURNISHINGS AND EQUIPMENT	100	27.5	24.5	28.0	18.5	89.0	11.0
Household Textiles	100	31.8	23.5	26.0	18.5	87.5	12.5
2 Sheets	100	29.5	22.5	28.0	19.0	91.0	9.0
3 Pillowcases	100	33.0	24.0	26.0	17.0	89.0	11.0
4 Pillows	100	28.8	23.5	25.5	22.0	87.5	12.5
5 Bedspreads, Comforters, Quilts	100	32.0	26.5	33.0	18.5	88.0	12.0
6 Wool Blankets	100	36.5	26.0	23.5	14.0	93.5	6.5
7 Electric Blankets	100	34.5	25.5	25.5	14.5	90.5	9.5
8 Other Blankets	100	23.5	32.0	23.5	21.0	93.5	6.5
9 Curtains, Draperies	100	34.5	23.5	26.0	16.0	88.0	12.0
10 Table Cloths, Place Mats, Napkins	100	29.5	23.5	28.0	19.0	92.5	7.5
11 Shower Curtains	100	35.5	18.5	22.0	24.0	88.5	11.5
12 Bath Towels	100	28.5	23.5	23.0	25.0	90.5	9.5
13 Other Textiles	100	28.5	24.5	24.5	22.5	89.5	10.5
14 Other Household Textiles	100	33.0	24.5	21.5	21.0	93.5	6.5
15 Furniture	100	26.0	30.0	27.5	16.5	89.0	11.0
16 Living Room Suites	100	27.5	28.0	28.0	16.5	91.0	9.0
Living Room Pieces	100	28.0	29.0	26.5	16.5	90.5	9.5
Sofas	100	29.5	24.8	26.3	19.4	91.2	8.8
Chairs	100	28.5	23.0	25.5	23.0	89.5	10.5
Occasional Chairs	100	24.5	23.5	32.0	20.0	87.5	12.5
Tables	100	30.7	23.1	23.1	23.1	92.3	7.7
Occasional Tables	100	30.2	23.5	27.0	19.3	91.0	9.0
Coffee Tables	100	31.5	23.5	25.5	19.5	90.5	9.5
Other Tables	100	28.5	23.5	28.5	19.5	91.5	8.5
Bedroom Suites	100	25.5	27.5	28.5	18.5	90.5	9.5
Bedroom Pieces	100	25.5	27.5	28.5	18.5	90.5	9.5
Beds	100	25.5	27.5	28.5	18.5	90.5	9.5
Chests	100	25.5	27.5	28.5	18.5	90.5	9.5
Dressers	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Bedroom Pieces	100	25.5	27.5	28.5	18.5	90.5	9.5
Dining Room Suites	100	25.5	27.5	28.5	18.5	90.5	9.5
Dining Room Pieces	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Furniture	100	25.5	27.5	28.5	18.5	90.5	9.5
Floor Coverings	100	25.5	27.5	28.5	18.5	90.5	9.5
Wall-to-Wall Carpeting	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Floor Coverings	100	25.5	27.5	28.5	18.5	90.5	9.5
Linoleum	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Floor Coverings	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Housefurnishings	100	25.5	27.5	28.5	18.5	90.5	9.5
Housewares	100	25.5	27.5	28.5	18.5	90.5	9.5
Glassware	100	25.5	27.5	28.5	18.5	90.5	9.5
Silverware	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Housewares	100	25.5	27.5	28.5	18.5	90.5	9.5
Miscellaneous	100	25.5	27.5	28.5	18.5	90.5	9.5
Lamps	100	25.5	27.5	28.5	18.5	90.5	9.5
Clocks	100	25.5	27.5	28.5	18.5	90.5	9.5
Other Miscellaneous	100	25.5	27.5	28.5	18.5	90.5	9.5

CIRCLE 6 ON READER CARD

august
1968

volume 14 number 8

Publisher **GARDNER F. LANDON**
Editor **ROBERT B. FOREST**

Managing Editor & Art Director **CLEVE MARIE BOUTELL**
Associate Editors **WILLIAM J. ROLPH**
AUBREY DAHL
Assistant Editors **WENDY REID**
JANET EYLER
F. BARRY NELSON
Eastern Editors **ANGELINE PANTAGES**
PHIL HIRSCH
Midwestern Editor **EDITH GOODMAN**
European Editor **PEARCE WRIGHT**
Contributing Editors **HOWARD BROMBERG**
ROBERT V. HEAD
PHILIP H. DORN
Washington Reporter **PHIL HIRSCH**
Editorial Adviser **ROBERT L. PATRICK**
Technical Consultant **LOWELL AMDAHL**
Production Manager **MARILEE PITMAN**
Director of Circulation **FRANK DeCARLO**
Circulation Fulfillment **ALGENE TRAINA**

ADVERTISING OFFICES

Eastern District Managers **JAMES M. MORRIS**
WARREN A. TIBBETTS
A. TREAT WALKER
35 Mason Street, Greenwich, Conn. 06830
(203) 661-5400

New England District Manager & Vice President **WARREN A. TIBBETTS**
112 West Haven Rd.,
Manchester, N.H., 03104 (603) NAtional 5-9498

Midwest District Manager **JOHN BRENNAN**
205 West Wacker Drive, Chicago, Ill. 60606
(312) FInancial 6-1026

Western District Manager & Senior Vice President **HAMILTON S. STYRON**
94 So. Los Robles Ave.,
Pasadena, Cal., 91101 (213) 795-9721
(213) 681-8486—from Los Angeles

EDITORIAL OFFICES
94 So. Los Robles Ave.
Pasadena, Calif. 91101

CIRCULATION OFFICES
35 Mason Street
Greenwich, Conn. 06830

BPA
Circulation audited by Business Publications Audit

ABP
Member, American Business Press, Inc.

DATAMATION is published monthly on or about the tenth day of every month by F. D. Thompson Publications, Inc., Frank D. Thompson, Chairman; Gardner F. Landon, President; Gilbert Thayer, Senior Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, Conn. 06830 (203) 661-5400. Editorial offices, 94 So. Los Robles Ave., Pasadena, California 91101. Published at Chicago, Ill.
DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $15.00 annually; single issues (when available) $1.50. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of $25.00 annually. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, O. and Form 3579 to be sent to F. D. Thompson Publications, Inc., P.O. Box 2000, Greenwich, Conn 06830.

Copyright 1968, F. D. Thompson Publications, Inc.

Microfilm copies of DATAMATION may be obtained from University Microfilms, Inc., 313 No. First St., Ann Arbor, Michigan.

Printed by Beslow Associates, Inc.

This issue 78,245 copies

don't compile and go

compile and Autoflow®

- AUTOFLOW aids in debugging
- AUTOFLOW produces accurate documentation
- AUTOFLOW lowers programming costs

'68 AUTOFLOW directly processes COBOL, FORTRAN, Assembly and PL-1 source decks and produces . . .

- one- or two-dimensional flow charts
- high level and detailed flow charts
- COBOL data-name cross reference
- label cross reference index
- alphanumeric label listing index
- program diagnostics
- syntax errors
- logical flow errors

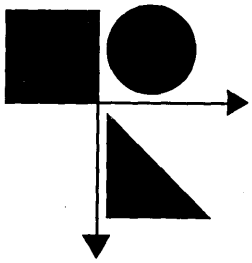
Available for:

- IBM Series 360 (under DOS or OS)
- Honeywell Series 200
- IBM 1400 and 7090 Series
- RCA SPECTRA 70 Series

AUTOFLOW is fast, processing 400 statements per minute on the 360/Model 40 to over 1000 statements per minute on the 360/Model 65.

AUTOFLOW is in use at over 200 data processing installations throughout the world.

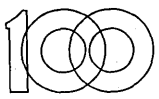
Make us prove the advantages of using AUTOFLOW:
Write today for free AUTOFLOW demonstration and new AUTOFLOW literature. AUTOFLOW is available for a free 30 day trial period.



APPLIED DATA RESEARCH, INC.

Princeton, N.J., Route 206 Center, Princeton, N.J. 609-921-8550
Washington, D.C., 2425 Wilson Blvd., Arlington, Va. 703-528-3141
Los Angeles, Calif., 15720 Ventura Blvd., Encino, Calif. 213-783-3500
Boston, Mass., Lakeside Office Park, Wakefield, Mass. 617-245-9212
Data & Information Products, Inc. (Sales Representatives)
Chicago, Ill., 10 West Maine St., Park Ridge, Ill. 312-692-7153
St. Louis, Mo., 7811 Carondelet Avenue, St. Louis, Mo. 314-862-2120
Detroit, Mich., 3049 East Grand Blvd., Detroit, Mich. 313-875-5721
Milwaukee, Wis., 2433 North Mayfair Road, Wauwatosa, Wis. 414-771-7880
Dallas, Tex., 400 Tower So., 2720 Stemmons Freeway, Dallas, Tex. 214-638-3890
New York, N.Y., 450 Seventh Ave., New York, N.Y. 212-244-5703
Philadelphia, Pa., 215 Ford Road, Bala-Cynwyd, Pa. 215-835-2088
Tokyo, Japan, Japan Office Supplies Co., Limited (Sales Rep.), Tokyo, Japan

AUTOFLOW*



1967 I-R 100 WINNER

Selected by Industrial Research as one of the 100 most significant new technical products developed during 1967

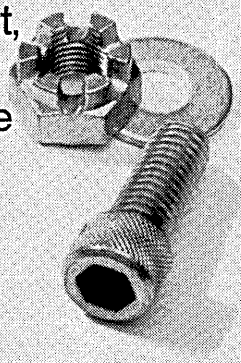
*patent pending

ADR is an equal opportunity employer.

CIRCLE 7 ON READER CARD

Computers are big, expensive components. Bit for bit, ounce for ounce, some are a bargain.

When you tie another man's computer into your product, you're staking your reputation on his equipment. Your reputation is worth shopping for. Naturally you want the most for your dollar. Like reliability at 130° F. Hewlett-Packard computers are designed for rugged dependability—as well as high performance. All things considered, they're something of a bargain.

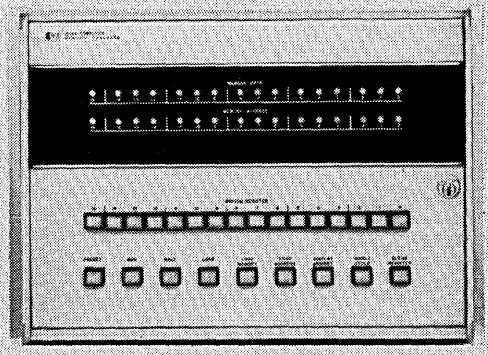


We've been selling quality instruments to original equipment manufacturers for years. We know the problems. So we back our computers with excellent training, complete service and our traditional warranty. We'll train your people or your customer's people in maintaining the computer and in using the software.

We supply plug-in I/O interfaces and the software drivers for peripheral devices. You buy only the equipment you need for interfacing your system. And you tie it in with minimum engineering time because both hardware and software are operational and fully documented.

The 2114A pictured here measures 16¾"x 12¼"x 22½" including its power supply. It uses 16-bit words, operates with 4K or 8K memory, and has a two microsecond cycle time. Price: $9,950.

For more information about a computer that will live up to your reputation, call your local HP field engineer. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.



HEWLETT hp PACKARD

DIGITAL COMPUTERS

06818

CIRCLE 8 ON READER CARD

DATAMATION 68®

august
1968

volume 14 number 8

22 THIRD PARTY LEASING, *by E. L. Meadows.*
An alternative that eclipses the risk of obsolescence.

26 AN INTRODUCTION TO LEASING, *by Angeline Pantages.*
The success stories in third-party leasing continue, as lessors become a major force in the marketplace.

33 SIM I — THE MODEL PATIENT, *by A. Paul Clark, H. Loberman and L. Arthur Hoyt.*
A computer-controlled manikin is used to simulate a human patient and reactions in the training of anesthesiologists.

46 A DIGITAL RESOLVER FOR THE PDP-8/S, *by Michael P. Greenberg and Frederick J. T. Dow.*
A parallel-processing accessory has been designed for the PDP-8/S, demonstrating a way of extending small g-p computer capability in control applications.

50 INTRODUCTION TO GOING PUBLIC, *by Arthur M. Borden and John H. Ball.*
Whether you own a company, would like to start one, or just might be interested in buying stock—it's helpful to know the rudiments of equity financing.

60 TWO MORE FROM DEC.
New, cheaper versions of the popular PDP-8 and PDP-9 appear.

61 AN INVESTIGATION INTO AN EMOTIONALIZED COMPUTER SYSTEM, *by William A. Logan.*

64 THE 1968 ACM CONFERENCE AND EXPOSITION.
A preview.

71 THE NATIONAL AUTOMATION CONFERENCE OF THE AMERICAN BANKERS ASSN.
A report.

74 THE ACM CONFERENCE ON COMPUTER PERSONNEL RESEARCH.
A humanistic mission in search of a science.

85 NEWS SCENE.
IBM's new Call/360 service arouses Justice Dept. attention . . . Burroughs explains 8500 production problems and view of supercomputer market . . . FCC Carterphone decision implications include lawsuit possibilities, new growth for independent modem manufacturers.

automatic
information
processing
for business
industry & science

datamation departments

9 Calendar
11 Letters to the Editor
17 Look Ahead
21 The Editor's Readout
89 News Briefs
115 New Products
131 New Literature
135 People
137 Books
143 World Report
149 Washington Report
170 Datamart
171 Index to Advertisers
177 The Forum

There's more to interactive graphics than way out hardware

If you're using computer graphics for engineering or scientific simulation, for data analysis, or for machine-aided design, then you need the right kind of software to make your investment really pay off — no matter how great the display-system hardware.

You need a resident monitor that was designed specifically for on-line man/machine interaction. You need a full set of graphics operators so that you can display, construct, manipulate, and store CRT images. You need routines for communicating with the central computer facility, and I/O utilities for peripherals and graphics devices. You need a FORTRAN compiler, and a macro assembler, and an editor.

This is the software package we deliver our customers with every Adage Graphics Terminal. It turns on our way-out hardware.

For a brochure describing our standard software, write D. R. Sudkin, Marketing Services Manager, Adage, Inc., 1079 Commonwealth Avenue, Boston, Massachusetts 02215.

Adage INC

CIRCLE 9 ON READER CARD

calendar

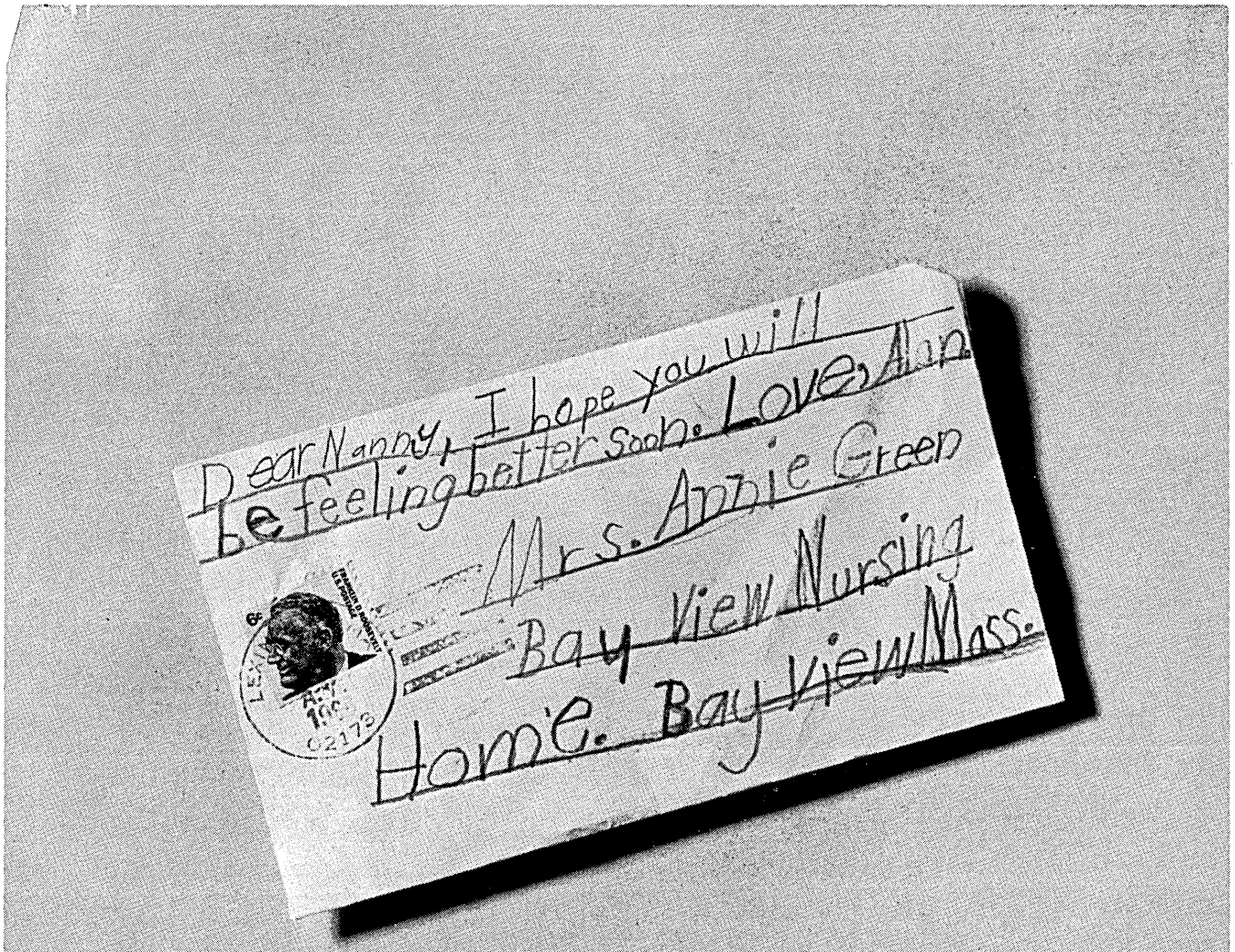
DATE	TITLE	LOCATION	SPONSOR/CONTACT
Aug. 27-29	National Conference & Exposition	Las Vegas	ACM/R. B. Blue, TRW, Bldg. R3, Room 1144, One Space Park, Redondo Beach, Calif.
Sept. 9-11	Electronics & Aerospace Systems Convention (EASCON)	Washington, D.C.	B. I. Edelson, Comm. Sat. Corp., 1835 K St., N.W., Washington, D.C.
Sept. 23-25	Journees Internationales de l'Informatique et de l'Automatisme	Versailles, France	Nat'l. Assn. of Tech. Research, Dr. Jacques Noel, 37 Ave. Paul Doumer, Paris 16eme
Sept. 30-Oct. 1	16th Joint Engineering Mgt. Conf.—Computer Impact on Engineering Mgt.	Philadelphia	Instrument Society of America, 530 William Penn Pl., Pittsburgh, Pa. 15219
Oct. 3-4	2nd Annual PL/I Forum	Buffalo	R. F. Rosin, Computer Sciences Dept., SUNY, 4250 Ridge Lea Rd., Amherst, N. Y. 14226
Oct. 6-10	10th Annual EDP Conf.	Montreal, Canada	Nat'l. Retail Merchants Assn., 100 W. 31 St., N.Y., N.Y. 10001
Oct. 9-15	4th International Congress with Exhibition for Instrumentation & Automation	Dusseldorf, Germany	Nowea, 4 Dusseldorf 10, Postfach 10203, Germany
Oct. 18	Symposium on the Application of Computers to the Problems of Urban Society	New York	ACM/J. M. Spring, Computer Methods Corp., 866 Third Ave., N.Y., N.Y.
Oct. 20-23	International Systems Meeting	St. Louis	Systems & Procedures Assn., 24587 Bagley Rd., Cleveland, Ohio
Oct. 24-25	Mgt. Conference: Marketing, Manpower, Management	Detroit	ADAPSO, 420 Lexington Ave., N.Y., N.Y. 10017
Oct. 28-31	23rd Annual Conf. & Exhibit	New York	ISA, 530 Wm. Penn Pl., Pittsburgh Pa. 15219
Oct. 28-Nov. 1	10th Annual Exposition & Conf.	Chicago	BEMA, 235 E. 42 St., N.Y., N.Y. 10017
Nov. 20-26	Industrial Process Controls & Computer Exhibition	Milan, Italy	R. B. Wallace, (Ref. 944), U.S. Dept. of Commerce, Wash., D.C. 20230

ACTUAL INSTALLATION

Oblique suspended filing permits easier, quicker EDP referencing through smaller bindings. Makes your EDP filing area attractive in appearance, efficient in operation. Write for free illustrated material.

OBLIQUE
Suspended Filing Compartments
R. P. GILLOTTE & CO., INC.
929 Holland Ave., Cayce, S. C. 29033
(803) 254-8452

CIRCLE 68 ON READER CARD



Some kinds of communications even a Honeywell computer finds tough to handle.

But in almost every kind of real-time application, Honeywell computers are smack in the middle of the communications revolution.

In a typical computer-directed control system, a Honeywell computer gets bombarded with electronic facts and figures from hundreds of sources. It absorbs every bit of data, figures out the logical course of action at microsecond speeds, then shoots this action information to people or even to computers and other devices.

In a flight simulation system, for instance, a Honeywell machine responds fast to a pilot's operation of hundreds of lights, switches, and controls. In a railroad yard, a Honeywell computer tracks cars, controls switches to route them. At a radio astronomy observatory, a Honeywell computer helps scientists map the invisible heavens, controls the movement of giant antennae.

And so goes our role in the communications revolution . . . in medicine, graphics, industry, aerospace, research, science, military — Honeywell and its customers work together as automation partners to get systems operating smoothly.

Like details on some of our on-line real-time computer applications? Write for our Control Applications Kit. It contains material that may well lead to the solution of your control problems. Honeywell, Computer Control Division, Old Connecticut Path, Framingham, Massachusetts 01701.

Honeywell
AUTOMATION

CIRCLE 10 ON READER CARD

letters

coc-5 font

Sir:

The April issue (p. 98) carried a release relative to the COC-5 optical font. It stated that X3 voted 19-1 to put out this proposal to letter ballot. The correct statement would have been, X3 voted 19-1 to refer this proposal to X3.1, Optical Character Recognition.

While this error is not serious enough to warrant a retraction/correction, I believe that it is misleading to your readers and would indicate that the proposal has gone much further along the standardization route than has actually happened.

ALEXANDER C. GROVE
Director of Standards
BEMA
New York, New York

training programs

Sir:

In the article on EDP schools (May, p. 33) footnote 3 states: "At present, Control Data . . . is the only computer manufacturer directly engaged in non-customer training." May I call your attention to the Electronic Associates, Inc. Education and Training Department program of regularly scheduled applications and programming short courses in analog, digital and hybrid computation which are open to qualified members of the public. While our program is not primarily directed toward edp, we do teach FORTRAN IV and assembly language programming (EAI 640/8400) in the digital area. All of our courses feature hands-on computer laboratory sessions (from 15-30 hours per week) on equipment in the same building.

PETER J. HOLSBERG
Director, Education and Training
Electronic Associates, Inc.
Princeton, New Jersey

technical reviews

Sir:

With regard to Mr. Beizer's letter and Mr. Shaw's reply (June, p. 12) about reviewing the government sponsored technical literature after publication, I would like to mention one such specific project. The name of the publication is *Reliability Abstracts and Technical Reviews.* It has been in operation since 1961 for reviewing the literature in the field of reliability and is supported by the NASA Office of Reliability and Quality Assurance. It has achieved widespread support through the reliability engineering community.

RALPH A. EVANS
Research Triangle Park,
North Carolina

social responsibilities

Sir:

Three items of great interest in the June issue were the guest editorial (p. 21), the Forum (p. 180) and the report on the RESISTORS' plans for expanding their group (p. 92). At a time when many people are concerned about the alleviation of conditions of poverty in this country, it is encouraging to see our profession assuming responsibility for improving matters voluntarily, and without expecting all initiative and action to come from the Federal government. For the rest of us who are interested, please provide details on how we can help with the Computer Industry Martin Luther King Fund.

MARTHA R. HORTON
Bethesda, Maryland

Contributions may be sent to: The Computer Industry Martin Luther King Fund, Wells Fargo Bank, 401 Battery Street, San Francisco, California 94111.

Sir:

Mr. Bromberg's suggestion is an excellent one requiring a tiny investment ($60,000 in a 5% portfolio would produce an adequate $3,000 per year). Considering the size of the computer industry, it is the least project that we dare undertake. A dollar from each of your 63,170 subscribers would do it. Mine is enclosed.

HARRY TURNER
Menlo Park, California

Sir:

Both Miss Hansen and Mr. Bromberg are to be commended for their compassion, humanity, and commitment to action. Nor should the rare example of editorial commitment go unnoticed. I concur warmly with the purpose and spirit of both recommendations. But, however meritorious, they are not likely to come to anything for want of a suitable organizational vehicle for coalescing this kind of spirit into a directed program for action.

Both recommendations are motivated by concern about the racial problem of our nation, and are programs for social or political action; they are thus anathema to any scientific or professional society. Yet it is only the professional societies that can make any claim at all to representing the community whose action and support Miss Hansen and Mr. Bromberg so eloquently solicit. If we wish to take action as "the data processing community" on an issue unrelated to data processing, we either must have an organization for the purpose, or transform what we have to make it responsive to this kind of requirement.

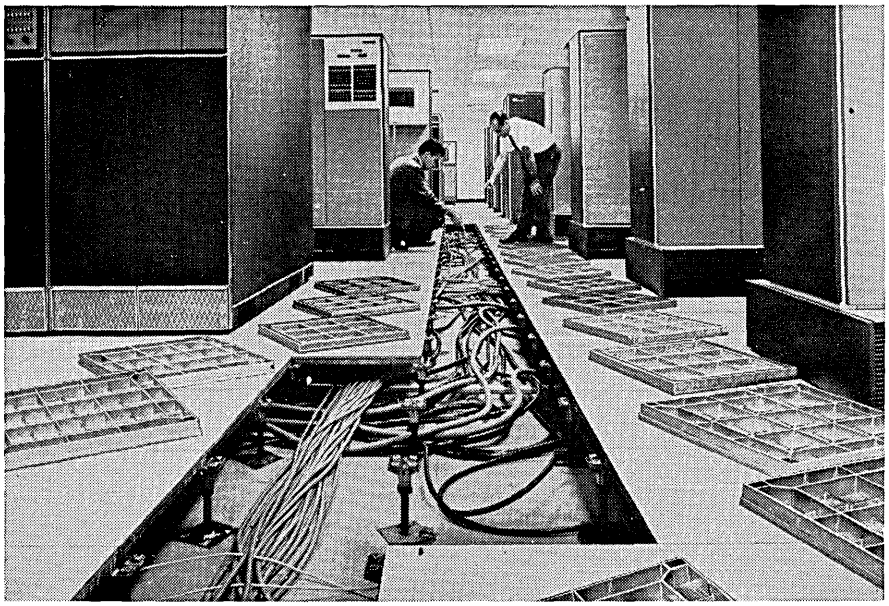
This raises (or, more correctly, resurrects) a fundamental question: should the members of a "professional community" take collective action or even state a collective position in the name of the "community," on a matter unrelated to their profession? It is easy to say "yes" under the conditions that impelled Hansen and Bromberg to make their proposals; it would be just as easy, indeed imperative, to say "no" under other conditions. We are all free to do or say whatever is legitimate, individually; there is considerable merit in restricting "community" positions to matters professionally germane.

And yet there is a "moral imperative" in the current environment that demands more than simple individual action. The data processing community really *should* do what Bromberg proposes, and maybe more. And it *should* be eager to implement schemes like the Hansen proposal, as a form of enlightened self-interest. And we can be certain that in the future we will be facing many issues in which this "moral imperative" will appear. Not the least of this is the one Hansen

refers to in passing: the social implications of automation.

I feel that the times, the new social forms that are beginning to emerge, call for professional communities to be prepared to leave their sanctified enclosures and commit themselves in action, or at least word, when the moral imperative demands. So, while endorsing both the Hansen and Bromberg recommendations, I make an additional one: that ACM become our leader and spokesman for all matters of collective concern and interest to the data processing community, even if not direct-

Your computer deserves a Floating Floors system.



Here are five good reasons why Floating Floors elevated flooring systems belong in your computer room:

1. TOTAL ACCESS. Simply lift a panel, and you have complete access to cables. Maintenance is easy. And system changes can be made quickly—with no downtime.

2. NO STATIC BUILD-UP. The floor is completely grounded for safe, worry-free, continuous operation. That's a "plus" feature of non-magnetic aluminum.

3. RUST-FREE ENVIRONMENT. There's no downtime caused by iron oxide infiltration. Corrosion-resistant aluminum won't rust, never needs painting. No paint, of course, means no paint flakes in the atmosphere.

4. TOTAL INTERCHANGEABILITY. Every panel is a match; every one is edge-machined for absolute squareness. They can't bind or seize-up after computer is installed.

5. SAFETY. These panels are fireproof. They're lightweight, easy to lift, won't hurt you if accidentally dropped. Proven application and continuous testing by the company that pioneered free access floors is your further guarantee of total safety.

There are more reasons why your computer should have the best available raised floor system—and your local Floating Floors distributor will be glad to outline them for you. Call him today. Or write National Lead Company, Floating Floors, Inc., Room 4619, 111 Broadway, New York, N.Y. 10006.

National Lead
Floating Floors, Inc., Subsidiary

CIRCLE 11 ON READER CARD

letters

ly related to data processing. I propose that ACM leadership take the measure of the membership on the question of transforming itself into an organization that can represent us in this way. The transformation would necessarily proceed gradually and take time; it would involve the creation of mechanisms both to lead and to represent. We must guard against sophomoric hysteria that takes a position on all issues no matter how trivial, just as we must not be so ponderous that we are unable to take action on matters of importance.

But these are procedural questions that can certainly be resolved if we want to do what I have proposed. I believe we must: the times and the nature of our profession demand it. And the sooner we act, the more likely we are to have the opportunity and privilege of contributing to the formulation of the society we will be leaving to our children.

CHARLES H. BLOOM
Mill Valley, California

turn-around tribulations

Sir:

Re "Matrix Rejects 360/65—Plugs GE 635" (June, p. 19): The contents of the Matrix memo is highly misleading, as it gives the impression that the GE 635 1) would have a faster turn-around time than (any) other third-generation computer; 2) could therefore outperform (any) other third-generation computer in terms of cost per computation; and 3) could do all this because it would be the (only) "true" multiprogramming machine.

This impression is *not correct*, as the originator of the Matrix memo should, and probably does, well know. What may be true is the statement in the memo that Matrix—in cases where it was using its other equipment—has not been able to provide its clients with a shorter turn-around time than the one it was able to provide when using the GE 635. And this might very well be the reason why Matrix found it necessary to place an order for a Univac 1108 computer system—which order, I have been told, was not accepted by Univac.

It would be nice to hear that Matrix wanted the 1108 because it knew only too well that the 1108 is a third-generation computer with *true* multiprogramming, multiprocessing, time-sharing, realtime, demand and batch processing capabilities, and which has, even as a unit processor system, shown that it can consistently outperform the 635 and the 360/65 in

turn-around time with ratios from 2:5 and 3:7, respectively. This can be witnessed by the people from University Computing Co., who, according to reliable information, seem to have demonstrated this fact time and again to their then prospective—and now solid—customers: their clients' benchmark problems were run on UCC's 1108 after comparative runs on the 635's and 360/65's of UCC's competitors in the field of computer utility services.
PIETER R. D'ARNAUD-GERKENS
South Pasadena, California

another terminal

Sir:
Keeping informed on all the new companies and new product developments in an industry such as ours is an extremely difficult job. I would like to do my share to alleviate this by mentioning an omission from the list of low cost remote crt terminals which was presented in the article by Theis and Hobbs (June, p. 22).

ARDS, made by Computer Displays, Inc., of Waltham, Mass., is a stand-alone remote terminal, announced at the SJCC. It sells for $12,750 and has both alphanumeric and full vector capabilities. It has a display area of 6½"×8¼", a spot size of 8 mils normal, brightness of 3 foot lamberts, and contrasts 3:1. It will plot 80 symbols on a line and 50 lines of text or 4000 characters total. It plots the 96 printable symbols of ASCII on a 7"×9" dot matrix. It uses a direct-view storage tube for memory and has a non-storing cursor. ARDS operates at 1200 bps, full or half duplex. A keyboard is standard with upper and lower case symbol characters; no function keys, per se, are included. ARDS includes a vector generator capable of drawing solid or dotted lines anywhere on the screen. Graphic input is optional at a cost of approximately $1200.

Because of ARDS' availability, I must take exception to the statement in the article, "Vector generation and graphic input capability are two features not presently available on low cost (less than $20,000) remote crt terminals."
ROBERT H. STOTZ
President
Computer Displays, Inc.
Waltham, Massachusetts

Sir:
I would like to congratulate the authors of "Low-Cost Remote CRT Terminals" (June, p. 22) for a very thorough and useful survey.

The table comparing the characteristics of a number of terminals were probably derived in some cases from standard literature or form responses from the respective manufacturers. In one characteristic, we were probably at fault, for our literature generally implies that our CC-30 terminal does not have "vector generation." Consequently, the CC-30 was shown, along with all of the other terminals except the BBN teleputer, as lacking this capability. However, in the text of the article, the authors make clear that "vector generation" really means "the means for producing continuous curves on the face of the CRT . . . to indicate time-varying functions or graphic drawings of one kind or another." We would like to point out that the CC-30 is unique among all the terminals listed in the survey in that it does have a "graph mode" which, through selectable dots on a dot matrix, provides graphic output capability along with graphic input capability via a light pen. Many of our users are exploiting this feature, and we believe that our terminal is presently the only stand-alone terminal available in its price range that provides this much graphic capability in addition to the more "standard" alphanumeric features.
SKIP NEWBERG
Marketing Administrator
Computer Communications, Inc.
Inglewood, California

edp in the schools

Sir:
Apropos of computing in the educational system (was the juxtaposition of the Beizer and Tondow articles in the June issue deliberate?), the following is quoted without additional comment from a letter to parents from the principal of what one national magazine has called the No. 1 high school in the U.S.:

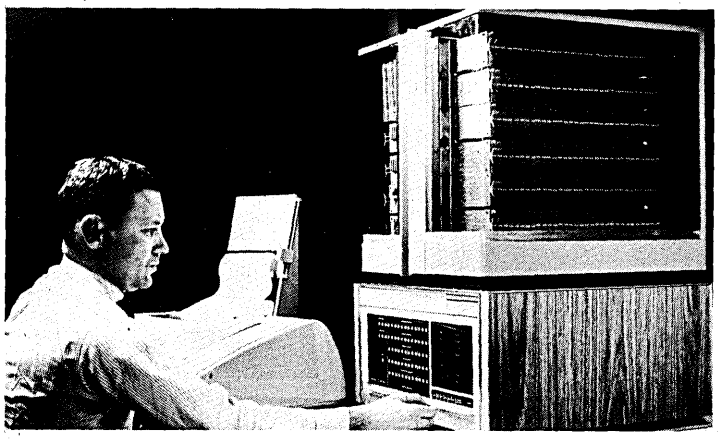
> It has become quite obvious to us this year that once a student's schedule has been arranged by the computer, it is almost impossible to make a change. The computer has been given many new instructions for balancing the schedules next year, and we anticipate an even "smoother" year ahead.

MONROE FEIN
Evanston, Illinois

the man from uncobol

Sir:
With regard to Mr. DeBlasi's comments ("COBOL versus UNCOBOL," June, p. 67) on remarks, notes, descriptive data names and descriptive paragraph names, I am in complete agreement. However, I must disagree with the author's contention that a COBOL pro-

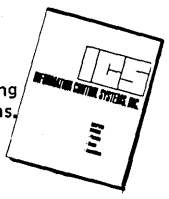
NEW ICS PROGRAMMING LANGUAGES FOR PDP8 LINE SAVE YOU TIME/MONEY, PROVIDE PROGRAMMING FEATURES OF LARGER COMPUTERS!



Two new ICS programming languages insure you of greater utilization of your computer. ALICS (Assembly Language by ICS) offers one tape-pass assembly, relocatable object code, automatic paging. ICS EXTENDED FORTRAN II features fast compilation and execution, a large capacity, provisions for subprograms, and automatically linked relocatable object code.

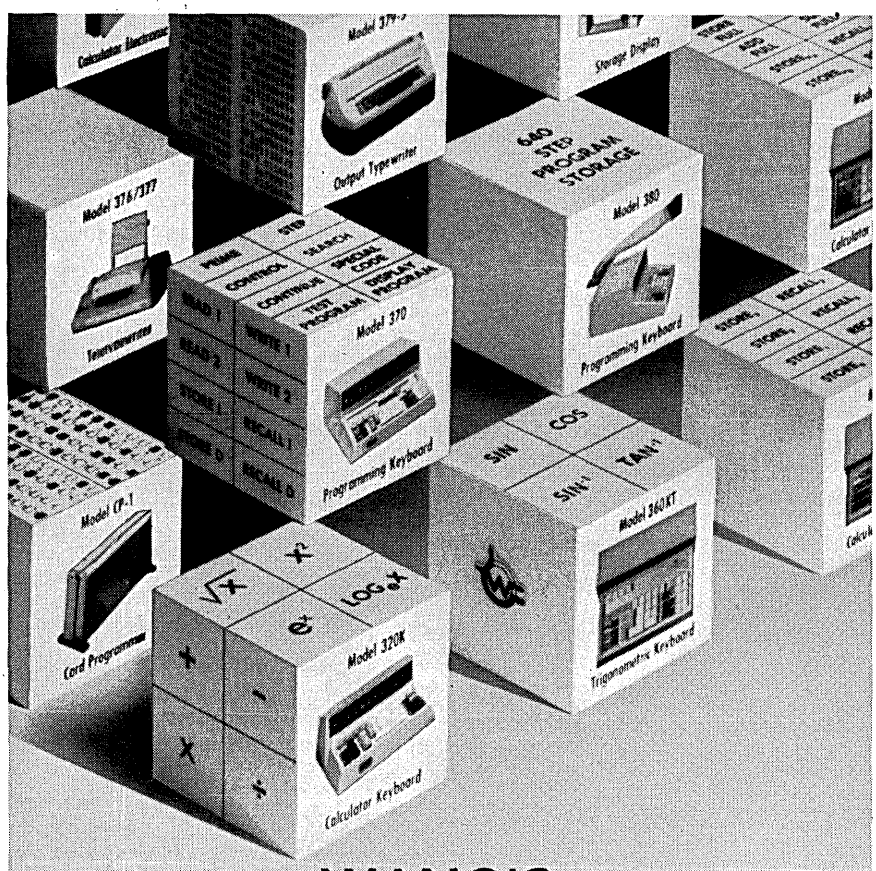
SATISFACTION GUARANTEED OR YOUR MONEY REFUNDED

Write for free brochure describing FORTRAN II and ALICS systems.



INFORMATION CONTROL SYSTEMS, INC.
327 S. Fourth Avenue, Ann Arbor, Michigan 48108

CIRCLE 12 ON READER CARD



WANG'S versatile, expandable calculator/computing systems

A unique building-block approach. You can specify the exact amount of power and versatility you need from a wide range of optional capabilities. (Wang offers more than all other electronic calculator manufacturers combined.)

Obsolescence-proof problem solving. Begin as simply as budget and requirements dictate. Add-on compatibility ensures that your initial purchase is never obsolete. Simply add modular capabilities to match your needs.

You can standardize on 300 Series. A growing number of companies use them to solve everything from basic arithmetic computations to complex equations and programmed calculations. Models 370 and 380 Programming Keyboards branch, loop, do sub-routines, make decisions and manipulate arrays to put true desk top computing power at your fingertips. Each is furnished with the most comprehensive program library available.

No waiting for computer time. Direct accessibility and immediate results on Wang 300 Series enable you to proceed directly to the important areas of analyzing and applying the information generated. Complete Wang systems can be **purchased** at less cost than **renting** a larger, less versatile system for 1 year. For application assistance or an immediate demonstration, call your nearest Wang office.

WANG LABORATORIES, INC.

Dept. 8G, 836 North St., Tewksbury, Massachusetts 01876 • Tel. 617 851-7311

Call today for immediate trial:

(201) 241-0250	(216) 333-6611	(313) 278-4744	(416) 364-0327	(604) 685-2835	(703) 931-7878
(203) 223-7588	(301) 588-3711	(314) 727-0256	(504) 729-6858	(612) 881-5324	(713) 668-0275
(205) 595-0694	(301) 821-8212	(317) 631-0909	(505) 255-9042	(613) 224-4554	(714) 234-5651
(206) 622-2466	(303) 364-7361	(403) 266-1804	(512) 454-4324	(614) 488-9753	(716) 381-5440
(212) 682-5921	(304) 344-9431	(404) 457-6441	(513) 531-2729	(615) 588-5731	(717) 397-3212
(213) 278-3232	(305) 564-3785	(405) 842-7882	(514) 482-0737	(617) 851-7311	(805) 962-6112
(214) 361-4351	(305) 841-3691	(412) 366-1906	(518) 463-8877	(702) 322-4692	(901) 272-7488
(215) 642-4321	(312) 889-2254	(415) 454-4140	(602) 265-8747	(703) 877-5535	(916) 489-7326
					(919) 288-1695

Visit us at WESCON, Booth 3168-69

CIRCLE 13 ON READER CARD

letters

gram should read like "English prose." COBOL is not English; it is a programming language, and jobs coded in this language should be structured logically rather than prosaically.

Although I agree with Mr. DeBlasi's plea for clarity, neatness and thoroughness, I do not agree with all of his techniques. Recognizing the need not to be a dissenter without alternatives, I would like to offer my recommendations:

1. All paragraph names should appear on a separate line and should be preceded by a three digit sequence number. These numbers serve to facilitate locating a paragraph in a large program.
2. All unnecessary commas should be omitted to prevent keypunch errors.
3. Paragraphs should be structured logically, one verb per line, and full use of indentation should be made to illustrate conditional statements. Example:

```
IF CONDITION-A OR
   CONDITION-B
      MOVE DATA-NAME-1 TO
      DATA-NAME-2
      PERFORM CALCULATION-
      ROUTINE
   ELSE
      MOVE DATA-NAME-1 TO
      DATA-NAME-3
      GO TO 120-INVALID-TRANS.
```

   In the paragraph structure shown in the subject article, insertions and changes to the paragraphs are difficult.
4. Data division entries should employ different levels of indentation for each level of data. PICTURE and VALUE clauses should start in the same card columns for each elementary item.
5. All data-names from the same record or work area should be prefixed with the same unique two or three characters. This facilitates ease of location and identification.
6. The use of the ALTER verb stems from the second generation technique of modifying operands in branch instructions. In the event of a program abortion, it is usually difficult to determine the status of an altered GO TO. This verb should always be avoided.

The industry needs a medium to act as a forum for the exchange of opinions on programming techniques. I am glad to see articles such as Mr. DeBlasi's appearing in DATAMATION.

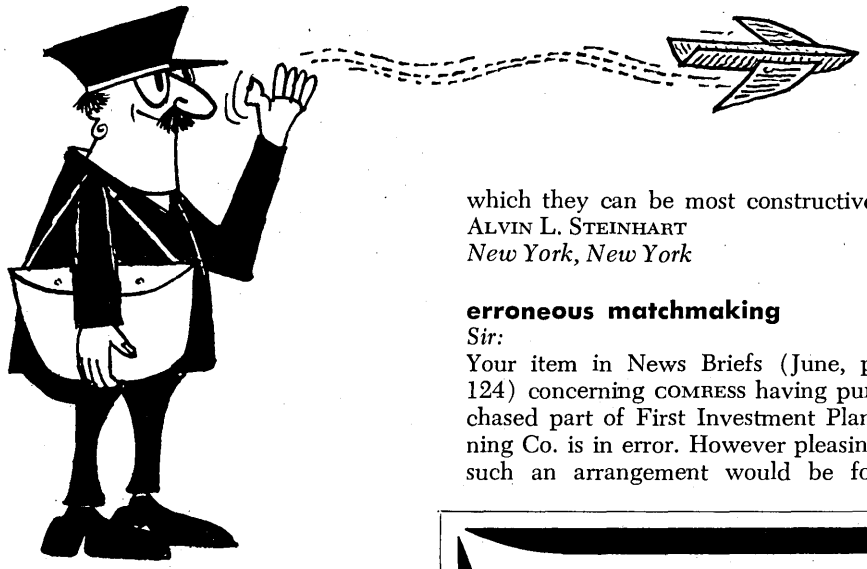
JAMES J. O'DONNELL, JR.
New Brunswick, New Jersey

programming in prisons

Sir:

As president of Datatab, Inc., the first company to employ a graduate of the Sing Sing computer programming course, I was very much interested in your article "First Programmer Class at Sing Sing Graduates" (June, p. 97). However, I feel that the article was inaccurate, and that if your purpose in publishing it was to elicit interest in the program, certain facts should have been emphasized.

First of all, two men—not one—have been released and are now working in the programming field, and neither is



attending further classes, as the training procedures of both employing companies negates that necessity. The money earned by the as yet unreleased inmates, as I understand it, will be channeled through a charity organization to the State Correctional Department to be used for future programming courses taught within the prison system. This, as a taxpayer, I feel is a more practical use for the money than to dole it out to charity.

Secondly, I feel that you should have emphasized that these men (as well as any programming school graduate) will have a rough time breaking into the programming field. Companies just do not have a need for trainees; they need experienced programmers. Therefore, to assure that these men will find employment, it is imperative that they gain some experience in writing programs before their release. Perhaps if this fact were stressed, more companies would be willing to send these men work.

In our case, the man we have employed has proven highly satisfactory, and, we feel, has a very good future in programming. In fact, we have come to the conclusion that the men participating in this program will prove more valuable to a potential employer than the average student for three reasons: 1) they are usually older and more mature; 2) during their training period at Sing Sing they have few outside distractions and concentrate more on their studies; 3) the men chosen to participate in the program are very carefully screened, and only those showing the highest desire and ability to make good are accepted.

This program . . . is doing a great service not only to the programming field, but to society itself. These men need—and are worthy of—a chance to do something constructive with their lives. I believe that this is a field in which they can be most constructive.

ALVIN L. STEINHART
New York, New York

erroneous matchmaking

Sir:

Your item in News Briefs (June, p. 124) concerning COMRESS having purchased part of First Investment Planning Co. is in error. However pleasing such an arrangement would be for COMRESS, I must report that our company owns no part of First Investment Planning Co.

Your choice of companies with which to affiliate us is flattering. COMRESS "firsts" in the field of data processing such as computer management decisions, using simulation techniques and leasing of proprietary software, are well matched by First Investment Planning "firsts" such as the first SEC registration of a computer software company and the first underwriting of a 100% dedicated computer time sharing company.

Careful, you may give us ideas!

DONALD J. HERMAN
Chairman
COMRESS
Washington, D.C.

predicting the unpredictable

Sir:

In Paul Sherer's fascinating review of Dean Wooldridge's book *Mechanical Man* (June, p. 155), he says "Given the means to describe in all detail the state of the universe at any instant, the entire future could be predicted."

Not so. Or, to state my disagreement with a little more precision, given a finite, deterministic universe, it is a physical impossibility to describe, at

(Continued on p. 165)

BOUND BY YOUR PERIPHERALS?

Would you like to go a step further with your operation but can't because additional peripheral equipment isn't available from your original supplier?

Contact **ANN ARBOR COMPUTER CORPORATION.** We supply peripheral equipment to meet any requirement, including card and tape readers and punches, magnetic tape, disc files and drums.

We also supply software.

We don't make computers — we make them work.

ANN ARBOR COMPUTER CORPORATION

A subsidiary of the
JERVIS B. WEBB COMPANY
415 W. HURON, ANN ARBOR, MICH. 48103
Phone: (313) 761-2151

CIRCLE 14 ON READER CARD

CIRCLE 15 ON READER CARD

look ahead

A BIG MIDGET FOR UNDER $5K

Bargain-hunters should watch for a new computer from General Automation (Orange, Cal.), the SPC-8 with 4096 eight-bit bytes of 2.2 usec core selling at $4900. It has three addressing modes, index register, parallel adder, 46 commands, and Teletype interface in the basic package. Another memory module of the same size can be added and some 30 other functional and interface modules are also options.

The SPC-8 is aimed at the OEM market for custom systems, comes with a one-pass conversational assembler, utility system, math package, and test programs. Delivery is in 90 days.

This is the second new computer from the company in six months. There are more than 50 installations of the larger SPC-12.

INTERNATIONAL BUSINESS MACHINES MAY ADD IDDY BIDDY MACHINES

While the Justice Department sits around thinking about the computer industry and the worn-out IBM Consent Decree of '56, IBM is putting up its flag in another new market area. Swift on the heels of full-scale entry into the time-sharing service bureau business (see News Scene, p. 87), early this fall IBM may finally announce entry into the smaller-than-mod 20 computer market. The new model -- the 10 and/or 7? -- is said to compete with Friden and Monroe units aimed at such markets as retailing, education, warehousing.

An observer close to the IBM scene says the firm almost wishes the Justice Department would define areas it can and can't enter: there is always internal turmoil in deciding new directions and in coping with Justice over a project IBM has already invested millions in.

By the way, voluminous cash flow at IBM, created by beaucoup computer purchases, has caused a moratorium on quick-money-making projects.

COMPUTER HISTORY HAUNTS MANUFACTURERS

An electronic components manufacturer, Technitrol, Inc., has litigation in various stages against the U.S. Government, Honeywell, Control Data, SDS, Collins Radio, and Ex-Cell-O. The claim: infringement of one of the most significant, and undervalued, patents in the computer field. The T.K. Sharpless et al. patent ("Magnetic Data Storage Systems", #2,611,813, granted in 1952) covers magnetic disc and drum systems and their addressing and restart schemes, telecommunications, and on-line inventory control via a fixed program.

Technitrol, headed by co-inventor E. Stuart Eichert, has already collected over $1.6 million in royalties from licensees IBM, Sperry Rand, Burroughs, RCA, GE, North American Aviation, and others. Ironically, the "practical" royalty ceiling was set

American Technological Institute
Subsidiary of F. D. Thompson Publications, Inc.
Dept. D, 35 Mason St., Greenwich, Conn. 06830

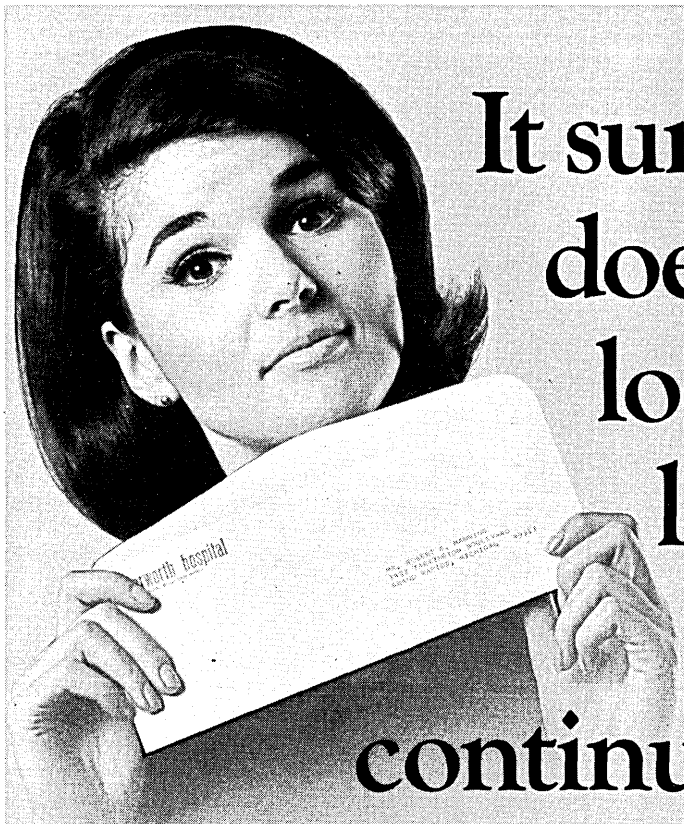
Send me your free catalogue by return mail. I understand there is no obligation and no representative will call.

Name.....

Address.....

City.....

State.....Zip.....



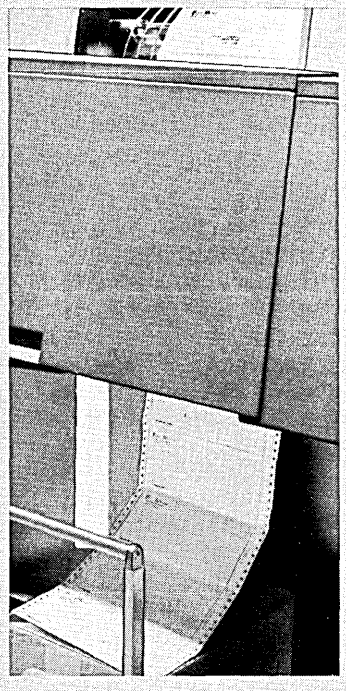
It sure doesn't look like a continuous envelope!

That's the point! Curtis 1000's Chain-O-Matic continuous envelope doesn't look like the ordinary "folded form" type of continuous envelope. Stripped from its carrier sheet it looks like a conventional envelope. In fact it is. So it retains all the valuable personalized appeal of a conventional envelope.

But looks aren't everything. The unique construction of the Chain-O-Matic continuous envelope allows it to run smoothly through computers, run smoothly through inserting and postage metering equipment. It runs better, looks better, is better!

Sound like a better way to handle envelope addressing in volume? It is. In fact that's the way it is with all Curtis 1000 products. We continually look for ways to make each of our envelopes and business forms more useful to you. Help you do a job better, faster, more economically.

Interested? Write Curtis 1000 Inc., Box 28154, Atlanta, Georgia 30328.



CURTIS 1000

making envelopes and forms more useful to you

NEW ADDRESS?

We know you want Datamation to follow you. If you're changing your business address, please use the card at the right and mail it to us **now.** We need your **old** address label, too. Paste it on the card (see instructions) to facilitate handling.

NEW AD

Name

Title

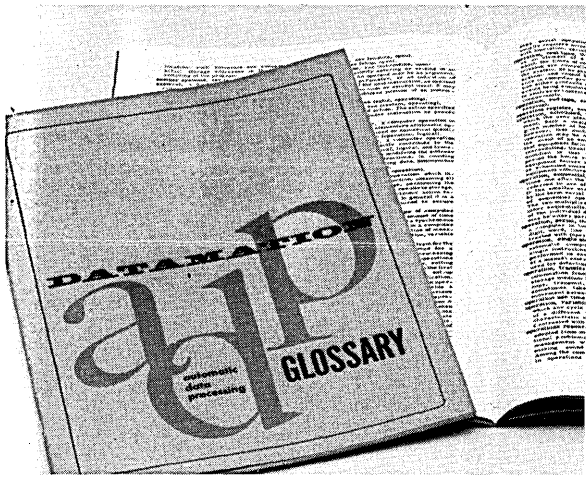
Company

Address

City

Your Sig

DATAMA INFORMAT



Whatever your work in infor
ADP Glossary. It gives you
daily EDP use. It covers the
tronics, communications, sys

This glossary has provided
students as a reference to s
familiarity with the specialis
venience for customer, pros
preparing or evaluating prop

Please use the attached coup

62 pages cross-referenced

$1.00 each

75c *in lots of 10 to 49 copies*

50c *in lots of 50 or more copies*

D

35 A

Plea

Nam

Addı

City

in '52, when an agreement with IBM called for payment to Technitrol of 1/8¢ per bit in each of the magnetic storage systems sold until the sum reached $400,000. This was accomplished within a few years.

The oldest of the current litigation is that against the government, starting in '64. The defense is that the invention was made under the Government-funded contract for EDVAC, which Sharpless managed after Eckert and Mauchley. (Sharpless left the project for Technitrol in '47; the patent was filed in '48.)

In the meantime, the location is the only thing settled in the Honeywell vs. Sperry Rand suit involving SR's ENIAC patent: the Federal District Court of Minnesota in Minneapolis. Both firms, plus co-defendant Illinois Scientific Development (SR's legal subsidiary), are gathering evidence now, but, barring out-of-court settlement, the case won't come to trial for at least a year.

FUND HONORING DR. KING ESTABLISHED

Datamation's June editorial has led to the establishment of "The Computer Industry Martin Luther King Fund." Pratt Institute has offered to set up a four-year scholarship, covering tuition, in memory of Dr. King, and one firm has promised employment to the scholarship recipient. AFIPS has been asked to administer the fund. Contributions should be made out to The Computer Industry Martin Luther King Fund and sent to Wells Fargo Bank, 401 Battery St., San Francisco, Calif. 94111.

H-P TO ANNOUNCE "B" VERSION OF 2116A

Hewlett-Packard's new 2116B digital computer will have twice the memory capacity of the 2116A (8K vs. 4K) and will sell for $24K, just $2K more than its little brother. A machine with 16K memory will sell for $34K. The lower cost is a result of core cost cuts. The 2116B utilizes new Ampex core stacks with circuit boards wired on both sides, reducing the height of the boards from 5" to 3".

The 2116B uses all the software developed for the A, including an Assembler, Fortran and Algol compilers, and Conversational Basic. It uses a 16-bit word, has a cycle time of 1.6 usec and a 3.2 usec add time. The machine is part of H-P's 2000 series, 16-terminal time-shared Basic language system, and will go into production this month. Initial 16-week delivery time is expected to drop as production increases.

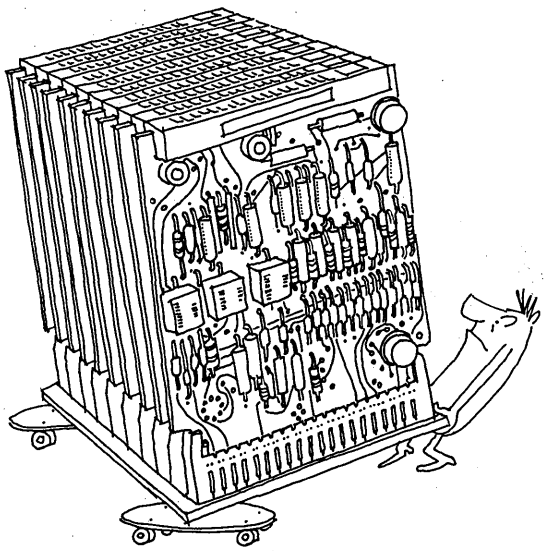
SEC HALTS OTC TRADING IN ATHANA PARENT FIRM

While not to be considered a reaction to Athana's recent 33% price cut on its 1316-type disc packs, the SEC has suspended over-the-counter trading in common stock in Comstock-Keystone Mining Co. (now called Comstock-Keystone Computer Co.), which owns Memory Magnetics Int'l., the Torrance, Calif., manufacturer of Athana disc packs. Athana in High Point, N.C., is the marketing arm. It seems the stock in early June was selling at 15¢ per share and rose to $8 per share by mid-July. SEC said that information on the financial condition and activities of the company is lacking, but a spokesman for C-K maintains that the company is cooperating fully with the commission, has appointed a top accounting house, Peat Marwick Mitchell & Co., to conduct a complete audit, and that the company is sound, the stock situation temporary.

It all began, it appears, when Wes Powers, pres. of C-K and Memory Magnetics Int'l board chairman,

(Continued on page 151)

Our Miniverter™ is out of hand



When we brought out the original MINIVERTER (16-channel multiplexer, sample-and-hold amplifier and 10-bit ADC) on a block small enough to hold in your hand, we thought it would hold you. But it didn't. So now we offer the MINIVERTER in more packages, with more options and more flexibility, but still the same low price.

For example, you can now have a MINIVERTER with 64 channels of multiplexing, a 10- or 12-bit binary or 13-bit BCD ADC, options like mode select and short cycle, register and address indicators, test and calibrate functions, and a power supply—all in a compact 40-module case.

Or one with 256 channels of multiplexing for the really big system, but still in a small package like a standard 19-inch drawer. All three instruments come assembled, wired, tested and ready to use. If you want to do it yourself, you can buy individual A/D, D/A, sample-and-hold, multiplexer and power supply modules.

Raytheon Computer has the only line of analog and digital IC modules that you can use for all your logic, control and interface functions and the only line of packaged IC instruments like the MINIVERTER, ADCs, DACs and others built from the same modules.

Our detailed literature is even more convincing. Write or call today. Raytheon Computer, 2700 South Fairview St., Santa Ana, Calif. 92704. Phone (714) 546-7160. Ask for Data File CB-157.

RAYTHEON

CIRCLE 17 ON READER CARD

editor's read*ut

TROUBLE . . . I SAY TROUBLE, TROUBLE IN DP CITY

There is a slightly ominous note for information processing management in the latest McKinsey & Co. study of computer systems management in 36 major companies.

McKinsey & Co. is a well-known management consulting firm which made a few ripples five years ago with a report which indicated that computers were not being properly managed and that they were not paying their way.

The latest report—"Unlocking the Computer's Profit Potential"—lays waste to the cherished dream that computers create profits. And it doesn't take them long to get around to popping *that* bubble. The second paragraph starts like this: "From a profit standpoint, our findings indicate, computer efforts in all but a few exceptional companies are in real, if often unacknowledged, trouble."

The report acknowledges that "As a superclerk, the computer has more than paid its way." But too many data processing departments are primarily concerned with refining administrative systems and reducing General and Administrative expenses. A breakdown of a typical sales dollar shows that G&A expenses represent only 15¢, while the cost of goods sold accounts for 65¢. Thus, reducing G&A expenses will add 1½¢ to before-tax profits. The same reduction in the cost of goods sold add 6½¢ of black ink.

After a look at soaring edp equipment and people costs (and their distribution), the McKinsey report suggests that top management must take a long, hard look at proposed extensions of the computing activity . . . then sets forth three tests of feasibility by which such proposals be evaluated. Taking a direct hit amidships are three proposals at one firm, submitted without specific cost or benefit estimates, which would have consumed "80 per cent of the computer staff time available for development."

Lack of management exposure to the feasibility concept is cited as one source of current failure of edp to live up to its potential. But edp management and staff get the heavy blows.

The report describes computer department staffs as ". . . typically . . . highly skilled in computer systems design, and their status as professionals is unchallengeable. But they are seldom strategically placed (or managerially trained) to assess the economics of operations fully or to judge operational feasibility." And, says the report, there is no evidence to indicate that "high organizational status assures effective performance on the part of the corporate computer staff."

Some other statements: "Computer professionals alone seldom constitute an adequate corporate support staff." "No top executive is going to turn over the operation of key departments to specialists with little or no operating experience." And: "There was a time, less than a decade ago, when management could afford to leave the direction of the corporate computer effort largely in the hands of technical staff people. That time is past. Yet the identification and selection of new computer applications are still predominantly in the hands of computer specialists, who—despite their professional expertise—are poorly qualified to set the course of corporate computer effort."

The solution, suggests the report, lies in teamwork: "Where top management provides leadership and operating managers actively and enthusiastically cooperate with professional computer staffs, major economic achievements can result."

We agree. And it may be true also that computer professionals are poorly qualified to chart future edp directions. We *do* have a tendency to get bogged down in the details of throughput speeds, cost/performance ratios and other important minutiae.

It's a deplorable tendency. And we suggest that the bright, ambitious computer professional will start taking steps to correct it. You could start by reading the McKinsey report. Mr. Top Management will undoubtedly be giving it a more-than-onceover. Afterwards, he may have some questions for you.

THIRD PARTY LEASING

one alternative

by E. L. MEADOWS

Use of the "third party" lease is gaining rapid acceptance as a means for reducing the increasing costs of data processing facing most companies today. If properly utilized, in conjunction with realistic planning, leasing can produce significant savings for most companies without commensurate loss in operational flexibility. The purpose of this article is to examine third party leasing in sufficient depth to provide managers concerned about the cost of data processing a basis for considering the leasing route to cost reduction.

alternatives for acquiring equipment

Assuming a company has decided the best method for providing data processing services is to install its own computing equipment, there are three financial alternatives for acquiring the equipment: rent from the manufacturer, direct purchase, and lease from a third party. The most widely used alternative is renting from the manufacturer. Acquisition of computers by this means is a somewhat unique way of financing when compared with the methods used for acquiring most of the capital equipment required by most organizations.

The broad use of the rental approach for acquiring computers is the result of several influences. Prior to 1956, IBM only rented its data processing equipment and since then has made little effort to sell, rather than rent. Renting has, therefore, become somewhat of a tradition in the data processing world. In many cases there has been little incentive to break with tradition. It has been much easier for a manager to obtain approval for an increase in his rental costs than for a large capital expenditure to change or upgrade his equipment, particularly when the increase can be easily justified by the savings obtainable from the new applications added.

The high rate of technical obsolescence of the early computers has added to the desire to retain the high flexibility renting seems to offer. Add to this the large amount of equipment rented by companies engaged in government contract work where there was almost no incentive to purchase and the practice of renting by governmental agencies, and it is easily seen how the renting tradition was established.

Recently, however, many companies have begun to question whether the higher cost of renting their computers from the manufacturer really buys them very much in protection and true flexibility, and consequently have begun to either lease from third parties or purchase their equipment outright. The government also has begun to press for purchase, both by its own agencies and by companies doing substantial work for it. The capacity gains obtainable from the latest generation of equipment are far less dramatic than experienced in the switch from vacuum tube machines to transistorized core memory equipment giving indication that the rate of technical obsolescence may have slowed. While there are undoubtedly many unique aspects in every company's data processing requirements and plans, the acceptance of the rental route—without serious consideration of leasing or purchasing—can mean substantially higher costs for data processing.

two types of leasing

In considering leasing versus either renting or purchasing from the manufacturer, a distinction must be made between two types of leasing. One type is the "full payout" or "financial lease." The other is the "non-payout" or "operating lease."

The full payout lease is actually a method of financing the purchase of a capital asset. This method was available long before computers came on the scene and is used to acquire many types of equipment other than computers. The lessee has essentially all the rights of a purchaser and

Mr. Meadows is vice president and regional director of Computer Leasing Co., a division of University Computing Co., in Washington, D.C. Prior to this recent appointment, he held several dp management posts with Union Carbide. He has a BS in chemical engineering from Syracuse and an MS in CE from West Virginia Univ.

assumes the same risks he would as a purchaser. For computers the lease must usually extend more than five years for the monthly payments to be less than the normal rental payments charged by the manufacturer or the lessee may be faced with a large one-time payment at the end of the lease term. During the lease term the lessor recovers the total cost of the equipment, plus a rate of interest equal to or higher than the lessee might obtain on a direct loan, plus an additional fee of .5% or higher. A variety of early termination provisions are obtainable; however, regardless of the option selected, the lessor always recovers the cost of the equipment plus interest and the fee. In the full payout lease the lessor, therefore, assumes *absolutely no risk of obsolescence* and is in reality simply making a loan for purchase of the equipment. He assumes no more risk than any financial source the user might utilize. In some cases, despite the fact that the lessee has in effect purchased the equipment, title for the equipment may remain with the lessor at the end of the lease and he may not ultimately own it or even have an option to buy it. The reasons why a full payout lease might be preferred over other means of acquiring capital for investment are entirely financial in nature. The decision to obtain a financial lease should only be made on a financial basis following a decision by operating management to purchase rather than rent the equipment.

The non-payout or operating lease is comparable to rental; the essential difference being the length of the commitment. With this type of lease, the term is generally two to five years and the rentals charged are 10-20% less than the manufacturers' rentals. The shorter terms do not allow leasing companies to recover the full cost of the equipment during the lease term and they are forced to assume risks of obsolescence, relying on their ability to lease or sell the equipment to a second user to ultimately recover their costs and to make a profit. The rates charged depend upon many factors, but primarily the length of the lease term, the cost of the equipment, and the residual value anticipated by the leasing company at the end of the lease term. Typically, on new equipment the rates scale down from 90% of manufacturer's rent for a two-year lease to as low as 80% for a five-year lease. This scale down has a sound business basis since the leasing company is taking less risk on the equipment as the lease approaches a full payout lease, and it can anticipate lower remarketing expenses. The practice of the manufacturers of crediting part of the rentals paid by the user toward purchase of the equipment can substantially reduce the cost of the equipment to the leasing company and allow lower rates on systems that have been installed for some time.

It is important that an organization planning to lease its data processing equipment recognizes the difference between these two types of leasing. With the financial lease, the lessee commits himself to purchase the equipment (even though he may not actually own it at the end of the term).

With the operating lease, the lessee commits himself only to a series of rental payments over the term of the lease, and to nothing more. To compare the rentals charged by these two means is somewhat meaningless since the objectives of the two are different, as is the position of the lessee at the end of the lease term.

financial comparisons

In a typical computer acquisition study, a great deal of effort is spent comparing equipment costs versus performance for the various systems under consideration. Often the selection of a particular system results from relatively small, and unsubstantiated differences in price performance ratios. A much lesser amount of effort devoted to consideration of the financing alternatives for acquiring the equipment can result in considerably greater savings than might ever be available from selection of one system over another. While selection of the financing alternative can generally be deferred until after the equipment selection has been made, the savings available through leasing may be the key to cost justification of the proposed change. In any case, the financial analysis should include an evaluation of alternatives. A comparison of purchase versus renting from the manufacturer may show a return attractive enough to favor purchase; however, extending the comparison to include third party leasing versus purchase may prove purchase unattractive.

To provide an indication of the relative attractiveness of the three alternatives, a cash flow analysis of a typical acquisition situation has been made. For the purpose of the analysis, it has been assumed that the equipment selection has already been made and only the method of financing is being studied. For the equipment selected, a large third generation computer, the following relative prices are quoted by the manufacturer.

Purchase Price	$1,000,000
Monthly Rental	23,260
Monthly Maint.	1,397

The actual prices have been converted to a one-million-

dollar basis for convenience in interpreting the results.

A cash flow analysis for the three alternatives is shown in Table 1. In order to compare renting or leasing with purchase, the cash flows must be obtained on an after-tax basis. Each column of the table shows the cash flows resulting from following each alternative for a particular year. A minus sign in front of a number indicates a payment or an outflow of cash. A plus sign indicates an inflow of cash. The analysis covers an eight-year span, assumed to be the maximum economic life of the equipment.

The annual cash flows for the rental case are simply the after tax cost of the annual rental payments. To be conservative, it was assumed the system will only be used for a single shift or at least is not subject to additional rentals for over one shift of usage. The leasing alternative assumes unlimited use of the equipment for 85% of the manufacturer's rental. For both these alternatives a 48% tax rate was assumed.

Obtaining the true cash flows for the purchase alternative is somewhat more complex and requires some assumption regarding property taxes, insurance rates, and the method used for depreciation. It was assumed that the equipment would be depreciated using the sum-of-digits method which provides higher depreciation charges during the early years, declining as the equipment ages. This method, besides providing for an earlier return of invested capital, is certainly in keeping with the high obsolescence rate incurred with computers. In renting or leasing, property taxes and insurance are normally paid by the lessor; however, if the equipment is purchased, these represent an additional cost to the purchaser. A declining schedule of these two costs combined (starting at 1.2% of the purchase price) was used. The effect of the investment tax credit has been omitted since this is not always available, and is subject to negotiation between the lessee and leasing company.

For purposes of later discounting the cash flows, a year zero is shown to represent the timing of the initial purchase payment. After the initial payment, the purchase alternative actually generates a cash inflow every year since the tax credits accruing from depreciation are greater than the after tax costs of maintenance, taxes and insurance.

Having obtained the annual cash flow amounts it is possible to compare the true cash position difference between alternatives. The total annual cash flow differences were obtained by adding the cash inflows from the purchase alternative to the outflows of the rent and lease alternatives. Summing these differences by year provides a running picture of the cash position of purchase relative to the other two alternatives. A comparison of the accumulated cash flow differences shows ostensibly that it requires approximately four years and eight months for purchase to break even with renting and about five years and four months for purchase to break even with leasing. Such a conclusion is misleading since neither the time value of the money invested nor the possible return from sale of the equipment have been considered up to this point. Simply requiring that the dollars invested in the purchase alternative at any time return a minimum of 6% simple interest lengthens the time required for purchase to break even to five years and seven months versus the renting alternative and to six years and seven months versus the leasing alternative.

These break-even times assume the equipment will have no value at the end of the use period. To be realistic, it must be assumed that the equipment will have some resale value dependent on the age of the equipment. Assuming a high resale value, of course, favors the purchase option, while assumption of a low value favors leasing. It is reasonable to assume, because of the technical obsolescence factor, that the decline in resale value will be high in the early years of the equipment's life, probably slowing down somewhat as the equipment ages. A safe, but not particularly conservative approach, would be to assume that the book value of the equipment, obtained by the sum-of-digits method over an eight-year life, is representative of the true resale value. It should be noted that this is considerably more optimistic than the four- or five-year life used by the manufacturers.

ANNUAL CASH FLOW CALCULATIONS
(All Figures in Thousands of Dollars)

	0	1	2	3	4	5	6	7	8
Rent From Mfg.									
Annual Rentals		−279.1	−279.1	−279.1	−279.1	−279.1	−279.1	−279.1	−279.1
Tax Credit		+134.0	+134.0	+134.0	+134.0	+134.0	+134.0	+134.0	+134.0
After Tax Cash Flow		−145.1	−145.1	−145.7	−145.1	−145.1	−145.1	−145.1	−145.1
Lease From 3rd Party									
Annual Lease Pymts.		−237.3	−237.3	−237.3	−237.3	−237.3	−237.3	−237.3	−237.3
Tax Credit		+113.9	+113.9	+113.9	+113.9	+113.9	+113.9	+113.9	+113.9
After Tax Cash Flow		−123.4	−123.4	−123.4	−123.4	−123.4	−123.4	−123.4	−123.4
Purchase									
Purchase Price	−1,000.0								
Maint. Costs		− 16.8	− 16.8	− 16.8	− 16.8	− 16.8	− 16.8	− 16.8	− 16.8
Insurance & Prop. Tax		− 12.0	− 10.5	− 9.0	− 7.5	− 6.0	− 4.5	− 3.0	− 1.5
Tax Credit (from costs)		+ 13.8	+ 13.8	+ 12.4	+ 11.7	+ 10.9	+ 10.2	+ 9.5	+ 8.8
Tax Credit (from Deprec.)		+106.7	+ 93.3	+ 80.0	+ 66.6	+ 53.4	+ 40.0	+ 26.7	+ 13.3
After Tax Cash Flow	−1,000.0	+ 91.7	+ 79.1	+ 66.6	+ 54.0	+ 41.5	+ 28.9	+ 16.4	+ 3.8
Cash Flow Differences									
Purch. Instead of Rent	−1,000.0	+236.8	+224.2	+211.7	+199.1	+186.6	+174.0	+161.5	+149.0
Purch. Instead of Lease	−1,000.0	+215.1	+202.5	+190.0	+177.4	+164.9	+152.3	+139.8	+127.2
Cumulative Cash Flow Differences									
Purch. Instead of Rent	−1,000.0	−763.2	−539.0	−327.3	−128.2	+ 54.4	+232.4	+393.9	+542.9
Purch. Instead of Lease	−1,000.0	−784.9	−582.4	−392.4	−215.0	− 50.1	+102.2	+242.0	+369.3

Table 1

Assuming a computer will continue to have a resale value after five years puts a purchaser in the position of speculating on the equipment to a greater extent than the manufacturer is willing to do.

To make the analysis complete, it is also necessary to introduce the time value of money. This can be done simply by discounting the annual cash flow amounts. Tables of discount factors are readily available. In doing the discounting, factors for continuous flows should be used for the annual cash flows since most of the payments are monthly in nature, and end-of-year factors for the final sale of the equipment. Table 2 shows how discounting may be applied to the purchase versus lease alternative. The annual discounted cash flow for any year was obtained by multiplying the after-tax cash flow by the continuous discount factor for that year. The cash position after tax for any year the equipment is finally sold can be obtained by adding the discounted sale price to the sum of the discounted annual cash flows through that year. The last column shows that it will require approximately six years to reach the break-even point if the money invested in the equipment is to earn 6% interest.

It is possible, by a series of trial and error computations, to determine for any acquisition study the interest rate earned through purchase rather than third party leasing, or renting from the manufacturer for equipment held for a given number of years. A series of such computations were made based on the above example. The results are shown graphically in Fig. 1. The graph shows the after tax rate of interest earned on the money invested in the equipment versus the length of time the equipment remains installed. The upper curve shows the interest earned from purchase rather than renting from the manufacturers. The lower curve shows the interest earned through purchase rather than third party leasing. Both curves assume the equipment can be sold at the end of any year for the book value based on eight-year sum-of-digits depreciation.

return close to the cost of money, the availability of the third party lease makes purchase generally unattractive for most organizations.

flexibility

Because renting from the manufacturer is always more expensive than third party leasing, a careful evaluation of the flexibility obtained for the higher price may lead to substantial savings. Leasing clearly offers a flexibility for equipment change somewhere between the one-year contract offered by most manufacturers and purchase. Each company must determine for itself the types of flexibility needed and then utilize the acquisition alternatives which can provide the flexibility at least cost. This may result in a mixed strategy in which some units, such as the peripherals, will be rented from the manufacturer, while other units will

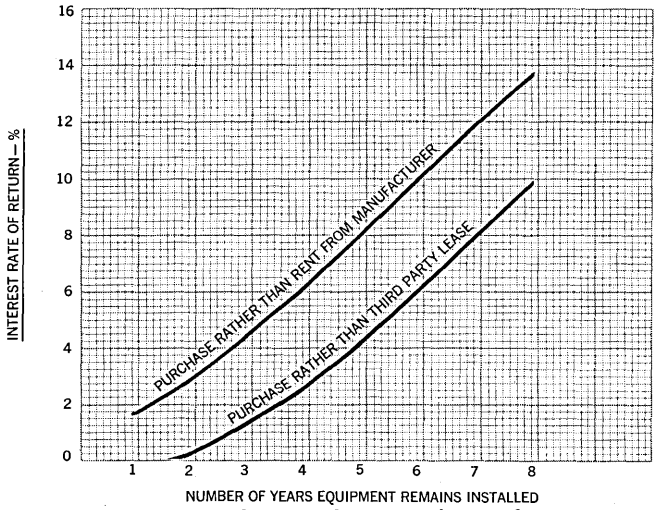


Fig. 1. Interest rate of return from purchase of equipment rather than renting or leasing.

DISCOUNTED CASH FLOWS & CASH POSITION

PURCHASE INSTEAD OF LEASE AT 6% INTEREST RATE
(CASH FIGURES ARE SHOWN IN THOUSANDS OF DOLLARS)

Year	After Tax Cash Flow	6% Discount Factors Continuous	Discounted Cash Flows Annual	Discounted Cash Flows Cumulative	Assumed Sale Price	6% Discount Factor End of Year		Disc. Sale Price	Cash Position After Sale
0	—1,000.0	1.000	—1,000.0	—1,000.0					
1	215.1	.971	+ 208.9	— 791.1	777.8	.943	+	733.5	— 57.6
2	202.5	.916	+ 185.5	— 605.6	583.4	.890	+	519.2	— 86.4
3	190.0	.864	+ 164.2	— 441.4	416.7	.840	+	350.0	— 91.4
4	177.4	.816	+ 144.8	— 296.6	277.8	.792	+	220.0	— 76.6
5	164.9	.769	+ 126.8	— 169.8	166.7	.747	+	124.5	— 45.3
6	152.3	.725	+ 110.4	— 59.4	83.4	.705	+	58.8	— .6
7	139.8	.685	+ 95.8	+ 36.4	27.8	.665	+	18.5	+ 54.9
8	127.2	.646	+ 82.2	+ 118.6	0	.627	+	0	+118.6

Table 2

This analysis shows that the maximum interest rate (versus leasing which is the least expensive alternative) that can be obtained on money invested to purchase computing equipment is approximately 10%. And this is only possible if the equipment is retained for at least eight years. If a company plans to keep its equipment for, say, five years, the after tax interest rate of return on the money invested to purchase the equipment would only be 4%, and this requires a greater speculation on the resale value of the equipment than the manufacturer is willing to assume. While purchase may be attractive versus renting from the manufacturer for organizations willing to accept a rate of

be acquired on a third party lease. It may even be attractive to purchase some equipment, if both a long useful life and good resale value can be predicted.

Because of the long delivery time for new equipment, many companies are paying for flexibility considerably beyond what the manufacturers can provide. In many cases, even if the new equipment could be delivered the anticipated flexibility may not actually be available because of the magnitude of the reprogramming effort required to make the conversion. Third party leasing can be the means to obtain a reduction in costs without losing any significant amount of flexibility. ■

AN INTRODUCTION TO LEASING

there's money in it

by ANGELINE PANTAGES

After our weeks of surveying the computer leasing industry, if someone asked what impressed us most, our initial response would be: that Harvey Goodman owns stock in his firm, Data Processing Financial & General, that's now worth over $30 million; that Saul Steinberg, at 30, has "grown out of" the presidency of Leasco and is now Chairman of the Board; that John Randolph (Randolph Computer Corp.) drives a 1929 Rolls Royce.

Mercenary. But the "rumor" of gold has helped drive at least 80 firms into the third-party computer leasing business—most in the last three years. And thousands of investors have flocked to the market to make outlandish gains on lessor securities. The basis for this glamorous subindustry has been a financial game of borrowing, buying computers, leasing them at less than manufacturer rental—borrowing more, going public, buying, leasing, etc., etc. At the beginning of 1968, the total dollar value of equipment on third-party lease was estimated at around $400 million. Major firms like Greyhound Computer, Leasco Data Processing Equipment Corp., DPF&G, Levin-Townsend, Randolph, and others indicate that by year's end each of them will have from $80-200 million in systems installed. Conservatively, the market total by that time should be bulging toward $1 billion—75-85% in IBM 360's.

The words "financial game" inadequately describe the diverse and complex industry now evolving. Further investigation and the senses are assailed. The economics are confusing; there is talk of depreciation, residual, investment tax credit, financial and operating leases, straight-line and sum-of-digits reporting methods, prime rate, floating rate. Many of the companies themselves, once characterized as one- or two-man operations with financial and/or dp expertise, now appear to have diffused. Lessors are making alliances with natural partners, like software firms, service bureaus, banks, financiers, insurance companies, other lessors; and there are not-so-natural partnerships, with real estate investors, movie makers, and Exquisite Form. There is the knotty discourse and struggle between the lessor and his prime provider, IBM, who gives and also takes away. And under all this, there's the user, seeking a leasing "bargain," a lessee's market, if he can understand what it's all about.

in the beginning

The leasing industry owes its existence to four major factors:

1. The Consent Decree of 1956 levied on IBM by the Justice Department. It required the firm to sell as well as rent its systems and to set a sales price with a "commercially reasonable" relationship to its rental charges. Further, maintenance services must be offered to all users at equal price and terms.

2. The introduction of increasingly reliable machines, including second-generation equipment, and the development of the long-life family concept in third-generation equipment.

3. The pioneering efforts (1961-1965) of Carole Bumpers, Jerry Trautman, D. P. Boothe, Jr., Randolph, Goodman, Howard Levin, and James Townsend in proving to the moneylenders that computer leasing on a non-full-payout or operating lease basis was a profitable risk.

4. The tight money market of 1966. This squeezed many lessors, but it also pushed manufacturers to encourage purchases to obtain greater cash flow. IBM was particularly in a bind, as it had prepaid a large loan just before the interest rates went up. Although it increased the down payment on systems 10% to 25% in October of that year, it also lowered purchase prices and increased rental prices. The IBM blessing was on purchases.

But the situation that created a natural climate for computer leasing is changing—both because of the evolution of computer life and the policies of those who control it. These factors and the direction of most of the firms in leasing should become more and more evident this year. In fact, several firms have been preparing for this change in the last year or two.

Both the problems and related trends in this industry might fall under these categories:

The end of massive buying of third-generation systems for leasing firms

IBM and its sales and administrative policies

IBM and its intermediate set of computers

Correspondingly, what to do with "comeback" computers (re-leasing) . . . and IBM

Stiffening competition among lessors

The effects of a tight-money market

cutting back

Essentially, the honeymoon with the 360's is almost over. Heads of major leasing firms, like Randolph Computer Corp., Levin-Townsend, and Granite Computer Leasing, say that their massive buying of 360's will end this year or mid-1969 at the latest. The reason is simply that most lessors count on at least six years of leases on a system (two to three contracts for most) to recoup their original investment plus the cost of money and other expenses. Taking relatively short-term contracts on these systems after this year means higher odds against being able to continue leasing a system at their current prices for that period. Although they figure on a 10-year life (most depreciate over 10 years with 15%-0% residual), one user says the life of leased computers at original rental is more like six or six and a half years.

This does not mean that they will never lease another third-generation system, but that the method of operation will change—possibly to a minimum four-year lease or full-payout (five years or more). This will vary from model to model, too. The larger systems, like the 65 or 85, may be taken by some lessors on shorter leases simply because the gamble is good that the user, once he has invested in software development for such a system, is likely to renew and maintain it for several years. Models like the 20 are not generally favored by the lessors, in any case, and most who deal in it will only handle it for a longer term.

Several lessors who have not yet done so will be examining the non-IBM systems, including those of smaller manufacturers. (Granite Computer Leasing just announced in July that it would lease computers and instrumentation of Varian Data machines.) Most of these will be handled, as in the past, on full-payout leases. But there are exceptions. For example, one lessor says that if any manufacturer agrees to repurchase the system if it cannot be re-leased, he may take such systems under shorter leases. (Skeptics say the computer maker isn't likely to do this, except under exclusive agreements.) The application area is another factor. Short-term contracts in application areas like plant automation and process control are becoming increasingly attractive to lessors, regardless of computer make. The reason: such applications involve such a massive investment that long life for the system is almost guaranteed. Indeed, some firms, like Systems Capital Corp., are going after leases involving all plant equipment used in the automated system.

Another area developing for next year is agreements with and possibly buys (perhaps part ownership) of peripheral manufacturers, so that the lessor can configure less expensive, high-performance peripherals around a basic IBM cpu. This will be discussed more later.

ibm and its policies

IBM's sales and pricing policies have fluctuated over the last few years. Some have squeezed lessors; others loosened the vise. In 1965, IBM, noting that obsolescence was no longer a major factor with its equipment, eliminated its depreciation policy on all equipment—including 360's, second-generation computers and punched-card equipment. This had little effect on the computer lessors, although 360 depreciation would have meant more profits. But it did serve to damage punched-card equipment lessors, like Management Assistance, Inc., which had developed its own service organization. Policy for the 360 then amounted to an option to buy after one-year rental at up to 12½% off purchase price.

As noted, in 1966, IBM increased the down-payment requirement from 10% to 25%, decreasing the payment period from 60 to 48 months—because of its cash flow problems. At the same time, it decreased the purchase price on 360 systems, while increasing the rental, a plan designed to encourage buying.

In 1967, IBM removed the ceiling of $7.5 million in credit on purchases, declaring that each request would be treated on a case-by-case basis. The lessors interviewed say this has not hurt at all, but helped in some cases.

In the fall, '67, IBM ended a "free ride" it had been giving lessors and other purchasers by changing its billing policy: all payments on purchased systems are due on date of installation. (In the case of a system switching from rental contract to purchase, it's due on the effective date of purchase.) The invoicing department at IBM had become so bogged down with paperwork that its bills were going out late. Under previous IBM policy, theoretically, down payments on systems purchased under time payment were due on "effective date" of purchase; payment on outright buys was due within 30 days of this date. But "effective date" actually was time of the receipt of invoice, which often came up to a month late. Thus the lessor could collect rent on an installed system for 30-60 days without having paid IBM a borrowed dime or paid interest and principal to the lender. If one figures just two months' interest on a $1 million loan at 7%—almost $12,000—the loss resulting from the new policy becomes staggeringly apparent.

As lessors and other buyers poured money into the Fortress, IBM became disturbed over its increasing cash flow, and took measures to stem it. To rally its salesmen to rental, IBM declared in a January 1968 letter to the sales force that third-party lessors were to be considered competitors. (And since IBM will not discuss competitors with the press, the firm was not interviewed on the leasing field.) IBM also increased the salesman's responsibility for keeping an on-rent computer at the first installation from two to four years. The terms of the salesman's liability (whether he loses all of his commission or part) are not clear, but essentially he cannot breathe easy that his commission won't be charged back against him for four years. This policy, say some lessors, is not likely to stand the test in the field. (Rumor says some salesmen are looking for new jobs because of it.) And no policy is without exception.

Why declare leasing companies competitors? Keeping purchases down is one reason. But some salesmen have been unwisely using third-party firms to assure contracts, says a lessor. And since few lessors deal in much other than IBM equipment, IBM does not want to rile other manufacturers to the point of anti-trust claims.

turnabout's fair play

On the other hand, the ways of IBM are wondrous, and springtime saw two new policies that delighted lessors. In April, the 360 maker wrote them all: "We are pleased to inform you of the establishment of the Leasing Company Relations Department" within the Data Processing Division. The essential function is "to insure an effective relationship between IBM and purchasers of its equipment." Richard Urfer, president of Diebold Computer Leasing, read this as somewhat of an about-face.

IBM again indicated it's "nice people," as one lessor quipped, with the more poignant policy change that came in May. From now on the second user of a purchased system will receive free training and programming support. (The latter means basic operating programs, corrections, and updated revisions.) This particularly means the lessor can more strongly attack the market of new or inexperienced computer users with the systems that are returned at the end of a contract. As Harvey Goodman told the Wall Street Journal, "Many potential customers were reluctant to do business with us, because of the stigma of being a second user, but now we can go after 100% of the market,

instead of 10%."

The reasons for this change are many. The lessors, both privately and through their leasing association, have discussed with IBM the long-term effects of its policies. Goodman reportedly was preparing to sue the manufacturer for violation of the Sherman Anti-Trust Act because it did not service second users. Just as important, if IBM is worried about the used computer market that is cropping up and the competition it faces from lessors, it must in turn be worried about what will happen if it makes it too difficult for these firms to re-lease their equipment. "Worst case" would be a price war.

It must be noted that IBM does not provide the second user with systems engineering help under this policy. This would be a costly proposition and strain the already critical manpower situation. Training and basic programming support, says one observer, are not big investments and they provide IBM with a *very valuable* benefit: the contact and working relationship with the previously remote second user.

What IBM may do still keeps the industry wondering. Lessors discount the idea of a long-term lease. Right now IBM has straight one-year rental contracts with 90-day termination clauses. A long-term lease, in order to be effective against lessors, would have to offer a discount of 10% to 20% off original rental, and that would rob IBM of a maximum $200-$400 million a year if its annual rental revenues are the estimated $2 billion. The rumors have flown—in the press, on Wall Street, in the industry—that IBM is pilot-testing a long-term lease, that IBM will form a leasing subsidiary, or that IBM will come up with short-term leases of six months, nine months, a year, aimed at the user who's already had his equipment in for the first year. Is it conceivable that IBM would couple the policy of the salesman's four-year responsibility for a first-user rental with some deals that would help both IBM and the salesman keep it in that long? It is impossible to tell what is feasible and what is nonsense. Again, the leasing firms feel the liaison department and support policy are signs that IBM isn't planning a damaging move.

ratio juggling

The recent introduction of the model 25 with a 64:1 purchase:lease ratio vs. the 48:1 ratio of the 30 (prices configured on equivalent cpu and memory) is, say lessors, the most effective move IBM has made against them. They are not happy about it and have pointed out this "discrepancy" to IBM. Says Goodman, "We suspect IBM will find when it prices this way, it won't sell as much as it has," and conceivably the Justice Department will take a "dim view of it." DPF&G, for one, won't write a lease on this new equipment without a normal rate of return. In other words, the user will save less on a lease. Several lessors indicate they will treat the 25 and other systems introduced with the same pricing only on four-year or full-payout leases.

Where there's a 25—a 35 or 37, a 45, a 58 are sure to follow, say observers. Lessors say these are not really a threat to the rest of the current models; instead they are ingeniously being slid into the line, offering different capabilities and applications from their even-numbered kin. Speed, they claim, is not that important to most applications, so the improved price:performance offering of the intermediate systems won't start a stampede away from current installations. And IBM delivery time on any new systems will determine impact.

Randolph Computer Corp. commissioned A. D. Little to analyze the prospective life of current 360 models. The report was completed before the announcement of the 25, 85, and cheaper, slower version of the 20, but nevertheless offers conjectures on their impact. The report sees little decline in value of the 30, 40, 50, and 65 up until 1978. But the 20 (the report says a slowed-down version by 1972?) will dip in value to 50-70% of original price before 1978; the 75, beat down by the 85, will fall to 10-40% of original value; the scientifically oriented 44, an easier machine to abandon because of "relatively simple FORTRAN programs," will drop to 30-50% of original price. The model 40 is the most vulnerable of the stronger systems, particularly because a 35 or 37 will impact it (and, say others, so would the rumored time-shared 58). A. D. Little basically concludes that present IBM users of batch processing configurations are happy with these systems and are likely to keep them for several years. But IBM hasn't produced what the user wants in disc-oriented random-inquiry systems, so the larger 30's and 40's are likely to be replaced. The report feels that Randolph and other lessors will not have problems reconfiguring these returned systems for the ample batch processing market.

the secondary market

The IBM policies and the introduction of new systems all relate, as noted, to the used or secondary market. Significant returns of computers on third-party lease should begin next year. One user notes that he has already been offered two "used" systems by a lessor: a 360/40 on a two-year lease for 23% off IBM rental (current norm is 10%), and a 360/50 for 30 months at 31% off rental (normally about 12%). Both are without peripherals; both supplement existing systems.

The parties to this game stack up like this: the lessor who wants badly to keep his equipment on lease, or at least to sell; IBM with returned 360's to re-install at original prices and with newer models for current users to "grow to"; the user-owner who, through his used equipment broker, puts a machine on the market for purchase; and, of course, the other manufacturers, some with their own leasing arrangements, such as GE, SDS, and Honeywell. All these machines won't hit the market at the same time. But 1970-71-72 should be crucial years, since even many full-payout leases written by banks, insurance companies, and private tax partnerships will be coming to a close.

If the user experience noted earlier is an indication, there could be a price war. But neither lessor nor manufacturer want that, at least not until later in the game when the lessor has received his return on investment and made some profit. For now, there are several conceivable markets for the lessor's equipment. First, they generally claim that they have selected their customers carefully enough (many boast large blue chip companies) to know that many renewals are forthcoming. Second, the equipment returned will have a sizable market among large users who want to increase capability by adding a second cpu to their system. This will eliminate any problems of support.

If, as A. D. Little reports, the lessor will find a market in the batch processing user, in some cases this will be a new or relatively unsophisticated user. Most leasing firms are not geared up for "hand-holding" this group through the turmoils of conversion to a computer. The IBM support for second users will help, as said, but more will be needed. Lessors are developing, in part, some strong software and service bureau capability, which, until now, has operated independently of the leasing activity. Indications are that perhaps application packages for some industries and other services will be available to the lessee, although it is not clear how these services will be tied together financially. (A more detailed explanation of what some firms are doing will be given later.)

a new home abroad

A new opportunity that should develop in first and second-user systems is the overseas market. This could be a major dumping ground for everyone. Leasco says the European leasing market alone should rival that in the U.S. by 1975. This firm made the first major move among lessors late last year by setting up its subsidiary Leasco Europa Ltd. with a $15 million line of credit. What has held other firms back is the Presidential edict this year against overseas investments. (Leasco squeaked through with its dollar requirement before the deadline.) But early in June, things started happening. Again, Leasco, now with Bankers Trust Co., set up the first Australian leasing company, Data Systems Management Corporation Pty. Ltd. (Bankers Trust, through its subsidiary Bankers International Corp., owns a majority interest.) At the same time, foreign subsidiaries and affiliates of Greyhound Leasing and Financial Corp. (Greyhound Computer parent) and Continental Illinois National Bank & Trust Co. joined to form Leasing Italiana in Milan. This firm will lease several kinds of equipment, including computers, on 3-5 year contracts. Diebold Computer Leasing, Levin-Townsend and others are also gearing up for overseas activity.

The government's attitude toward leasing its computers is favorable, but so far there has been little action. The one-year contracts to which it is bound are a disadvantage. The implementation of the revolving fund could change this, but the Vietnam war still precludes near-term hope for this.

And there are those markets that exist for any computer maker or lessor. In-house placement looms large for some lessors. Greyhound Corp., owns about 80 firms, none of which now lease from Greyhound Computer. Randolph Computer Corp. already has an on-line savings and loan service in its United Data Processing, Inc., center in Cincinnati and more such services are planned for small metropolitan areas around the country. Leasco recently announced formation of a time-sharing service bureau subsidiary. If DPF&G does buy Railway Express Agency, it has the basis for a network; REA has several systems of its own, plus a communications network of Teletypes that reaches every U.S. hamlet. Granite plans service bureau franchises and co-operative use of a system among several lessees.

But regardless of where a company places its systems, the relocation of its systems will require more marketing and edp talent than most have operated with in the first few years. Finding the outside customer and technically "talking" him into taking available systems, including peripherals, will take much harder work and considerable knowledge.

the peripheral problem

The real problem in the secondary market could be the peripheral equipment. Peripheral technology, because of the need for more reliability and speed at lower cost, is expected to change more rapidly than cpu development. The second-generation leases generally did not include the peripherals, but most of the 360 leases do. Leasing firms admit they do not like many IBM peripherals because of reliability troubles and high cost of maintenance, particularly at the low end of the line. They claim they have lists of devices, such as the 2321 data cell, which they either will not take at all or will only lease under separate full-payout contract. Contrary to this, increasing competition has indeed forced lessors to take many unwanted peripherals to obtain a contract.

Further, each lessor also claims a portfolio of generally applicable, well-balanced systems which will be little problem to re-lease as a configuration or separate components. But as new peripherals come on the market, the "well-balanced system" of today could be tomorrow's poor configuration. IBM's tape drives are a case in point: the A.D. Little report noted that there are reliability problems on 360 drives, but that IBM, because of its $1 billion investment in them, will probably not change the line radically. There are already non-IBM products on the market which offer equal or better performance at 50% of the price. There is also strong competition in areas like disc packs (Athena Corp. cut the 1316 pack price to $300 recently, vs. IBM's $490), drives, optical scanners, data communications, and conversion equipment.

So what is a conceivable situation facing the lessor? Granted, there will be a market for their second-lease equipment; many IBM users are not yet willing to attach non-IBM equipment to their processors, primarily because of maintenance problems. But the trend among some users, particularly the more sophisticated, is toward mixed-brand or "black-box" systems. Consequently, the leasing firm is already finding there are some peripherals of a system for re-lease that aren't so easy to unload. The question is: how many of these devices will ultimately gather dust in a costly warehouse? And when does this situation start eating into the lessor's profits?

But while peripherals are a bane to the lessor, they could also provide a boon, a new direction. These devices, the industry likes to quote, will ultimately account for up to 80% of the cost of a computer system. And the size of the market automatically grows for the non-IBM brands. Many of these peripheral makers suffer from common ills various lessors think they can cure: the independent manufacturer often has good equipment but no force to sell it to the end-user market; and the small firm often can't afford to rent the systems as this would diminish cash flow.

Thus, most computer lessors have begun approaching these manufacturers about exclusive agreements to buy and lease their products. Levin-Townsend already has such an agreement with Milgo on its automatic deposit station, Lectro-Teller. Rumors flew in May that L-T was going to buy Milgo, denied by both parties; but such buys are possible.

Other firms, not in computer leasing, are also going after the peripheral market. Most notable is Management Assistance Inc., which would have seemed primed to be a force in computer leasing. MAI chose for various reasons to go around it to the peripheral field, now having contracts to buy tape drives from Potter Instrument and disc drives from Memorex to sell or lease in the end-user market. Essentially, MAI intended to be a major service firm in data processing, starting with leasebacks on punched-card equipment (accounting for most of its portfolio of $160 million in equipment). It had planned the same leaseback deals, including service, with the 1400 series, and has some. But at that point IBM stopped depreciation on this equipment. MAI, with its 1000 customer engineers being trained in MAI schools to service tab, peripheral and 1401 systems in MAI service plants, is a natural for this business. It's also conceivable that the lessors, none of whom want to offer maintenance, may try to contract with MAI and other service firms like RCA's to provide the second user the service that will be needed when peripherals come back. In any case, MAI will also be a competitor for the lessors who do sign on to lease non-IBM peripherals; theoretically, its edge is service.

competition on the way

The breadth of competition has been intimated. The 70 or 80 firms users have identified take on all shapes and sizes. Some work under wealthy parents that provide much financing and support; these range from insurance companies and commercial lenders to the general equipment lessor and the undescribable conglomerate. Others stand

alone, going to banks and other institutions for lines of credit. Still others are buying firms that are a source of revenue, though still borrowing. There are also countless one- and two-man operations content with a few computers and willing to "sweeten" the deal with contract concessions. For full-payout leases, there are banks, insurance companies, and tax partnerships. Banks are being urged to make a stronger attack on the field, and some may even go after the long-term operating lease.

A tight money market makes the source of financing important. The established firm has little trouble getting money today, but the prime rate of interest has gone up—and this is crucial for those whose principal source of income is the outside institution. The rate went from 6 to 6½% in April, and those lessors whose lines of credit are running out must deal with the added cost of money. An example of this: on $1 million in hardware the interest and principal per month at 6% is $23,486; at 6½%, it is $23,715. On a four-year contract, this difference amounts to $10,000. If the lessor is to realize a normal rate of return on investment, this added cost must be passed on to the user.

If the major firm must constantly work to find less expensive financing to maintain competitive prices, those new companies weak in heart and credit don't stand much chance. The price of entry into the field today is set at about $10 million. This is a far cry from the DPF&G operation, which had one man, Goodman, from 1961 to 1966, when a total of $6 million in leases were written. And it's different from the $180,000 in capital Levin-Townsend started out with in 1963.

Actually, the first operating lease (not full payout) was written by D. P. Boothe, Jr., in December, 1961.[1] A $3 million 7094 went to Ling-Temco-Vought. The market was the heavy users of such systems, since extra-shift rental was high (40% of prime shift). Boothe chopped 10% off prime and extra-shift rental for a long-term lease. The 94 is still at LTV, now costing $100K/year, vs. $60K/month under the original lease.

Boothe and John Randolph worked together under Boothe Leasing Corp., which was purchased by Greyhound in 1965 and became part of Greyhound Leasing and Financial Corp., a subsidiary. In 1966, this firm became GC Computer Corp., now called Greyhound Computer Corp., the largest lessor in the industry. In 1963, Levin-Townsend was formed and became Greyhound's sales agent in computer leasing. This combination produced a portfolio of about $60 million worth of second-generation equipment, much of which Greyhound still owns (now at a book value of $20-25 million.)

Each of these pioneers has since left Greyhound Computer, most under cloud of suit. GC terminated L-T's contract six years in advance, suing its agent, Levin-Townsend countersuing. These claims were settled out of court last year, GC selling its stock interest in L-T and paying to them a percentage of the sale amounting to over $9.5 million. John Randolph broke away to form North American Computer Corp. in 1965 (now Randolph Computer Corp.). Boothe left in July, 1967, and formed Boothe Computer Corp., and is now being sued by Greyhound subsidiary Boothe Leasing Corp., which claims the right to the Boothe name in leasing. There are counterclaims from Boothe Computer and several principals have been dropped (Boothe says he never signed away his name.)

[1]Actually there were some third-party efforts on the part of manufacturers before independent lessors came on the scene. In 1958, Philco Lessors Inc. was formed by Philco to provide cash sales for the computer department: The leases ran between 60 and 72 months, while Philco itself wrote off the equipment in 42. Eighteen Philco 2000's ($3 million systems) went to customers under this arrangement and several are still in first user installations. Burroughs and NCR also offered long-term contracts in the late '50's.

in the same boat

Despite these problems, one lessor says these and other leaders of major firms maintain a "British Club" relationship, each with much knowledge and respect for the other's operations. (User beware when discussing competitor deals with a lessor.) And most of these firms make up the "power block" called the Computer Lessors Assn., which seemingly has some influence with government agencies and IBM.

Greyhound, L-T, and Randolph are in the top five, along with Leasco and DPF&G. And Boothe's firm, while new, is considered a top contender. Others moving into significant positions are SSI Computer Corp., Transamerica Computer Co., and Diebold Computer Leasing—all with strong financial backing from parent or affiliate companies. Computer Leasing Corp., when and if it completes the agreement to buy Standard Computer Corp., will be among the giants and have the backing of conglomerate parent University Computing Co.

For our survey we tried to cover most of the larger firms, plus a sampling of those that have substantial holdings or deviate in contract, equipment handled, or services. We leave the discussion of the details of contracts and what they mean to the user to another article. But here are general comments.

Most leases run generally between one or two and five years, with a range of 10-25% off manufacturer rental. Stiffening competition has, in some cases, lowered these rates by a point or two. Primarily, leasing firms prefer to keep the 7% investment tax credit to write off against their earnings, although in competition or for a major customer they may hand it over. John Randolph notes, however, that the trend is toward leasing machines that have been installed for a year, in which case the ITC is lost.

Many lessors will update equipment; Levin-Townsend, for one, will replace, say, a seven-channel tape drive with a nine-channel unit at no cost to the user. Unlike most, L-T does charge for extra-shift use.

The termination clause has become important competitively. Several firms will permit termination several months in advance of the contract's end, but with a penalty clause —some stiff, others simply amounting to paying retroactively the shorter-term rate.

The hullaballo about how these firms depreciate their equipment and their method of accounting is less vital to the user than to the investor in the public stock of lessors. Those with liberal accounting methods are playing the not-uncommon game of showing lower earnings first and a much higher earnings gain each succeeding year than would have been possible through more conservative methods.

Note this comment from a Standard Computer Corp. report (SCC had depreciated most conservatively, 9 years, 5% residual): "From very rapid depreciation schedules (which have the effect of understating assets and income) to long-time schedules (which tend to maximize cash value of assets and current income) there is ample leeway in judgment to allow computer leasing firms to report variations of up to 50% in earnings on the same gross income. This is accomplished in financial leases by varying the residual value used, and these variations can be accented by the ability to adjust the rate at which residual value is taken into income."

Generally, the revenues and earnings of most of the major, stable leasing firms should continue to increase substantially each year (at least 40%, says one report) for at

least the next few years no matter what their procedure. The investor should simply be aware of the accounting method, when evaluating price:earnings ratios and earnings per share.

some typical companies

Here are brief sketches of 14 leasing firms:

Greyhound Computer Corp., 75% owned by Greyhound Leasing & Financial Corp. and headed by Carole Bumpers and James Campbell, is the largest lessor. In addition to a book-valued $20-25 million in second-generation equipment, as of March 1, the firm had about $150,300,000 in third-generation systems installed or committed—all IBM. Donald Andrews, regional vice president, noted Greyhound would be purchasing about $8-15 million in systems per month throughout the rest of '68. Leases run from 1-8 years.

Greyhound is also in other areas, with data center offices offering service bureau and project management services in New York, Los Angeles, and San Francisco; they will open in two more cities by Sept. 1. As noted, Greyhound has an Italian leasing company affiliation.

Randolph Computer Corp. aims for 2-5 year leases, averaging 40 months. As of Sept. 30, it owned 121 systems valued at $60,920,000; by April this had increased to 162 systems (79 customers) costing over $90 million. In late May, they broke the $100 million mark.

Randolph also has a software and service bureau operation (five locations) which should gross over $5 million in 1968. It consists of three acquired companies with a total of 300 employees: United Data Processing, Inc., in Portland, Ore., and one of the same name in Cincinnati, and Electronic Data Processing Services of Eugene, Ore. As noted earlier, Randolph intends to expand its service bureau operations into more small metropolitan areas around the country. The marketing staff is small, says Randolph, but quality.

Data Processing Financial & General, which started operation in 1961, accumulated $6 million in second-generation equipment, and in April claimed to have over $100 million in third-generation systems, including a $20 million contract with North American Rockwell. In July, 1967, the total was $38,941,000.) Originally working with one-year leases, DPF&G now takes 18-month to five-year leases, with a three-year average.

The firm has 16 people involved in leasing, 10 in marketing, and 60 in its software subsidiary, Information Systems Co., acquired from Lear Siegler in 1967. Goodman, a CPA and lawyer, is an ex-IBMer.

Levin-Townsend had $100 million in systems installed or committed April 1 and expects to have a portfolio at year end of $150-200 million worth. Leases generally run 1-5 years, with short-term contracts preferred. Eight acquisitions of information services firms (all or controlling interest) go to make up Levin-Townsend Service Corp.: Computer Programmers and Analysts, Realtime Systems, Fashiontronics Associates Corp., Systems Analysis Corp., Financial Computer Applications, Inc., John Kirvin & Assoc. (consulting for securities industry), EDP Leasing Corp. (punch-card leasing), and Ernest Blanche & Assoc. (service bureau). Levin-Townsend Enterprises, Inc., is a subsidiary formed to acquire diversified businesses not in the computer field and now consists of two Florida real estate firms. Negotiations are underway to purchase Exquisite Form Industries.

Of the major lessors, **Leasco Data Processing Equipment Corp.** is perhaps the most unusual in contract and most ambitious in expansion. It has concentrated on long-term (4-6 years) and full-payout (five and more years) leases, with renewal options amounting to rentals of from 1/12th to all of original rental. Over 60% of its $60 million in leases was in computers—IBM, Univac, CDC, and NCR—as of Sept. 20, 1967. (An undetermined amount was in add-on peripherals and terminals.) About $17 million of this was in operating leases, the rest in full-payout. Actually, 1968 is the growth year for Leasco in computer leasing, when it expects to invest about $100 million in computers, mostly IBM, and a majority of that will be on operating lease.

As of March, Leasco spun off the U.S. leasing activity into a separate subsidiary, Leasco Computer Inc., which has a marketing staff of 50. Overseas operations noted are Leasco Europa and the Australian affiliate. Of a staff of 850, about 700 are in the information services subsidiary, Leasco Systems and Research Corp. This is composed of two 1967 acquisitions, Documentation Inc. and Fox Computer Services. Leasco Systems and Research (Europe) was recently formed and operates in three countries. There are also the new time-sharing service bureau network and Carter Auto and Transport Corp., a warehousing and service firm. Leasco is also trying to buy control of Reliance Insurance Co. (at writing).

Computer Leasing Corp., which should by now know if it owns Standard Computer Corp., is another firm under a strong parent company, University Computing Co. It is basically different from the rest on two counts: it has a big investment in non-IBM equipment—Univac and Control Data—and concentrates on large systems exclusively: 1108's, 6000 series, and 360/50's and up. Its $42 million in equipment (April 30) is split equally among the three manufacturers. While it has long-term leases for UCC 1108's (seven-year), CLC goes after one-to-four-year contracts. Computer Leasing relies on a 12-man edp-oriented staff, headed by ex-CEIR executive Robert Holland, and some of the 1300 people at UCC, to evaluate whether a system will be likely to fill the user's needs and the lease be renewed. Its only subsidiary is a data center in Los Angeles.

In **Standard Computer Corp.** we see a situation where the major investors took their money and ran. Blair & Co. and Auerbach sold all or part of their SCC holdings to CLC to provide 15% ownership and, through seats on the boards of directors, voted for the acquisition. This was over the objections of president Herman Affel (an ex-Auerbach vice president with minority ownership) and major stockholder Lease Financing Corp. Far from a company in trouble, Standard had amassed $40 million in IBM systems as of April, was among the most highly respected firms in the field. It will provide CLC with sound senior lines of credit and what CLC needed to complete its IBM 360 holdings at the low end of the line. Much of Standard's equipment covered the range of IBM systems, and averaged three years per lease. The trade is for 1.9 CLC shares to 1 SCC share. Standard had intended to enter many dp related areas, such as edp supplies.

Boothe Computer Leasing, formed last July, already has $39.4 million in IBM equipment on lease (50-55 computers, 35-40 leases). Some are one-year, but most three-year. President of Boothe is Paul Williams, who came with Boothe (board chairman) from GC and was with IBM for 11 years; 16 of the 39 employees are marketing and executive staff. With over $50 million in senior credit lines and $34 million in equity, Boothe expects to purchase up to $90 million in systems this year. Although interested in agreements with non-IBM peripherals manufacturers ("we can test any device at our installations"), Boothe won't develop software subsidiaries (the software bunch "is the most fickle, unreliable" in the world. "When we need software, we'll go out and buy it. Let someone else warehouse the programmers").

Formed in September, 1967, **Diebold Computer Leasing**

has a $75-million credit line with investor Commercial Credit Corp. (which is being bought by Control Data Corp.). For first-user placements Diebold relies on Banker's Leasing Corp. (for the secondary market, DCL is on its own) to find leads and help administer leases, and for technical evaluations of the equipment specified relies on The Diebold Group. Like Computer Leasing, Diebold sends a team in to evaluate the systems the user wants. Richard Urfer, president, notes that they protect their investment against systems that are too exotic (for re-leasing) or that the user will find inadequate, while in essence providing some consulting services to him. Diebold will take 2-to-5-year leases, and offers to be very flexible in negotiation on the terms of the lease, depending on customer needs and credit. This June they had 85 systems in or committed at "over $50 million."

Granite Computer Leasing Co., a subsidiary of Granite Equipment Leasing formed mid-'63, had $30-35 million in third-generation systems, plus a "few million" in second generation as of April, and plans to invest about $50 million more this year. The Data Services Division contains five acquired companies: Commercial Data Systems and Equipment, which does programming and re-marketing of second-generation equipment (bought particularly to develop experience in re-marketing); MBI, which re-markets unit-record and second-generation equipment and does third-generation leasing; Data Corp. of America, a service bureau and programming and systems support group; Omni Computer Systems, Inc., a consulting and software firm; and an edp school, American Institute of Technology. Other leasing done by the parent firm includes aircraft machinery. Granite is now firming up a deal with a machine tool manufacturer; it will lease the computer of the computer-based numerical control systems the manufacturer plans to market. It also has the Varian agreement noted earlier.

Transamerica Computer Co., made up of ex-IBM and MAI people, is a subsidiary of Transamerica Corp. Formed this January, TCC is a real newcomer, and has $100 million to spend for openers. This 6-man group is after the whole package: leasing computers, supplying software (by acquiring the right companies), doing feasibility studies, handling turnkey operations, and supplying peripherals (they too intend to be selective on what peripherals they lease). For the latter, they hope to buy or make agreements with small manufacturers. The mother company is going to have an internal remote service bureau, with two 65's at headquarters servicing the empire, so they too could have a computer utility sometime. TCC has a man in Boston, one in Chicago, and will add one in Washington, Toronto, then Europe.

SSI Computer Corp. was acquired early this year by The Fund America Companies, a holding company representing $1.3 billion in assets. The Fund's largest group of subsidiaries is the Fireman's Fund American Insurance Companies. So SSI has good financial backing, plus a prospective market built in. The firm in March announced initial capital resources of $95 million. Regional offices are established in six cities, supplemented by a nationwide organization of agent representatives. The San Francisco firm is headed by an ex-Transamerica executive, Peter Redfield.

Continental Computer Inc., founded in 1965, hasn't been fast to grow. But it's moving now and has one characteristic that makes it different from all the others: a management services division of 17 people to "hand-hold" the customer in helping him get proper manufacturer support—revisions of software, engineering changes, maintenance and other services, that are supposed to be offered but are often late in coming. This group also differs in that it wants to stay at the low end of the line, 360/20-50. It has $11 million out in these systems on 3-to-5-year leases, and extra shifts cost extra; CCI cut its leasing teeth on $2 million in punched-card equipment. About $35 million more in computer systems ought to be signed for by this summer, and there are hopes for a total of $75 million by mid-'69. All but one of the professional staff (a total of 30) are edp people, and they're gearing up the marketing force.

Computer Investors Group is unique in that it was founded in 1965 and just went public. A majority-owned subsidiary of Longines-Wittnauer Watch Co., it has 29 360's on lease ($13,820,194), 25 of which are leased to Shell Oil. Most of these are three-year leases (2-to-5-year range). Before 1967, the firm dealt mostly in accounting machines. Its president and vp, Bruce Williams and Carl Freyer, are ex-Honeywell employees.

Systems Capital Corp., founded in 1967, is a deviator from the norm—dealing in GE equipment on 8-year full payout leases and on a 4-5-6 plan through agreement with GE: it finances its buys through tax partnerships. Until late 1967, most of its leases involved CATV systems, aircraft, and real estate, 24.9% being in full-payout computer leases (over $15 million worth of GE and other systems). The non-dp equipment came from merger with Investment Leasing Services, Inc., in November. Now the 4-5-6 plan agreement with GE, which GE's marketing staff will initiate with customers, will involve the total GE line both here and with GE affiliates in France and the U.K., saving the customer between 7.5% and 15% of manufacturer rental. SCC will also take long-term leases on total process control systems, of which the computer will be a component. SCC is now negotiating a $66 million plant automation lease.

The tax or investor partnerships, which often operate on a private basis and not through a corporation, work thus at SCC: SCC brings the partnership and prospective customer together, charging a fee for doing so—a principal source of income. SCC is entitled to 15% of the income from re-leasing or selling the equipment after the first lease. SCC and lessee have options to purchase after the lease as well. Under the 4-5-6 plan, a partnership leases the equipment for 8-to-10 years to SCC, which then subleases to the end-user for the GE plan term. Depending on the length of lease, SCC may lend the partnership up to 18% of the equipment cost. The result of all this is that SCC is essentially in the position of taking on a lease of any dollar amount because the funds of the partnerships are said to be virtually unlimited.

There are other growing computer lessors following the operation pattern of the major firms, like Dearborn Computer Corp., National Computer Rental Ltd. (National Equipment Rental subsidiary); other subsidiaries or departments of financial firms, such as CIT Leasing Corp.; other small new companies with different orientations, such as Graphic Sciences Inc., which leases 360's, but really intends to go for large-scale manufacture of a facsimile transmission device, Transceiver. There are others that use variations of the tax partnership, such as Machine Equity Corp. and Detroit Equipment Leasing. Then there's Applied Data Research, which leases PDP-8's with software, and Celestron, which at last count wanted to lease unnamed non-IBM systems with software.

No one is sure how may of these names will still be in the field—bought, merged, or defunct—by the time the fourth generation comes around. Or how many new firms there will be. Or what shape they'll all be in, or what policies and pricing schemes IBM will come up with. But for an industry group that has become second in computer ownership only to IBM, one thing is certain: things won't be the same as they were in 1961. ■

breathe deeply

SIM-I THE MODEL PATIENT

by A. PAUL CLARK, H. LOBERMAN and L. ARTHUR HOYT

Pushbutton commands, initiated at either an instructor's console or by sensors within a unique "patient" in a simulated surgery room in Azusa, Calif., cause a human-like manikin to undergo changes in respiration rate, muscle tone, blood pressure, and heart rate. Fasciculation, contraction and dilation of the pupil of the eye, and other physiological events can also be induced. The manikin can even die as a result of heart arrest or erroneous doses of gases or drugs.

Sim I, as the machine human is named, is the brainchild of a team of engineers and computer programmers from Aerojet-General, and doctors from the University of Southern California School of Medicine. Sim's "nerves" are imbedded sensors, which react to many student-initiated procedures (proper and improper) or to situations induced by an instructor at the monitor-console. The inputs and outputs of these sensors are processed by a hybrid computer—the real brain and heart of the system—which in turn feeds back signals to activate the many actuators and pneumatic components within the manikin that cause the lifelike reactions. In essence, the manikin serves as a display and input device for the computer—a display that is readily understood and appreciated by the medical student.

application example

One of the procedures an anesthesiologist trainee must learn is endotracheal intubation. This procedure consists essentially of injecting the appropriate doses of barbiturates and muscle relaxants so that the patient becomes insensitized and immobilized. While the patient is immobile, the anesthesiologist inserts a tube down the trachea so that controlled amounts of anesthetic gases flow unobstructed to the lung. An undesirable side effect of these drugs is that the patient stops breathing on his own, and must be artificially ventilated for a period of time until his own natural breathing functions take over again.

The student anesthesiologist will have natural apprehensions if he must learn this procedure by practicing on a living human. And the instructor, who would be constantly looking over the student's shoulder, and on whose judgment the safety of the patient rests, would have even more. Using Sim I, the instructor can work under more relaxed conditions while the student still experiences a high degree of realism.

project development

There have been many similar instances where real-life practices involved danger until skills were acquired and computer-based simulations provided the research and solution route. Included among them are: the many faceted trips through space—with the environmental and trajectory unknowns presolved; the extremely expensive startup procedures and control designs for process or nuclear power plants—the prepilot plant experimentation; military and commercial aircraft design; and many military weapon designs. In addition to the above are many types of experimentation in which a real-life system is too big, impractical or impossible to "play" with—and thus computer-based simulation systems provide the means.

In the manikin project, the original concept resulted from discussions between Aerojet-General engineers and USC medical people with the realization of the similarities between in-practice physical science simulations and the requirements for a human-system simulation.

Drs. Stephen Abrahamson and J. S. Denson of USC foresaw the great value of the computer-manikin system, and with their help, USC obtained financing for a 1½-year development contract with Aerojet from the Office of Education, U.S. Department of Health, Education and Welfare, under the provisions of the Cooperative Research Program. The program commenced in January, 1966, and with an extended evaluation period, was successfully completed in December, 1967.

Aerojet-General's A. Paul Clark, Program Manager, and Leonard Taback, Project Engineer, under the direction of Charles Hampton, Manager of the Computing Sciences Department of Aerojet's Azusa (Calif.) Facility, worked closely with Drs. Denson and Abrahamson in the develop-

Mr. Clark is manager of the Data Systems and Simulation Laboratory, Computing Sciences Div. of Aerojet-General, and is responsible for control and thermal systems analysis, vibration analysis, and design of systems using A/D techniques. He has also worked for the Astrionics Div. of Aerojet-General as head of the Analog Computer Section. He holds a BS and MS in electrical engineering from USC.

ment of Sim I. The Aerojet team evolved the mathematic descriptions and subsequent computer program to match the related human reactions described by the medical professionals.

The original simulation was programmed on a hybrid computing system, an EAI HYDAC 2400. Early formulation of portions of the model was done completely as an analog problem using only the analog computer. This was because: (a) as a complex feedback system, stability conditions could be investigated more readily; (b) the coefficients of empirical equations could be changed and determined more rapidly; and (c) analyzing transfer functions is more in the province of analog computers.

After the equations were generated and the coefficients evaluated, the system was reprogrammed for the digital computer. The reasons for this were: (a) the digital computer has greater capability for handling the more complex logical relationships that are not computational in nature, especially the switch inputs from the control console; (b) transport delays are more easily implemented on the digital computer; (c) the setup is easier with a digital computer for making operational runs in that only a program tape need be loaded, whereas with an analog computer, potentiometers and diode function generators must be set; and (d) ultimate size for packaging is much less.

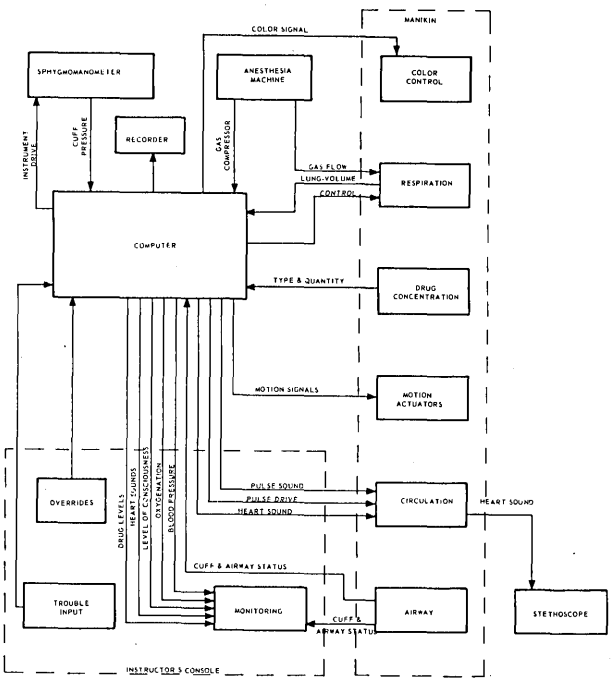


Fig. 1 System block diagram.

Student Operations	Method
1. Monitor blood pressure*	Through use of blood pressure cuff, stethoscope and meter
2. Monitor heart rate*	Through use of stethoscope
3. Check pulse* in temporal or carotid arteries	Through finger feel
4. Administer artificial ventilation	Through positive pressure with anesthesia machine and mask or airway
5. Administer intravenous liquid drugs	Hypodermic syringe and needle injection into an intravenous catheter
6. Administer anesthesia gases	Through anesthesia machine and mask or airway
7. Insert endotracheal airway into trachea	Through use of laryngoscope and proper drug administration to relax the muscle of the larynx* (i.e., vocal cords and aryepiglottic folds)
8. Clear foreign liquids from oral cavity	Through use of suction apparatus
9. Monitor respiration rate* and depth*	Through observation of chest motion
10. Observe pupils of the eye* for conditions indicating dangerously low oxygen levels or heart arrest	Through observation of eye
11. Observe relaxation of eyelids* and jaw* for indications of depth of anesthesia or action of muscle relaxant	Through manual manipulation
12. Observe fasciculations* of the shoulder muscles for reaction to muscle relaxant	Visual observation after injection
13. Observe heart arrhythmias* if present	Through use of stethoscope
14. Observe and counter bucking* condition of the patient	Through visual observation of motion of patient's upper body and use of proper drugs

* Computed parameters that control sound, motion, or tenseness cues of the manikin as functions of the administration of drugs (both liquid and gaseous) and oxygenation and physical manipulation of the manikin.

TABLE 1 Actions of the student

The first approach, attempting to simulate the physiology of the entire body, proved impractical because of the size of the computer. Clark and Taback, however, decided to eliminate those functions not necessary for the primary purpose of the project (i.e., training anesthesiologists), and simplified the remaining complex functions into a readily programmable series of interacting transfer functions. The results were accepted and proved to be satisfactory.

Fig. 1 shows a block diagram of the system model. It depicts a complex feedback control system involving the interaction of input parameters and physiological variables. No attempt was made to simulate the physiological structure of the organs, such as the motion of heart valves and blood flow in the chambers or gas transfer in the lungs. Rather, only the parameters of interest to the anesthesiolo-

Mr. Loberman is at present senior engineer with the Computing Sciences Division of Aerojet-General Corp., and is engaged in studies involving the programming and use of hybrid computers. He was formerly with the National Bureau of Standards where he helped develop automated design of large-scale multiple digital computer systems. He holds a BS and an MS in physics from the Univ. of Mich.

gist were used; for example, the pulse rate is calculated as the output of a transfer function whose inputs are oxygen and CO_2 concentration, anesthesia level, etc. In turn, the inputs to this transfer function are functions of other variables that may be also dependent on pulse rate.

Relationships between physiological variables were derived from medical texts, actual medical reports supplied by Dr. Denson, and through the professional experience of Dr. Denson. The human-like responses in various situations were verified by the doctors from USC.

The end result is an electronic/pneumatic anesthesiological training device that appears to breathe and can be artificially ventilated. Its jaw opens and closes and exhibits increasing or decreasing resistance to being manually opened. The eyelids open and close and also offer variable resistance to being opened manually. The pupils dilate and contract, the eyebrows and forehead skin are capable of wrinkling, the temporal and carotid arteries pulse and the shoulder muscles fasciculate when subjected to certain conditions of intravenous injection. The internal structures of the mouth and trachea are cast with a high degree of anatomical fidelity (including teeth, tongue, epiglottis, and articulated vocal cords) and provide lifelike reaction to the anesthesiologist's manual procedures. Table 1 lists student operations.

The model was such that a condition resembling Chain-Stokes breathing—rapid breathing to expel built-up CO_2 followed by a period of no breathing at all—was an unscheduled reaction. It was a natural byproduct that developed as a result of reactions established by the other transfer functions.

From the instructor's console it is possible to close either or both main bronchus branches, change heart rate, and modify pulse rate and blood pressure. The instructor can also, merely by flipping switches at the console,

Parameter	Type of Control	Description
Blood pressure	Incremental increase or decrease	Momentary, three-position, center-off switch allows instructor to influence parameter as computed from mathematical model
Pulse rate (heart rate)	Same	Same
Respiratory rate	Same	Same
Vomiting	On-off	Two position switch, spring return to off, continues until empty or released
Bucking	On-neutral-off	Three-position switch: Momentary on initiates action, momentary off stops action, and center position is neutral. In neutral position, computer can stop action under proper response from student
Fibrillation	On-off	Two-position switch: Action (in this case, heart fibrillation) initiates and continues when on, and stops when off
Arrhythmia	On-off	Same as fibrillation
Heart arrest	On-off	Same as fibrillation
Jaw tension	Incremental increase or decrease	Same as blood pressure
Bronchus block (right and left)	On-off	Same as fibrillation
Laryngospasm	On-neutral-off	Same as bucking
Simulator mode	Pushbutton switch	Three-position switch: Position 1 resets equations of simulator to initial condition, and manikin and student inputs are not accepted by computer. Position 2 holds or "freezes" time-dependent functions in the mathematical model, and inputs are not accepted. Position 3 sets the simulator to operate and time-varying parameters proceed as a function of time; inputs are accepted by the computer and change the outputs that result from the mathematical model.
Print button	Lighted pushbutton	Momentary pushbutton: May be actuated during reset or hold modes of the simulator. Causes computer to print out data on significant events since the operate mode was last actuated. Button is lighted during printout, and the mode-change switch is disabled for this duration

TABLE 2 Instructor's control inputs

Mr. Hoyt is director of publicity for Electronic Associates, Inc., and has had extensive experience in public relations and technical writing. He earned a BS in electrical engineering from New Mexico State Univ.

create special problems such as changing the heart rate and jaw tenseness; heart arrest, fibrillation or arrhythmia (irregular beat); a laryngospasm or bucking (attempting to cough when the lung cannot build up sufficient pressure). Table 2 lists Instructor control functions.

The control functions are derived from the physiological state of the patient, which is a computed function of student inputs and actions modified by instructor input. The control outputs are used to generate physiological cues in the manikin for the student that are nearly identical to those from a human patient. The block diagram of Fig. 2 shows how the various portions of the model and system are tied together and interact.

the computer program

Hardware: Fig. 3 is a block diagram of the hybrid computer system, which is comprised of a Computer Control Corporation (Honeywell) DDP-24 digital system with a 4K memory plus optional features, two EAI 231-R analog sys-

tems, and an EAI DOS 350 interface system.

The DOS (Digital Operation System) contains a 12 bit analog-to-digital converter with a multiplexer having 20 input channels. There are, in addition, 20 digital-to-analog converter channels. The DOS contains circuitry for buffering additional output control and sense lines and also allows direct input to the DDP-24 parallel input channel. For this simulation, outputs of the switches on the control console are strobed simultaneously into the parallel input channel via the DOS and then read into the DDP-24 as a "console status word." An analysis of the bit configuration of this word determines the status of the switches. Further control signals can be generated by a decoder on the DOS which outputs one of 24 signals as a result of a 5-bit code sent to it by way of the parallel output channel.

Software: For a simulation involving the response of a human to stimuli in a realistic teaching situation, it is necessary for the computer to operate in real-time. The real-time clock with its interrupt feature is used to maintain this condition.

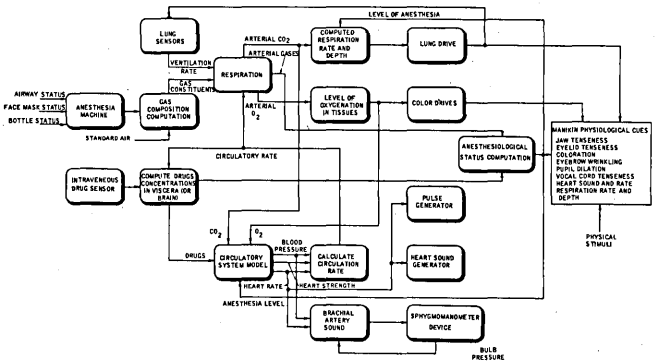


Fig. 2 Trainer system block diagram.

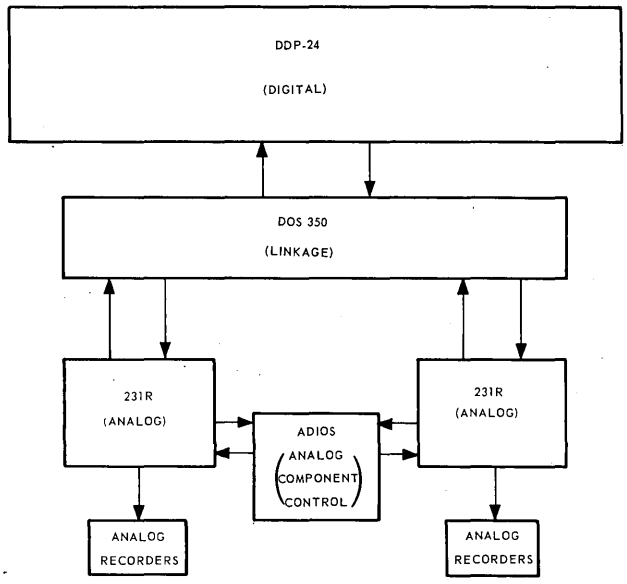


Fig. 3 Hybrid computer system block diagram.

The real-time clock in the DDP-24 can operate in two modes. It may be initially set either manually by switches on the computer maintenance console or under program control via the parallel output channel. Once set and started it counts down at one-millisecond rate. When it reaches zero the computer will be interrupted if the interrupt is enabled.

After initiating all parameters, the clock is set and the interrupt is enabled. The clock is set to interrupt every 0.1 second. When the interrupt occurs, the computer samples, via the analog-to-digital converter, the external conditions that determine the status of the stimuli. These include:

1. Needle injected sensor
2. Volume of drug injected
3. Anesthesia machine gas flow transducer voltages
4. Lung position sensors
5. Airway position sensor

The computer then checks the status of the mode switch on the control console. In the Reset position, all parameters are maintained in "normal" condition. Time is also reset. Only the lung drive and eyelid tenseness are changed to simulate breathing and blinking. In the Freeze position, no computations are made that change the physiological variables. The student is permitted to inject a drug but the drug is not allowed to take effect. Time is held constant. In the Run position, the physiological variables are recalculated according to their current values and changing input parameters. Time is advanced.

After this, the computer outputs the computed variables, via the digital-to-analog converters, for actuating transducers on the manikin or setting meters on the control console. These variables include:

1. Effective drug concentrations
2. Blood pressures
3. Effective oxygen level in the blood
4. Anesthesia level
5. Ventilation rate
6. Pulse rate
7. Jaw tension
8. Eyelid tension
9. Lung position drive
10. Vocal cord tension
11. Anesthesia gas flow rates linearized for the meters

The computer then exits from the interrupt routine and waits for the clock to run down and interrupt again. The process then repeats. The time spent in the interrupt routine is approximately 33 milliseconds—thus the computer is waiting about ⅔ of the time. Since human motor reactions operate mostly at low frequencies, it was found that updating the physiological variables every 0.1 second was sufficient to cause smooth responses. This known computation cycle is required for implementing digital transfer functions involving time constants and transport delays operating in real-time.

Past analyses of drug distribution and effect have shown that after the drug is injected, a period of time elapses before the drug begins to take effect. This amounts to a pure transport delay of approximately 20 seconds. After this delay, two mechanisms determine the anesthesiological effect of the drug; these are, the distribution of the drug to the organs and the elimination from the organs. In particular, the effect of the drug follows the concentration in the viscera.

Fig. 4 shows the visceral concentration after injection. It was found that by combining lag and lead transfer functions with properly selected time constants, this curve could be fitted within a few percent. The overall transfer function is:

$$H(S) = \frac{ST_G\ T_L}{(ST_G + 1)\ (ST_L + 1)}$$

where S is the Laplace operator. Dynamically, the time constants are actually functions of other physiological parameters, e.g., the blood circulation rate.

In a similar manner, the concentration of oxygen and CO_2 in the blood are simulated by combinations of these simple transfer functions.

Fig. 5 shows the effect of the partial pressure of CO_2 in the blood on the breathing rate and amplitude. These curves are the results of empirical data and by their nature cannot be easily expressed analytically. Therefore, the curves are stored as functional tables consisting of values of

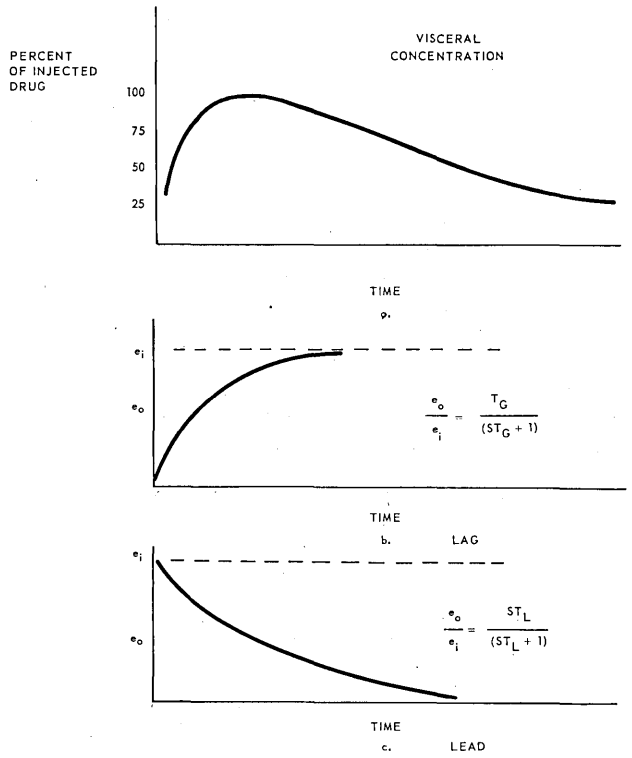


Fig. 4 Simulation of drug concentration.

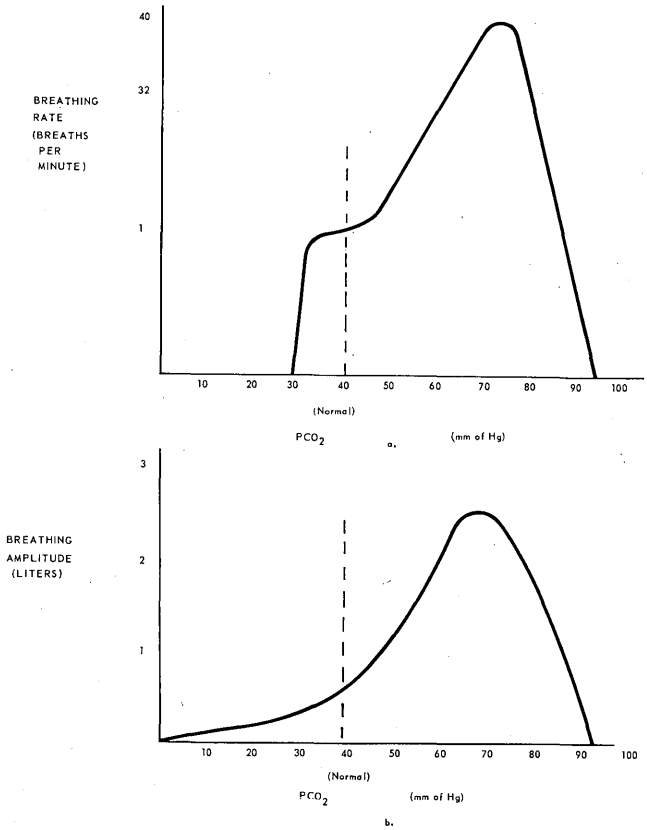


Fig. 5 Effect of CO_2 on breathing rate and amplitude.

abascissae and corresponding ordinates. For any value of PCO_2 the computer makes a linear interpolation between the values stored in the table. In a similar manner, there are functional tables stored for other non-analytic relationships between variables. Tables are also stored for the purpose of linearizing the outputs of transducers.

The prime benefits of Sim I are: (1) The student can learn and practice without risk to human life. The instructor needn't even be present for practice sessions. (2) The computer driven manikin can be put into "hold" while the instructor explains various steps, or corrects mistakes, and then the run can continue where it was interrupted—or it can be started all over again. In real life, if the doctor stepped in, the experience would be lost to the student, or at least the next opportunity might be a long time coming. (3) The computer can provide a written report of the run sequence at any time for critique after the training exercise. (4) The instructor can induce events at any time from his monitor console to test the student's alertness and capability under stress.

In general, whenever danger to the patient exists due to lack of experience on the part of the student, the computer-manikin system can provide an effective and safe means of training.

Aerojet-General, at the suggestion of Drs. Abrahamson and Denson, plan the development of computer-driven manikins in other areas of medical education. The company feels that these training simulators meet an urgent need of medical education where lifelike training is either expensive, unobtainable, or dangerous.

Surgery and triage (separation of patients according to the degree of need for medical attention) are just two examples of where procedures or decisions must be right the first time. Since cases of many diseases are not always available, even in large general hospitals, observations via manikin would benefit diagnostic training. Training simulators heighten the effectiveness of the available teaching staff, maximizing the use of instructor and student (including student nurse) time.

Continued growth in population will create demands for increasing numbers of medical personnel. There will be more and more patients in the foreseeable future—better informed—demanding higher standards of care. Simulator-trainers would provide key factors for simultaneous acceleration and improvement of medical education.

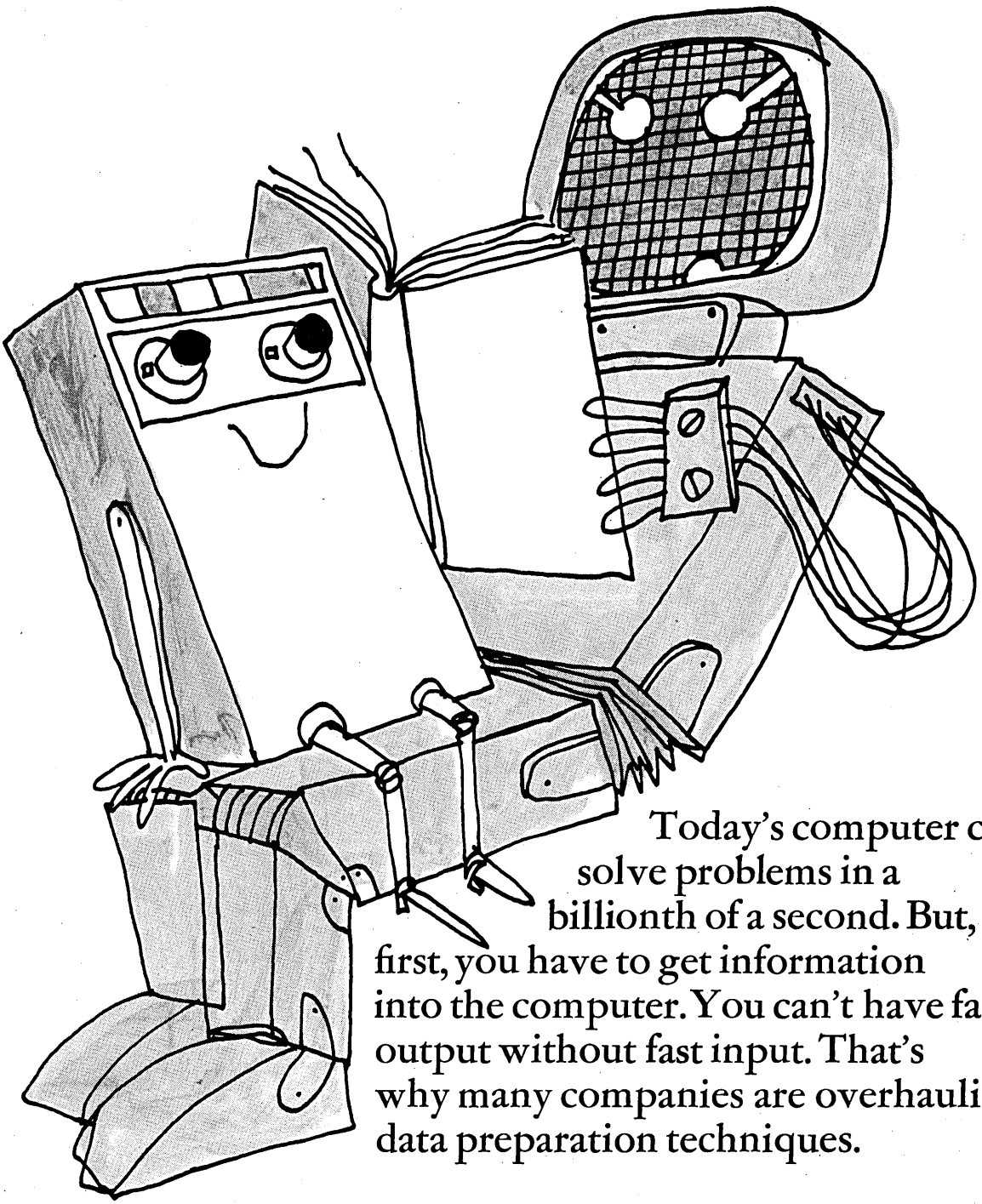
The future production trainer will probably consist of small, low-cost, general purpose digital computer, specialized analog equipment, the manikin, its associated instructor's console and appropriate linkage equipment to integrate the system. This approach provides ease of program setup, the necessary reliability and repeatability, and is within an economic range acceptable to the teaching hospital and university.

Several other applications for similar systems have been suggested. Manikins could be equipped to provide realistic wounds and symptoms for aid-station training—and even carried to the hospital ward level with a group of "patients." A similar trainer could permit a student surgeon to "solo" on a variety of major operations without patient hazard, and even enhance the continuous training of practicing professionals for new surgical techniques. An obstetric trainer is another variation. Team training—defibrillation teams for example—could be effectively improved by a properly programmed patient.

Systems can be designed as diagnostic trainers, in which a combination of computerized teaching-machine techniques and audio-visual displays present the patient's initial appearance and complaint. Closeups of portions of the patient's body can be selected from a slide bank. Results of various instrumental tests are available to the student, on request, on subsidiary data displays. The student makes a diagnosis and is critiqued by machine. The trainer will be operated by the student. It will be available for use at any time.

Computer-driven manikin trainers can provide significant improvements in the expansion, quality and economics of medical science. Their availability and use will mean increased practice time for the student doctor and a more relaxed approach to the learning of his profession. ■

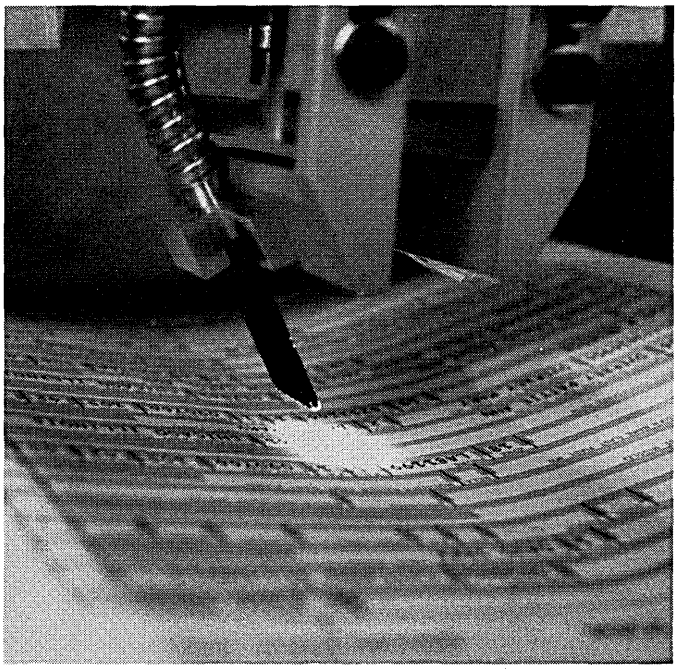
The machine that reads to computers



Today's computer can solve problems in a billionth of a second. But, first, you have to get information into the computer. You can't have fast output without fast input. That's why many companies are overhauling their data preparation techniques.

Under normal conditions, American Airlines feeds its computers an overwhelming three million pieces of paper a month. But, in 1966, a Machinists' strike against every other major U.S. airline made American the busiest carrier in the country; if not the world. The company's data processing center in New York was suddenly inundated with more tickets each day than they usually saw in a week. In fact, tickets were piled in the halls almost waist-high. In desperation, American plugged in a new machine—equipment that wasn't supposed to be operational until later in the year. (They even sent a special plane to pick it up from the manufacturer.) Within a few days, things were under control. The new input system was feeding data to American's computers faster than it had ever been done before.

The machine that unplugged the input bottleneck at American Airlines was the Electronic Retina* Computing Reader developed by Dallas-based Recognition Equipment Incorporated. The input system reads 1200 documents a minute, records the data in computer language on magnetic tape, weeds out incorrectly written forms and sorts the documents automatically. And, it only costs a million dollars. (That's a pretty reasonable figure considering it can cut costs by 50 percent or more.)

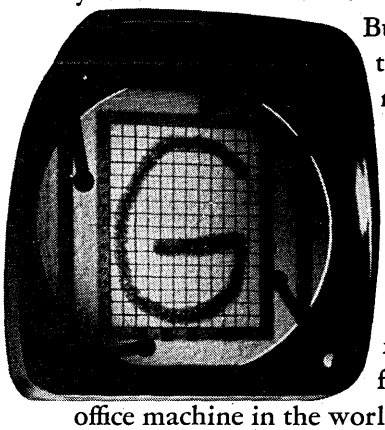


Generically, the Electronic Retina Computing Reader is known as an OCR (Optical Character Recognition) machine. It's one of a dozen OCR machines on the market. But, there's a big difference. The other machines are optical scanners. Recognition Equipment's machine is the only one that actually reads.

The readability gap

Scanners have small vocabularies. Most of them can only recognize special alphabets. The average scanning speed is 300-500 characters a second.

Scanners never see a whole character at one time; only a segment of it. They're easily confused by ink smudges, poor character spacing, torn paper, varying ink densities, and similar imperfections. But, scanners have their place in the world. If the reading matter is carefully prepared and the format can be controlled, you don't need a versatile reader.



But, if you're dealing with the human vocabulary, you need a machine that understands your language. The Electronic Retina Computing Reader is the only OCR system in operation that can read a complete upper and lower case alphabet; plus numbers. And, it can read just about any type face from any typewriter or office machine in the world. It can even be equipped to read handprinted letters and numbers.

The reader sees the whole character at once and will read up to 2400 characters a second. It sees a smudge as a smudge and won't be fooled by lightly inked characters or crumpled paper.

THE EYE OF THE SYSTEM

The Electric Retina works like the human eye. It compensates for imperfections in the material being read. A complete character image is projected on the retina surface. A vertical analyzer catches misalignment up to one full character high. Another device provides image clean-up. (Gray areas of the characters are automatically filled in. Smudges are ignored.) A classification filter discriminates between similarities in characters to eliminate incorrect readings. The character is then compared with information stored in the system. The whole process takes 1/2400 of a second.

The education of Israel Sheinberg

Recognition Equipment was able to develop an accomplished reader because Israel Sheinberg once got tired of engineering and went to medical school. (Sheinberg is Recognition Equipment's Vice President of Engineering.) After a year and a half of test tubes and stethoscopes, he decided engineering wasn't so bad after all. So, he got into the research and development side of life and invented a light sensing device based on the human eye. The device became the Electronic Retina part of the Electronic Retina Computing Reader.

*Electronic Retina is a trademark of Recognition Equipment Incorporated

Slaying the paper dragon

Paper is an equal opportunity obstruction. It will clog up anybody's operation. To beat the problem, Recognition Equipment had to build a flexible system. Today, Electronic Retina Computing Readers are setting type in Florida; processing bank forms in Sweden, Great Britain and Germany; paying U.S. Army allotments in Indianapolis; handling soccer pool transactions in England; reading airline tickets in Chicago, New York, Winnipeg and Kansas City; and billing credit card holders everywhere.

At Perry Publications in Florida, two of the readers are reading typed news copy and feeding it into automatic typesetting machines. In their spare time, the readers do most of Perry's bookkeeping.

The U.S. Army Finance Center in Indianapolis receives 10,000 allotment forms every day from bases all over the world. The forms are prepared on every kind of typewriter imaginable. An Electronic Retina Computing Reader reads the forms just the way they come in; even if a single form was prepared on more than one typewriter.

In most European countries, there are Postal Giros (banks) that report transactions to account holders on a daily basis. Electronic Retina Computing Readers are already being used in the Swedish, British and German Giros. The British Giro alone is expected to reach a volume of 1.4 million daily transactions when it opens on a national basis in October.

Littlewoods Pools Ltd. of Liverpool runs the largest soccer pools in England. An Electronic Retina Computing Reader reads printed information from address labels on returned envelopes at a rate of 900 per minute and keeps track of how often each client invests.

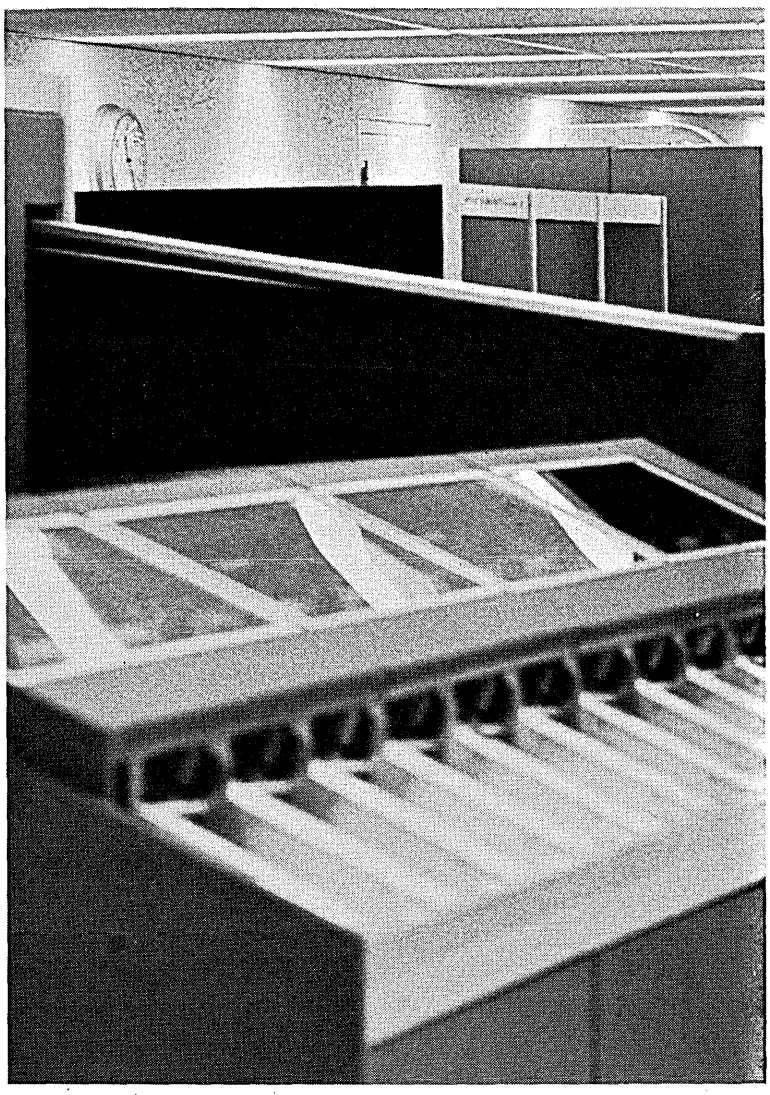
The State of Michigan uses a reader in the Driver and Vehicle Services Division of its Department of State as the primary input source for its Information Services System. It processes 500,000 drivers' records per month, including 26,000 drivers' licenses each week prepared at locations throughout the state.

Electronic Retina Computing Readers are also helping the airlines do things like keep track of revenues and capture marketing statistics. Systems in use at United, American, TWA, Pan Am and Air Canada read more than 1.5 million airline tickets every week. Of course, the reader can do a lot more than read tickets. In fact, one of the airlines has found fifteen different jobs it can do.

Texaco, American Express, Atlantic Richfield, Standard Oil of Ohio and Humble are using Electronic Retina Computing Readers to process credit card charges. (American Oil, Sinclair and Standard Oil Company of California are about to join them.)

Spiegel, Inc., Chicago, one of the nation's largest catalog sales firms, uses a reader to process customer accounting and sales solicitation information.

A system at the Library of Congress in Washington soon will be reading catalog card orders typed or printed by hand at the 25,000 libraries around the world which subscribe to the Library's Card Distribution Service.



So, Electronic Retina Computing Readers are reading a lot of things in a lot of places. Often, 24 hours a day, 6 or 7 days a week. But, in every case, reading is only half of the story.

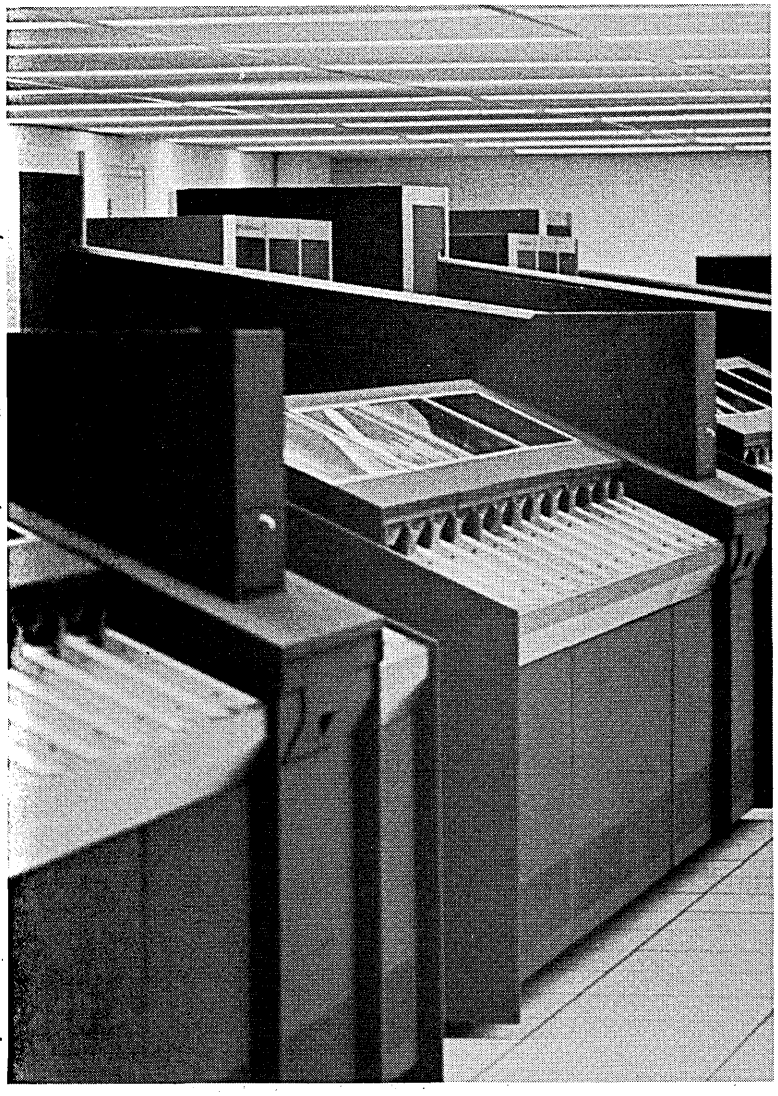
It's O.K. to fold, spindle and staple

The second most important area that separates the readers from the gropers is paper handling. Most OCR

systems can only process a single type of document. They're also touchy about torn and tattered paper.

The Electronic Retina Computing Reader is a lot more flexible. It will handle everything from flimsy airline tickets to card stock. Page size or pint-size. Dog-eared, torn and stapled. Intermixed or uniform. And, without punching a single hole, it can encode and sort documents into a dozen or more categories.

One of the first companies to realize the importance of efficient paper handling was United Air Lines. UAL's



Electronic Retina Computing Reader is paying for itself in half the time predicted. It saves the airline approximately $20,000 to $25,000 a month in input preparation.

Tilt

Nothing is perfect. The Electronic Retina Computing Reader sometimes finds a character it can't read. Occasionally, it even makes a mistake. But, compared to scanning, these goofs are negligible. Recognition Equipment's reader reads up to ten times better than scanners.

An unreadable character means a rejected document that must be processed by hand. And that's an expensive way to feed a computer. Credit Card organizations have tried both reading and scanning techniques. They've learned that scanners reject about twice as many documents as the Electronic Retina Computing Reader. With a volume of only 500,000 charge tickets per day, the cost of keypunching those rejected documents (with no verification) is more than the monthly rent for the reader. If you let a mistake get into the computer, it can cost anywhere from 10¢ to $10, depending on how long it takes to find it and the kind of job being done.

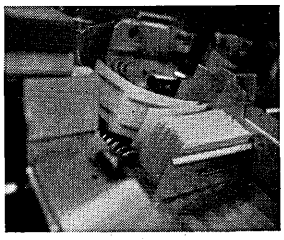
But, even without mistakes, keypunching is expensive. Seventy-two keypunch operators producing about two million cards a month (average of 40 characters per card) cost about $48,000 a month in salaries, equipment and materials. An Electronic Retina Computing Reader leases for as little as $15,000 a month and will process an equivalent data volume in less than an hour a day.

The $750-million charge account

Your credit card invoices are going to catch up with you a lot sooner than they used to. Companies like American Express have found that Electronic Retina Computing Readers solve a growing credit card industry problem. They help cut down the float. Charges can be processed faster, so bills go out sooner. As a result, the companies extending credit get their money back faster.

CODING AND SORTING

In conjunction with the Electronic Retina Computing Reader, Recognition Equipment developed an Ink-Jet Printer and Bar Code Reader/Sorter for high-speed, economical sorting of ordinary paper documents. The system eliminates the need for punched cards. After the document has been read by the Electronic Retina, it passes the Ink-Jet Printer where it is encoded with electrically charged fluorescent ink. The printer sprays 48,000 drops of ink a second. When the document reaches the Bar Code Reader/Sorter, the coded information is read and the document is sent to the correct sorting bin.



The American Express Company uses Electronic Retina Computing Readers to process close to three-

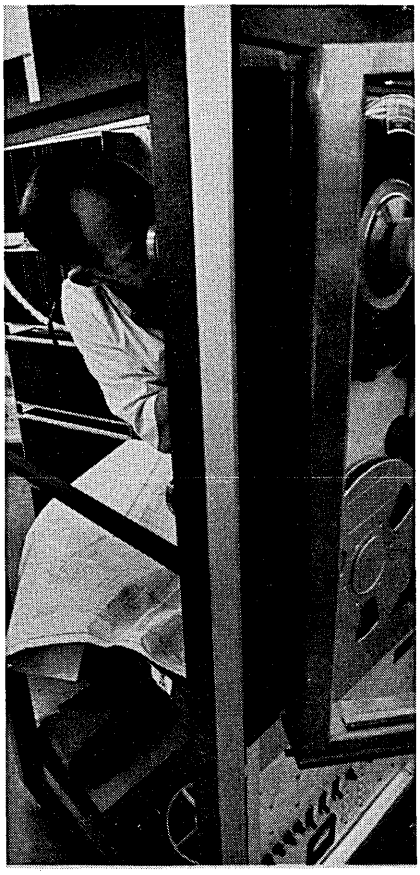
quarters of a billion dollars in annual billing. (American Express also has a reader for its money order division.)

The typical Recognition Equipment credit card system works like this:

When the charge tickets come in, they go directly to the reading system. Account numbers are read and checked against a list of lost and stolen cards. Amounts are balanced and the tickets bar-coded. All automatically. When the statements are generated, they're bar-coded and sorted together with the charge tickets ready to be returned to card holders. The system reduces 13 processing steps to four or five and cuts billing time by as many as five days.

The built-in engineer

Every Electronic Retina Computing Reader installation comes with its own, live field engineer. He's on Recognition Equipment's payroll, but reports to work wherever the equipment is operating. The idea is unique. Recognition Equipment is the only company in the data processing field that has at least one full-time resident engineer at each installation.



Recognition Equipment personnel have also been known to stretch service policies a bit. Two years ago, when American Airlines was up to its waist in tickets (because of the Machinists' strike), Recognition Equipment's marketing vice president and his wife went to the American data processing center to see if they could lend a hand. They could. And, they did. They worked all night to help get the new reader into the system.

The American Airlines story is unusual. But, so is Recognition Equipment. And, it's all the result of a master plan devised by the company's president a little over six years ago.

The Philipson philosophy

The Electronic Retina Computing Reader is the first departure from scanning techniques since the OCR industry began in the early 1950s. It was a planned departure. Herman L. Philipson, Jr. started Recognition Equipment Incorporated in 1961 with one goal: to produce a real optical reader; the best one in the industry. He established three areas in which the machine had to exceed all other OCR machines on the market: *how* it reads; *what* it reads and *how* it handles paper. He knew that the big users of data processing equipment couldn't afford anything but the best input system. So he built the best. And the most expensive. The Electronic Retina Computing Reader costs from three to five times more than any other OCR machine. But, when you consider paper handling, speed, versatility and accuracy, it tells a pretty impressive price/performance story.

Philipson believes that specialization is the key to successful implementation of advanced technology. Recognition Equipment has one major interest: computer input. All technology is developed in response to customers' growing data input requirements. The concept has led to such developments as the Ink-Jet Printer, the Bar Code Reader/Sorter and the Handprinting Reader. And, just a few months ago, Recognition Equipment engineers developed a remote Time-Sharing Retina that can be used in a large number of remote locations.

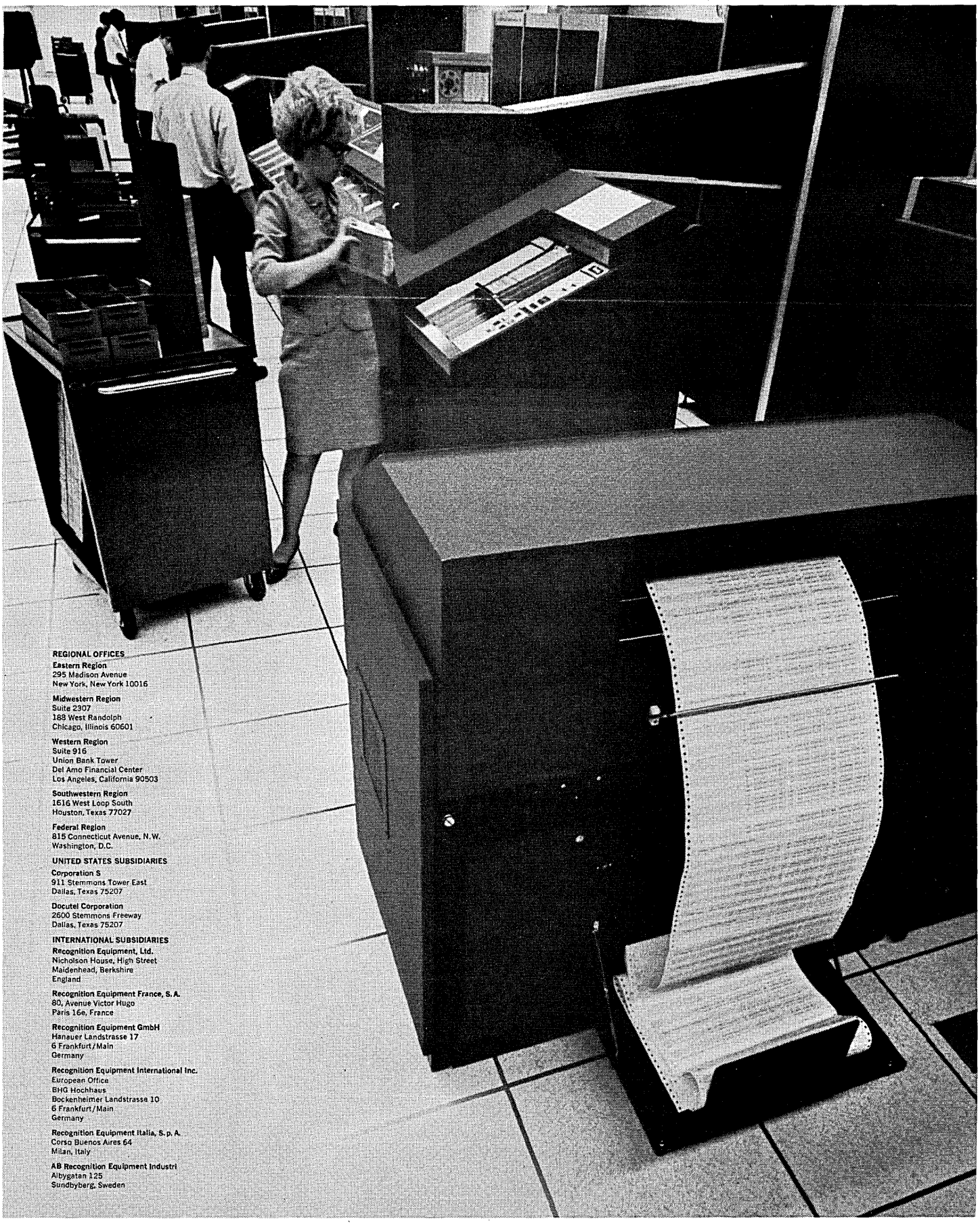
Philipson also believes in diversification. Recognition Equipment is the parent firm for a group of companies with related products and services. One of these, Docutel Corporation, is extending computer technology into consumer service areas.

Recognition Equipment makes large-scale systems for large-scale users. Philipson has always felt that only a major installation could support the kind of full-time, on-the-spot customer service his company provides.

The philosophy has paid off. Today, Recognition Equipment is the world's largest manufacturer of OCR systems. The company's average contract is about $1.5 million. And, that's the highest average contract value in the business.

Recognition Equipment Incorporated

1500 West Mockingbird Lane Dallas, Texas



REGIONAL OFFICES

Eastern Region
295 Madison Avenue
New York, New York 10016

Midwestern Region
Suite 2307
188 West Randolph
Chicago, Illinois 60601

Western Region
Suite 916
Union Bank Tower
Del Amo Financial Center
Los Angeles, California 90503

Southwestern Region
1616 West Loop South
Houston, Texas 77027

Federal Region
815 Connecticut Avenue, N.W.
Washington, D.C.

UNITED STATES SUBSIDIARIES

Corporation S
911 Stemmons Tower East
Dallas, Texas 75207

Docutel Corporation
2600 Stemmons Freeway
Dallas, Texas 75207

INTERNATIONAL SUBSIDIARIES

Recognition Equipment, Ltd.
Nicholson House, High Street
Maidenhead, Berkshire
England

Recognition Equipment France, S.A.
80, Avenue Victor Hugo
Paris 16e, France

Recognition Equipment GmbH
Hanauer Landstrasse 17
6 Frankfurt/Main
Germany

Recognition Equipment International Inc.
European Office
BHG Hochhaus
Bockenheimer Landstrasse 10
6 Frankfurt/Main
Germany

Recognition Equipment Italia, S.p.A.
Corso Buenos Aires 64
Milan, Italy

AB Recognition Equipment Industri
Albygatan 125
Sundbyberg, Sweden

CIRCLE 18 ON READER CARD

upgrading

A DIGITAL RESOLVER FOR THE PDP-8/S

by MICHAEL P. GREENBERG and FREDERICK J. T. DOW

Small general-purpose computers, such as the Digital Equipment Corp. PDP-8 series of 4K machines, are ideally suited for many process control applications. Use is already being made of this small computer capability and potential applications offer extensive economies and performance improvements. Our particular applications of these machines have been in the area of numerical control for machine tools where, for example, we have been able to provide simultaneous, real-time control for eight milling machines. This system time-shares the slowest and cheapest computer of the present DEC line, the 28 usec PDP-8/S, to provide completely independent control of each machine plus a tape reader. This is made possible by the relatively simple data processing required for point-to-point machine control where relatively little mathematical computation is involved.

Having configured a PDP-8/S system able to control eight millers for point-to-point, we were then challenged by "full contouring" numerical control requirements. Indeed, the wider range of applications demands circular interpolation and cutter compensation as well as contouring, all to an accuracy of 1 part in $(10)^6$ (20 bits) while moving at speeds exceeding 200 inches per minute. The real-time data input to the system contains only line segment end points and arc segment radius centers and end points for the part to be made. Determining the cutter path for variable-sized cutting tools requires sophisticated and nonlinear computation. For this application the relatively slow PDP-8/S could still handle all the routine monitoring and servicing of machine motion and associated functions; but even the fastest and most versatile of the small computers could not calculate the tool path on a real-time basis. This then was our design challenge.

Our solution was to utilize the PDP-8/S computer to perform all data processing and machine servicing, and to design a parallel-processing peripheral device to solve the trigonometric problems of contour path control. Dubbed the EUCLOX for Euclidian (geometry) box, this accessory plugs into the standard PDP-8/S computer bus and performs all its computations from instructions and data loaded by the computer. According to the computer-given instruction, the device will either interrupt the computer when the solution is completed, or will simply halt and wait for computer service. Vector calculations are made with up to 20-bit precision (expandable to 24) at a rate exceeding 1 radian/second at full accuracy. Reduced accuracies of 16 and 12 bits are programmable and solutions proceed at correspondingly faster rates. Thus, the entire tool path for a 20-bit radius circle could be generated in less than 2 seconds of processor time. Computer interrupt and service time is, of course, additional. Twenty-bit multiplication or division can also be programmed, and provision was made in the basic design to

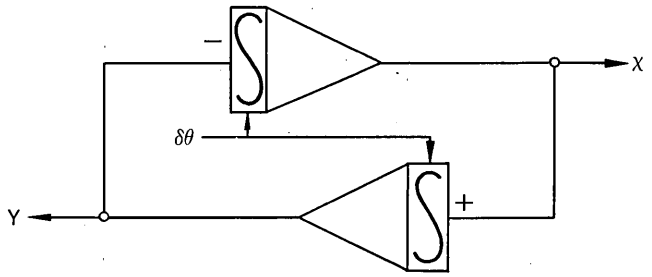
Mr. Greenberg is a senior electronic engineer at Bedford Associates, responsible for design of instrumentation, digital, and display systems. He was previously with Laboratory for Electronics and the Norden Laboratories Div. of United Aircraft. He has a BSEE from MIT.

permit parabolic and logarithmic calculations as optional features. The total cost for the EUCLOX processor plus computer is approximately equal to that of a full sized PDP-8; for this type of problem the performance offered is many times more powerful.

theory

The generation of circular arcs in real-time via digital-operational techniques is well known. In many numerical control applications, circuitry such as that described here is used for direct generation of such contours. In the application to be discussed, however, the capability of an arc generator to resolve angles and to rotate vectors is utilized by the central processor as a trigonometric calculation extension.

Fig. 1 illustrates the basic equations of the arc generator:



$$X = -\int_0^{\circ} Y\delta\Theta + X_0; \quad -\frac{\delta\chi}{\delta\Theta} = Y \qquad (1)$$

$$Y = \int_0^{\circ} X\delta\Theta + Y_0; \quad \frac{\delta\gamma}{\delta\Theta} = X \qquad (2)$$

Solving the differential equations, one obtains

$$X = R\,\cos(\Theta + \Phi) \qquad (3)$$

$$Y = R\,\sin(\Theta + \Phi) \qquad (4)$$

$$\text{WHERE } R = \sqrt{X_0^2 + Y_0^2}$$

$$\text{AND } \Phi = \tan^{-1}\frac{Y_0}{X_0}$$

Fig. 1

A digital integrator can be implemented by an adder and counter as shown in Fig. 2, where X, RY, and Y are N bits each.

The combined RY and Y register then is a double-length accumulator and the combined contents are considered to be scaled by 2^{-N}. Let these contents be designated y. At the Kth add pulse

$$Y_K = Y_{K-1} + X_{K-1} \qquad (5)$$

$$Y_K = 2^{-N} Y_K = 2^{-N} Y_{K-1} + 2^{-N} X_{K-1} \qquad (6)$$

$$= Y_{K-1} + 2^{-N} X_{K-1}$$

$$= Y_{K-1} + X_{K-1}\Delta\Theta$$

$$\text{WHERE } \Delta\Theta = 2^{-N}$$

$$\text{THUS } Y_N = Y_0 + \Sigma_{K=1}^{N} X_{K-1}\Delta\Theta \qquad (7)$$

corresponding to $Y(\Theta)$, where $\Theta = n\Delta\Theta$.

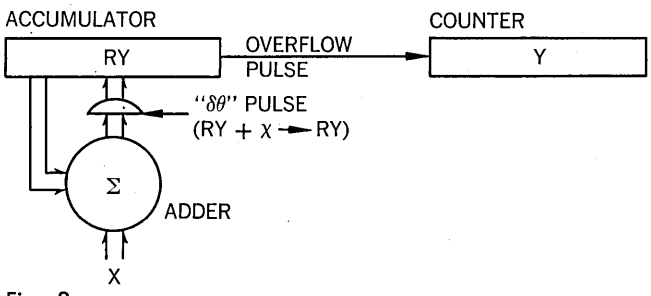


Fig. 2

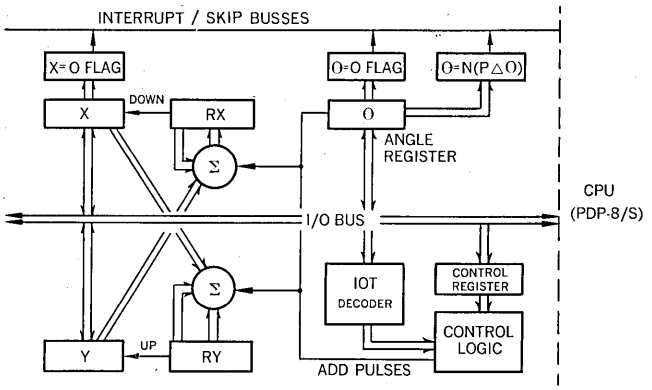


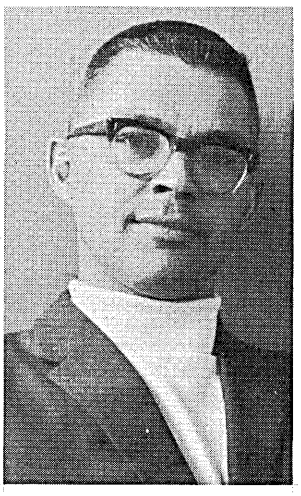
Fig. 3

Since the maximum size of $X_{K-1}\Delta\Theta$ on a single step is unity (least significant bit of the Y register) it can be shown that the integration process is approximated to within one count of the resolution of the Y register for a variable X which changes at a rate of less than one count per add pulse for $N\Delta\Theta < 2$.

Fig. 3 shows the complete complement of equipment required to perform the arc generation functions and to communicate with the central processor (cpu). The angle register is a counter which counts total add pulses ($\Theta = n\Delta\Theta$).

The angle register thus contains the angle (in radians times 2^n) through which a vector has been rotated following each operation. Rather than transmitting X and Y position or rate directly to machine tool servos, the X, Y, and angle registers are sampled by the central computer which, in turn, transmits positional points to machine interfaces. A control register is provided in order to establish modes of operation. By means of this register the solution may be programmed to stop after a preset number of add pulses, a rotation to zero angle, or a rotation to the X axis. Auxiliary functions allow counting to be disabled in the X or Y register, permitting multiplication or division by a constant.

Note that path generation using binary rate multipliers may also be applied where reduced accuracy is acceptable. A rate multiplier approach, however, creates cumulative errors which depend upon angle of rotation and starting point. Prediction of peak errors in such a system is highly involved, and depends upon exact knowledge of input variables. The difference in hardware cost between the digital



Mr. Dow is a senior circuit engineer at Bedford Associates. He was previously with Laboratory for Electronics, Honeywell, and Vitro Laboratories. He has a BS in engineering physics from the Univ. of Maine and has done graduate work in mathematics at Boston Univ. and Northeastern Univ.

integrator and rate multiplier approaches effectively vanishes for systems of equal accuracy.

application

The device is, then, a digital resolver that in one mode of operation generates the end points of a line segment that will approximate the circular arc to machine tolerances. Using the end points thus generated and machine feed rate information, the X and Y components of the machine velocity vector are determined by employing the resolver once more (after placing current working position in the computer core). In Fig. 4, r_1 and r_2 are the position vectors of the two generated end points, representing a rotation of a radius r through and angle increment α. In order to generate the velocity vector v, the angle of the position vector last generated is determined by loading the Δ X and Δ Y values into the resolver and rotating to the X-axis (Δ X and Δ Y are the components of the generated line segment Δ r). The angle register now contains the angle β of the incremental position vector Δ r. The X register is now loaded with the feed rate /v/ (absolute magnitude of desired velocity) and the vector is re-rotated to the original angle. The X and Y components of velocity are thus produced and can be applied to the machine interface along with the incremental positional information. The tool path solution would then continue following the recovery of working values from core.

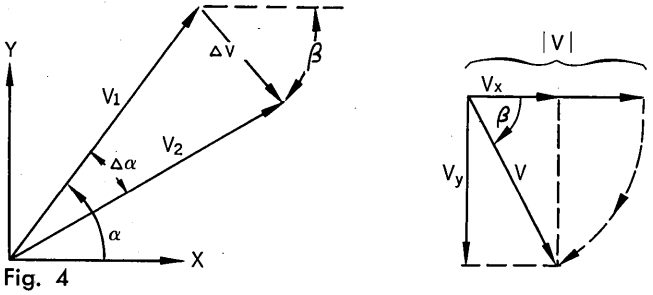


Fig. 4

A second important application of the resolver is for tool offset calculations. At a point on a tool path, the vector from the desired cutting point to the actual tool center must be determined and then rotated at corners, joining points, and along circular arcs. For arc cutting (see Fig. 5) the radius vector r to the start point is rotated to the X axis to determine the angle. The offset vector (K) is then rotated through this same angle. The X and Y components of K thus determined are added to the X and Y values of the start point. The solution will then progress from this point with offset maintained throughout the cut. To minimize calculation time, the X and Y values of the start point may be initially scaled down since tool offset is small compared to the radius of curvature in the application for which the resolver was designed.

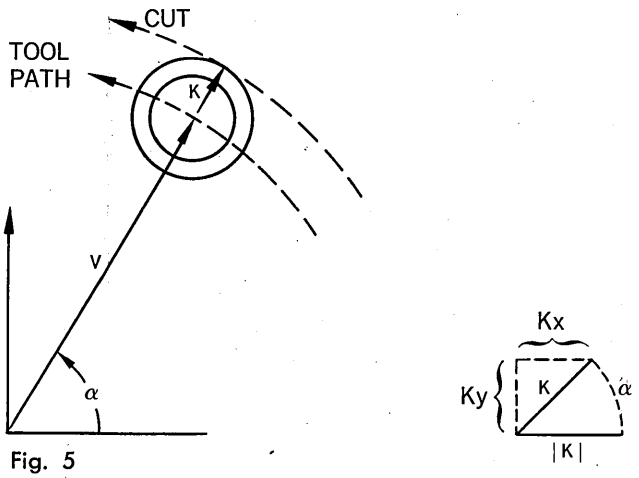


Fig. 5

For a join calculation (Fig. 6), the resolver may be utilized to find the angle at which the two paths intersect, and to perform the offset vector rotations to produce the new tool paths. The "inflection" point may then be found by sampling the two paths or by direct calculation of the intercepts using the resolver in its normal and multiply/divide modes to generate K/ (tan α/2) as shown.

summary

One of the major limitations of the digital-operational approach to computation has been speed of solution. The EUCLOX digital resolver has unique advantages in this application for several reasons. A small computer, although highly efficient for housekeeping, multiplexing of input/output devices, and simple arithmetic, is severely limited as to speed and capacity in the calculation of trigonometric and other nonlinear functions. The low cost ($10,000), low capacity (4096 12-bit words), low speed (28 usec/cycle) machine used could not perform the number of multiply cycles required to generate a tool path in real-time, let alone perform all other control and decision functions simultaneously. Since off-line processing of part tapes is undesirable in the current application, cost trade-offs among a larger and faster machine, a two-processor system, and the digital resolver, give an advantage to the latter. A full 20-bit radius quadrant can be generated in 1.0 second using 2 mHz logic. Thus, for a 12-bit solution, a quadrant rotation requires 15 milliseconds.

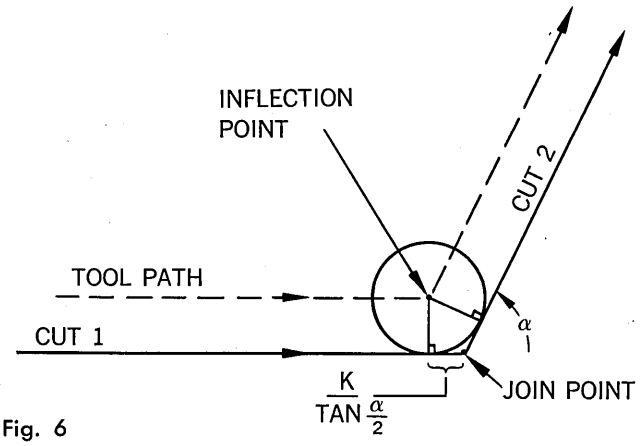


Fig. 6

Various word size options are provided to facilitate minimum solution time. Features that provide selection of interrupts or flags at zero X, zero angle, or at fixed angular increments allow the cpu to set up the resolver and continue other processing as the solution takes place. Since the cpu takes over the functions of determining quadrant and direction of rotation, the resolver hardware can be minimized and therefore can be implemented at modest cost. Multifunction microcircuit implementation is feasible and offers increased speed and reduced cost.

For numerical control applications, the advantages of the configuration described are:

1. The ability of the resolver to service several machine tools and other peripheral devices via time-sharing through the cpu.

2. To simultaneously serve to augment the arithmetic capability of the cpu.

These features are equally applicable to a variety of process control systems using small general-purpose computers. ■

Kodak

Want a system that retrieves and refiles at the touch of a button?

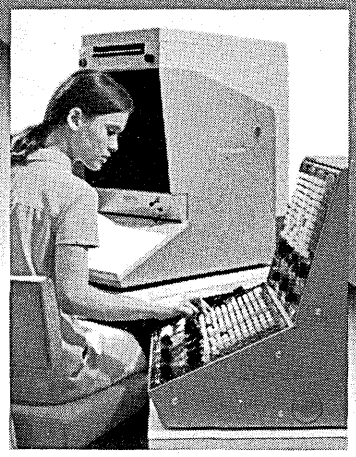
Come to Kodak.

Automated handling of records on microfilm—even by the millions, is a basic advantage of the RECORDAK MIRACODE System. It takes only a split second to "file" an item on microfilm, only seconds to retrieve it for reference, only seconds to refile it.

But there's more to this automated record-handling system. One good example is the MIRACODE System's unique ability to "browse" the file—to locate a desired image by practically any indexing method. By accession number . . . by time . . . by author . . . by descriptor . . . or by any combination of these, and in any sequence!

Put in another way, this means that you only need to know something about what you're looking for. The RECORDAK MIRACODE System does the rest . . . searches through the microfilm . . . gives you a count of the images that match your search parameters . . . and displays the desired image or images in seconds. Want a facsimile print? Just press a button.

For more details, contact: Eastman Kodak Company, Business Systems Markets Division, Department XX-8, Rochester, N.Y. 14650.



"Recordak" and "Miracode" are trademarks of Eastman Kodak Company.

RECORDAK® Microfilm Systems by Kodak

CIRCLE 20 ON READER CARD

INTRODUCTION TO GOING PUBLIC

by ARTHUR M. BORDEN and JOHN H. BALL

The major hardware manufacturers such as IBM, GE and RCA have, of course, been publicly owned for a long time. In the mid 50's, a number of the newer hardware companies such as Control Data, Digital Equipment and Teleregister were organized and went public, and in the late 50's and early 60's some of the pioneer software companies such as Computer Sciences, Computer Applications and Computer Usage joined the family of publicly-owned companies.

In the mid 60's, smaller companies in the data processing field, both in hardware and software, as well as service centers and those engaged in leasing data processing equipment have come to the attention of the investing community. Accordingly, it may be appropriate at this time to review the basic legal and practical information that any company must have if it is contemplating a public offering of its securities.

governing statutes

The public offering of securities is governed by the Securities Act of 1933, as amended (the Act), administered by the Securities and Exchange Commission (SEC), and the securities laws of the various states (called "Blue Sky" laws), which are administered by the securities commissions or other designated officials of the respective states.

The Act is a so-called disclosure statute, that is to say, it seeks to protect the purchasers of securities by requiring adequate disclosure by sellers. It contains two principal types of provisions—those requiring what is called registration of public offerings of securities and the so-called anti-fraud provisions. The Blue Sky laws range from those permitting public offering without any filing or on mere notice filing, through others fixing minimum standards which a public offering must meet, to some which vest in the securities commissioner discretionary authority to approve or disapprove an offering.

Generally, as a rule of thumb, an offering is public and subject to the various securities acts if it is made to more than 25 offerees, or if any of the offerees is not in a financial position to risk the investment or lacks the sophistication to understand the nature of his risk. The so-called intra-state public offering—that is, one by a corporation incorporated and doing a substantial portion of its business in a single state and offering its securities only to residents of that state —is exempt from the registration provisions of the Act (described below) although the anti-fraud provisions of the Act are still applicable. Nevertheless, companies considering an intra-state offering should understand that it is difficult to comply with this exemption from registration, and the SEC generally takes a dim view of the attempt.

public offering procedure

Under the Act, in order to effect a public offering and sale of securities in excess of $300,000, the company must file a Registration Statement with the SEC in Washington, D.C., and the SEC must declare the Registration Statement effective. A Registration Statement is a form which requires certain information to be supplied, the bulk of which is set forth in what is called a "Prospectus." The Prospectus is filed with the SEC and may be circulated among potential investors, with the familiar statutory form of red legend imprinted thereon—as a result of which such a Prospectus is commonly called a "red herring." During the "red herring" period, the securities may not be sold, nor may offers to buy be accepted, but offers to buy, called "indications of interest," may be solicited. The SEC then reviews the Registration Statement and issues a letter of comment, on the basis of which the Registration Statement, including the Prospectus, is appropriately amended. The SEC then declares the Registration Statement effective, whereupon offers for the security may be accepted provided a final Prospectus, this time without a red herring legend, is delivered to the purchaser prior to or with the confirmation of sale. The entire process from date of filing to effectiveness usually requires from four to eight weeks, although on occasion it may be considerably longer.

If the offering is of $300,000 or less, an alternative procedure is applicable under a regulation known as Regulation A. Pursuant to this procedure a filing is made in the SEC regional office in the region where the principal place of business of the company is located. The filing is made on a form called 1-A, and contains, for subsequent circulation among potential subscribers, a document called in this instance an "Offering Circular" rather than a "Prospectus." There are nine such regional offices throughout the country. No red herring Offering Circular is permitted, which means that the Offering Circular cannot be circulated in the investment community prior to the date upon which the Commission permits the offering to be made. The time required to "clear" a Regulation A offering varies from two weeks to two or three months. Generally, both the Pro-

Messrs. Borden and Ball are partners in the law firm of Robinson, Silverman, Pearce, Borden & Ball. Both are members of the New York Bar and are lecturers for the Practicing Law Institute in the corporate and securities field.

spectus and the Offering Circular require a disclosure of the history of the company, the precise nature of its business, including information concerning its products, properties, personnel, sales, patents and competition, its financial condition, its principal shareholders, its officers and directors, important contracts with suppliers and customers, and all other information which would be of significant interest to a potential investor.

offering readiness

Before a company can decide whether or not it would like to go public at any particular stage of its development, it must determine its offering readiness.

With the principal exceptions noted below, such a company must have available or be able to obtain an unqualified certificate of an independent certified public accountant with respect to a balance sheet which must be of a date not more than twelve months before the date of filing with the SEC, an income statement for each of the three full fiscal years and any interim period preceding the balance sheet date and unaudited income statements for the two prior years. In addition, if such audited financial information is of a date more than 90 days prior to the date of filing with the SEC, an unaudited income statement from the date of the audited balance sheet to a more recent date, and for the comparable period during the prior fiscal year, and an unaudited balance sheet as of more recent date, must also be furnished. Of course, if the company has been in business less than three years, it only must go back as far as does its history. If there are subsidiaries, financial statements must be consolidated.

An auditor who in any way keeps the books of a company, or has a stock or financial interest in, or participates in the management of a company, is not independent under SEC rules. The exceptions to the foregoing financial requirements are: (1) if the offering is made under Regulation A then there are required an unaudited balance sheet dated within 90 days of the filing, together with unaudited income statements for the two full fiscal years prior thereto and for any interim period between the close of the last fiscal year and the balance sheet date, or (2) for certain companies in the development stage without any substantial operating history which file on a registration form known as Form S-2 and which are only required to furnish an audited statement of assets and liabilities and audited statements of cash receipts and disbursements.

Another possible source of difficulty for companies considering public financing arises out of prior financings through which a substantial number of stockholders or bondholders, or both, may have been accumulated. These financings, taken singly or as a whole, may constitute a prior illegal public offering in violation of the registration, anti-fraud, or both, provisions of the Act, so that the company may be required to make a registered rescission offer to such prior stockholders or bondholders, offering to return their moneys to them or, at least, may be required to establish on its books a so-called "contingent liability" to such stockholders or bondholders for having made an illegal offering. Either of these possibilities may, as a practical matter, preclude a public offering for a number of years.

Since the Act is a disclosure statute, management, in order to comply with the registration requirements of the Act, must be willing to make full and complete disclosure of all pertinent information regarding the company. Those companies unwilling, or for any reason unable, to do so, are not ready for a public offering.

types of underwriting

An underwritten public offering is one in which the services of a broker-dealer are employed to make the offering. There are three basic forms of underwritings—a firm underwriting or firm commitment; a best efforts all-or-none offering; and a straight best efforts offering.

A firm offering or firm commitment is one in which the underwriter agrees to purchase all of the securities to be offered at a discount (called the "commission" or "spread") from the public offering price; such purchase is made by the principal underwriter, called the "managing underwriter," and by other underwriters whom the managing underwriter brings into the offering, called "co-underwriters," all of whom offer to sell the securities to the public as principals (either directly or through other brokers who are called "selling group" members) and not as agents for the company. In this form of underwriting, the key fact is that these underwriters do not sign the purchase agreement until the day of, or the day before, the effective date of the registration statement and, accordingly, until such date there is no firm commitment to "take down" the securities. On the other hand, if a registration is filed by a company with a reputable underwriter, it is only in the most unusual instance that the underwriter will not proceed with the offering unless, of course, there occurs an adverse change in the circumstances of the company or a serious dislocation of market conditions.

In a best efforts all-or-none offering, the underwriter, pursuant to an agreement which usually is signed well before the effective date, agrees as agent for the company to offer securities to the public and to use its best efforts to sell them on an all or nothing basis, which means that unless all of the securities are sold within a designated period, usually 30 or 60 days, the offering is terminated and all moneys received to that date are returned in full to subscribers. In a variation of this form, all moneys are returned to subscribers unless a specified portion of the securities is sold.

In a pure best efforts offering the underwriter agrees to use its best efforts, as agent for the company, to sell securities for the company during a designated period of time and all sales are final regardless of how many securities are sold. This latter form is the least desirable, particularly for the company and the securities purchaser, and is not commonly used except for the smallest and most speculative issue.

Corporate executives contemplating a public offering will usually be well advised to consult their bankers, attorneys, auditors and responsible business contacts for suggestions as to appropriate investment banking firms which may be interested in underwriting their securities. Any names which are suggested should be checked both for reputation and recent performance with other issues, especially with respect to the managing underwriter's continuing interest in the so-called "after-market," that is, the market for the securities after the offering. Generally, investment banking firms will be glad to meet with executives and will give a prompt reply as to whether the firm has an interest in handling the proposed public offering. These services are always performed without charge. On occasion, a person acting as a finder may effect the introduction of a company to an underwriter, in which case it is not uncommon to provide for the payment of a finder's fee either in cash, stock or stock options. In all cases where there is a finder, it is essential that any agreement with respect to compensation be reduced to writing as early as possible and that the agreement provide that no compensation be due and payable if for any reason, including the willful default of the company, the offering is not successfully consummated.

In negotiating with an underwriter, it is always useful to study the so-called price-earnings ratio (i.e., market price to after-tax earnings per share) of comparable companies in order to define the range of the price-earnings ratio in which the company's own shares are being offered. A company going public for the first time must appreciate that its securities must be offered at a discount from the market price of similar companies which have already won market

acceptance, in order to attract interest in the investment community. In some cases, the managing underwriter may agree on a price range but not agree upon the exact amount of the offering price to be inserted in the Prospectus until the day of, or the day before, the effective date. Among the subjects for discussion with the managing underwriter are underwriting commissions, whether the underwriter may purchase any shares or warrants in advance of or upon completion of the offering, the placing of a designee of the managing underwriter on the company's board of directors, a right of first refusal with respect to future public or private offerings by the company or its principal shareholders, making the company's transfer sheets available to the managing underwriter, and the like. While sometimes it is unavoidable, companies that seek public offerings are generally well advised to avoid "shopping" the deal. It is often said that there are no secrets in Wall Street, and underwriters are often reluctant to underwrite offerings that they learn have been rejected by other firms. In order to avoid this pitfall, it is important to give careful consideration at the outset to approaching only those firms which are likely to have an interest in the prospective offering.

Normally, the basic issues to be negotiated between the company and the prospective underwriters are the size of the offering and the price-earnings ratio of the security immediately after the offering. Agreement on the price-earnings ratio and the size of the offering generally determines the structure of the capitalization of the company. For example, suppose agreement is reached that the securities of X Corp., which earned $400,000 after taxes in its last full fiscal year, should be marketed at 11 times such earnings after the public sale. This would mean that the shares to be outstanding after the offering, valued at the public offering price, should have an aggregate value of $4,400,000 (11 times $400,000). If the underwriter concludes that $10 per share price would be an appropriate offering price for the common stock of X Corp., the total capitalization would then be represented by 440,000 shares. If the decision were to raise $1,000,000, for the account of the company, then the present shareholders of the company would receive in exchange for the shares presently held by them 340,000 shares and there would be sold by the company in the public offering 100,000 shares at $10 per share so that following the offering there would be a total of 440,000 shares outstanding.

It is apparent from this analysis that if the company is not itself in need of funds, the underwriter may consider recapitalizing the entire pre-offering shareholdings into as many as 440,000 shares, and selling 100,000 shares for the account of selling stockholders. Usually, however, the issuer will require some funds and underwriters are reluctant to file a first registration on behalf of a company on a full "bail out" or even a partial "bail out" basis ("bail out" being the term used where the offering is made on behalf of the selling shareholders as contrasted with one made on behalf of the company) and, accordingly, the offering in most instances will be entirely for the account of the company.

Some underwriting firms prefer, and others are willing, to enter into non-binding agreements, commonly known as letters of intent, setting forth the important points of the agreement between the company and the underwriter. These letters are only an expression of the good faith or intention of the parties and are not legally binding.

securities to be offered

The decision as to the type of security to be offered is generally made after discussions between management and the underwriter. In reaching that decision consideration will be given to many factors, including the past earnings record of the company and its prospects for the immediate future, the amount of money to be raised, and whether those proceeds are to be solely for the benefit of the company or partly for the account of management, and the type of offering then in vogue or, to put it another way, most likely to offer a saleable package. Consideration is always given to management retaining its controlling interest in the company even after the offering; this consideration is pertinent regardless of whether there is to be an immediate dilution of control through an offering of common stock or a prespective dilution of control where a convertible security, with limited or no voting rights, is offered.

The types of securities that may be offered are several: i.e., common stock of one or more classes, preferred stock, which also may be of several classes, long-term notes (commonly called debentures), long-term notes convertible into shares of stock of any class, warrants to purchase any class of stock, or any combination of the foregoing. A combination offering may be in units, as for example, a unit consisting of $1,000 principal amount of a non-convertible note, 100 shares of common stock and 50 warrants. Again, the decision may be one of marketability.

Further, it is to be noted that a company may elect to offer a non-convertible note together with warrants, thereby giving the investor the same protection as owning a debt security and at the same time affording the investor the opportunity to profit from a rise in the value of the common stock. It is to be noted, however, that the company is not able, as in the case of the convertible note, to call the warrant for redemption and, accordingly, to oblige the holder either to accept payment in full for his note at any time prior to maturity or to convert his note into stock. On the other hand, an issue of long term warrants involves certain Securities Act expenses which must be thoroughly understood before this type of proposal is adopted. These examples are given merely by way of illustration of the type of considerations to be given in choosing the appropriate form of security to be offered.

An offering may also be entirely, or in part, of stock owned by selling shareholders. Such an offering is known as a "secondary offering." Principal shareholders may wish to include their own shares in the offering, either to diversify their investment, because they wish to create a market in the stock of their company even if the company does not require additional working capital or, in some cases, because they wish to make additional shares available for trading to satisfy the listing requirements of the American Stock Exchange. Under recently adopted listing requirements, the American Stock Exchange requires that the company have minimum public distribution of 300,000 shares (exclusive of the holdings of officers, directors, controlling stockholders, and other concentrated or family holdings) among not less than 900 holders, including not less than 600 holders of lots of 100 shares or more. This, however, is a matter of negotiation to be worked out between management and the prospective underwriter.

expenses

While there is no fixed rule, a company going public for the first time, with an issue of, let us say, up to $1,000,000, would have to anticipate costs of between $25,000 and $50,000, which would cover legal, accounting and printing costs. Certainly, any company considering going public should attempt to obtain some understanding as to costs and expenses before making any final commitment. In addition, smaller firms, dealing with smaller underwriters, will generally be required to make an accountable or, in some instances, a non-accountable expense allowance in a specific sum available to the underwriter. Expense allowances

Our customers got bigger. So did our small computer.

A few years ago we introduced our System/360 Model 20.

And pretty soon a lot of people began using it.

But before long we noticed something.

Their companies were growing. Even outpacing our computer.

So we decided to do something about it.

We added tape capabilities. But that wasn't enough for everyone.

We added disk capabilities. But that wasn't enough either.

That's why we decided to introduce another Model 20.

It looks like any other Model 20. It's even programmed the same way.

But it processes data approximately three times the internal speed. Has twice the core. Double the on-line storage.

And it can even keep computing during input or output with disk and tape.

But the nicest thing of all is that Model 20 grows with your business.

Because you can have up to 24K or 32K of core. And up to four IBM 2311 Disk Storage Drives.

And when you're ready to move to System/360 Model 25, you can make the move *without* reprogramming.

You see, Model 20 is for the smaller company that doesn't plan to stay small very long.

IBM®

FOR 3M CIRCLE 21 ON READER CARD

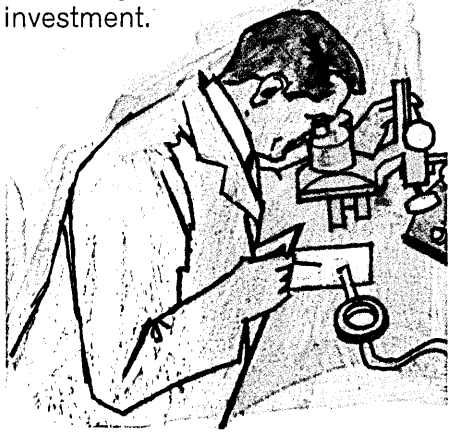
Take a good look at this label. It's on our new "Scotch" Brand 777GP Computer Tape.

This is 3M's Guaranteed Performance* Tape that makes costly roll-by-roll certification obsolete.

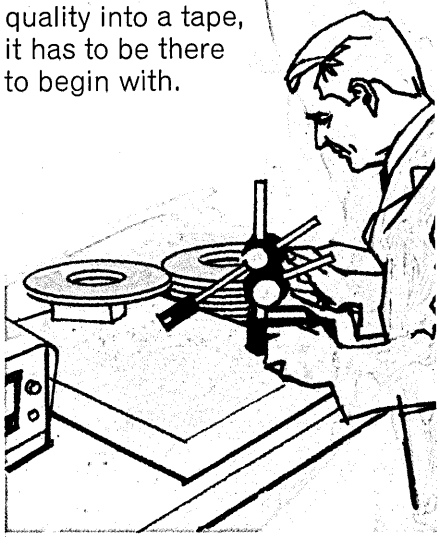
What is "Scotch" Brand 777GP? A new Guaranteed Performance computer tape designed specifically for use on third generation computers—an extension of the high reliability "Scotch" Brand 777 Computer Tape except that it does not require roll-by-roll certification.

*What performance can I expect from 777GP? With 777GP there are no read errors. In this critical area you will receive the same long term reliability as with certified "Scotch" Brand 777 Computer Tape. (For detailed specifications and performance characteristics ask your 3M representative for specification sheet M-CL155.)

How can 3M assure such performance? Because 3M's exclusive binder formulation has eliminated oxide re-deposits that cause read errors, and today's third generation dual-gap head computers now compensate for minor tape flaws with no loss of data. In addition, 3M's advancements in manufacturing technology have reduced minor tape defects to the point where roll-by-roll certification is no longer a valid investment.



How is 777GP quality assured There are more than 100 distinc quality control checks in the mar ufacture of every roll of 777GP. W have replaced outmoded roll-by roll certification with automated in-process electronic testing. You can't "inspect" quality into a tape, it has to be there to begin with.



For what performance capabilitie is 777GP recommended? 777G performs at all bit densities to 160 bpi (3200 fci).

Is "Scotch" Brand 777 certifie computer tape still available? Yes for those who feel the added cos of certification is warranted be cause the information being re corded or stored is irretrievabl and even the remotest chance of write-skip cannot be risked.

I'm interested in trying your ne "Scotch" Brand 777GP Compute Tape. What do I do now? See you 3M representative. Or write: Marke Services Department, Magneti Products Division, 3M Company 3M Center, St. Paul, Minn. 55101.

Who knows more about computer tape than the people who perfected it?

Magnetic Products Division 3M COMPANY

Is he for you or against you?

CHRONOS—GOD OF TIME

Time, the world's most valuable commodity, is being made to work for users of Planning Research Corporation's automated Management Information Systems. The payoff is increased profits resulting from the availability of immediate, sifted, and analyzed information essential to the conduct of your business in a competitive market. We distinguish this *information* from the *raw data* that formerly took days or weeks of processing to be of use in decision-making. Information is now available in hours or minutes, and not buried in voluminous tab runs. You can *manage* with it.

When we structure a Management Information System, we examine the total environment of your business. We begin by defining the objectives you want to achieve. We survey your organization and define its information needs. We define both the economic implications and the technical specifications of the system, and we design and optimize the system to respond to the people who use it. We select and procure the most effective hardware (we make no hardware of our own). We select or create the software. We train your operations personnel. More important, we train your users. This total approach ensures that the system embraces its environment, interacts successfully with its people, and works with maximum effectiveness.

Planning Research is a unique group of professionals. In addition to the computer sciences, disciplines include economics, business administration, behavioral psychology, most branches of engineering, the classical sciences, and mathematics. These disciplines, representing thirty areas of knowledge, are skillfully blended on project teams to form the most powerful analytic tool yet developed for the solution of computer problems.

To find out how a Planning Research Management Information System can let you manage information for your benefit, contact Mr. J. N. Graham, Jr., Vice President and General Manager, Computer Systems Division.

PLANNING RESEARCH CORPORATION

Home office: 1100 Glendon Avenue, Los Angeles, California 90024

An Equal Opportunity Employer. Candidates are invited to write to the Administrator for Professional Staffing.

range from $10,000 to $20,000 and are intended to cover the legal fees of the underwriter's counsel as well as the underwriter's advertising, mailing, travel and related expenses. Where the expenses are accountable, reimbursement is only made to the extent that expenses are actually incurred and payment is made against receipted bills. Also, as noted above, in some cases options or stock at reduced prices may be required to be sold to the underwriter in anticipation of the offering or upon completion thereof.

problems of data processing companies

Without attempting to define all of the problems which may be peculiar to companies involved in the data processing field, it might be well to note just a few:

1. Software companies have to consider whether they should capitalize or expense the cost of developing proprietary programs. Where programs are expensed the full cost is written off in the period in which the costs are incurred, thereby reducing income for the period. The alternative is to capitalize the cost of developing a proprietary program and writing off the cost of the program over its anticipated useful life.

2. Hardware companies face similar problems with respect to their research and development programs. In general, underwriters will prefer the expensing of costs and, to the extent not expensed, will prefer that only expenses directly related to research and development, and not the related overhead expenses, be capitalized.

3. Software companies involved in performing long-term contracts must consider the most appropriate way of accruing income, especially where partial payments are made, as is generally the case with government agencies.

post-offering obligations

Companies which register their securities must file regular periodic reports with the SEC. These include an annual report on Form 10-K, monthly reports on Form 8-K in any month in which a reportable event occurred such as a charter amendment, an acquisition, the commencement of an important litigation, or other important corporate event, and a semi-annual sales report on Form 9-K. In addition, at the end of the first fiscal year following the public offering in which the company has 500 or more shareholders of record and gross assets of at least 1 million dollars, it must register under another statute with the SEC as a so-called 12(g) company. The result of this requirement is that all subsequent proxy statements must be processed by the SEC and appropriate reports on Form 3 and 4 must be filed by officers, directors and 10% stockholders, with respect to any changes in their securities holdings in the issuer. Of course, public companies must hold annual meetings of their shareholders and generally supply quarterly as well as annual reports to shareholders.

Furthermore, principal shareholders must realize that although there may be a public market for their securities, they and members of their immediate family are not free to sell their shares on the public market, subject only to limited exceptions, without filing a registration statement.

Many companies find that going public makes it possible for them to acquire other business enterprises by the issuance of stock or other securities rather than for cash, and in many instances the ability to list a security on a national securities exchange, such as the New York or American Stock Exchanges, makes the company's stock more valuable for this purpose. Each of the exchanges has specific requirements which must be met to qualify for listing. ■

When graphic presentation means more than numbers, the CØMPLØT™ system saves time and money

Used at the remote terminal of a time-sharing computer, this CØMPLØT$_{tm}$ time sharing digital plotting system provides fast, accurate plots of scientific, business, engineering and financial data. Tedious columns of tabular matter come alive in graphic form—in minutes.

The Plotter/Teletypewriter Controller PTC-3, located in the desk drawer, connects to a Model 103A2 Dataphone, or equivalent, or to an appropriate acoustical phone coupler. The PTC-3 monitors incoming data and directs it to the Teletypewriter (TTY) or to the Digital Plotter DP-1. The information for the TTY is handled exactly as if the TTY was directly connected to the Dataphone. If the information is intended for the Digital Plotter, the PTC-3 decodes it and drives the DP-1 Digital Plotter.

Competitively priced . . . feature by feature

Speed:	290 increments/sec. limited only by transmission line speed
Chart Size:	11″ x 144′ Z-fold
Paper movement:	Bi-directional
Price:	PTC-3 Plotter/Teletypewriter Controller — $5,250 DP-1 Digital Plotter — $3,550
Rental:	PTC-3 and DP-1 — $315/mo. Unlimited use
Software:	No additional charge with purchase of system.

houston instrument | DIVISION OF BAUSCH & LOMB

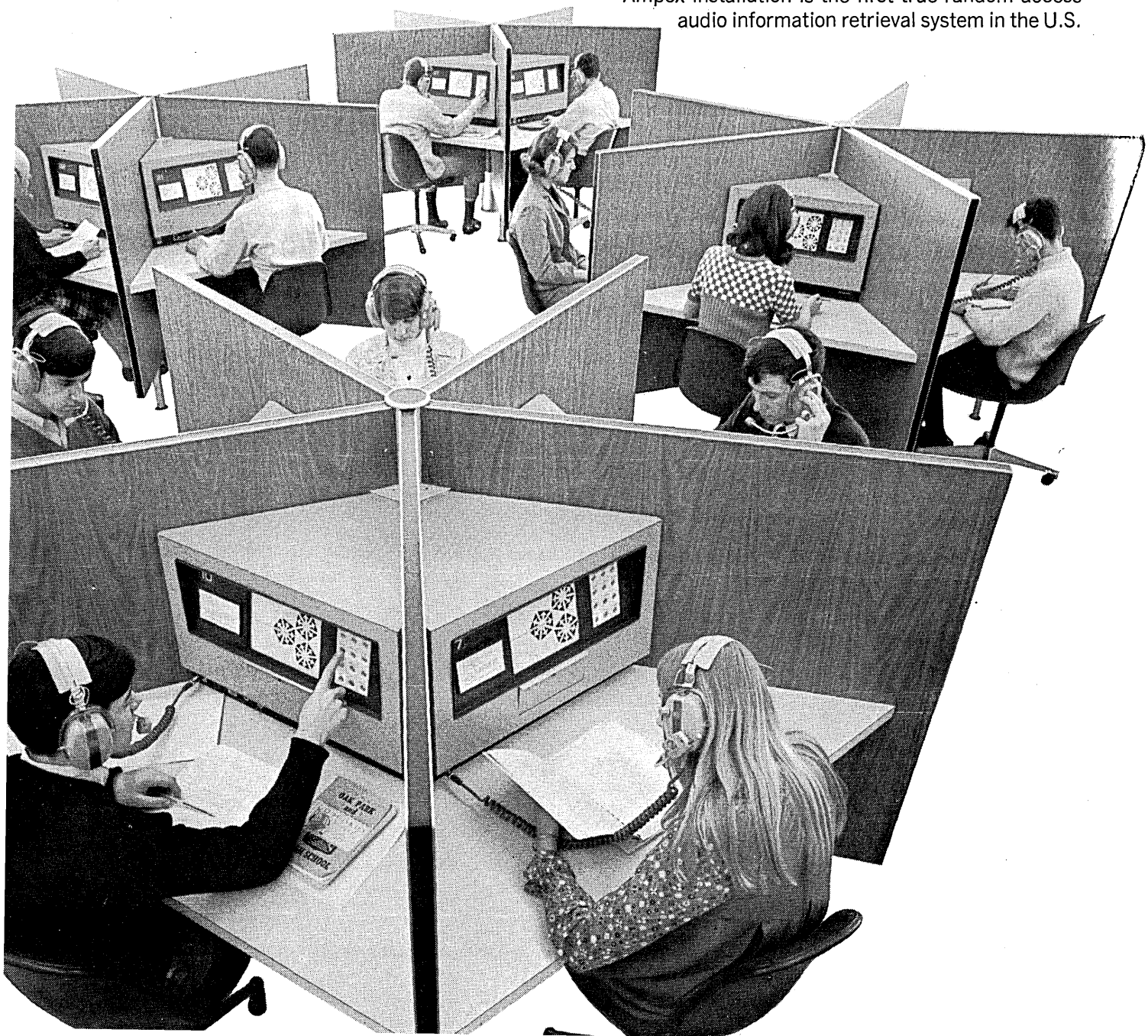
4950 TERMINAL AVENUE, BELLAIRE, TEXAS 77401

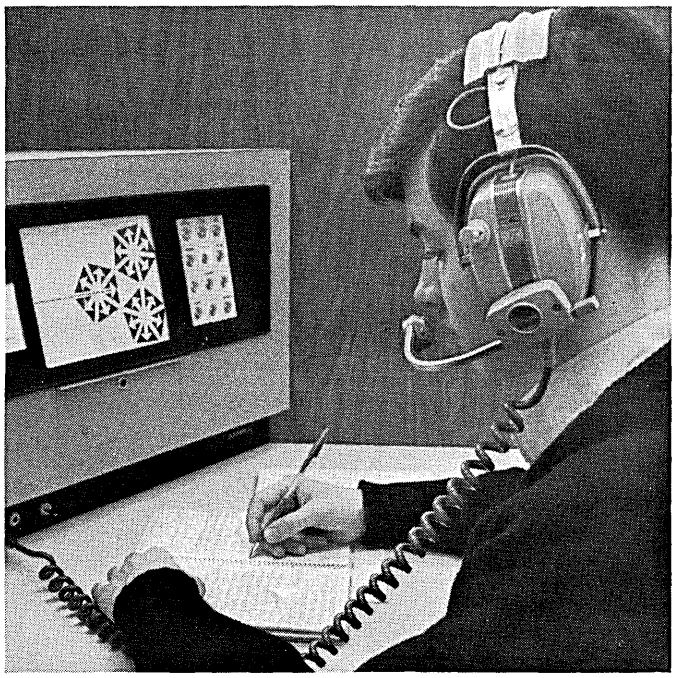
(713) 667 7403 CABLE HOINCO

CIRCLE 23 ON READER CARD

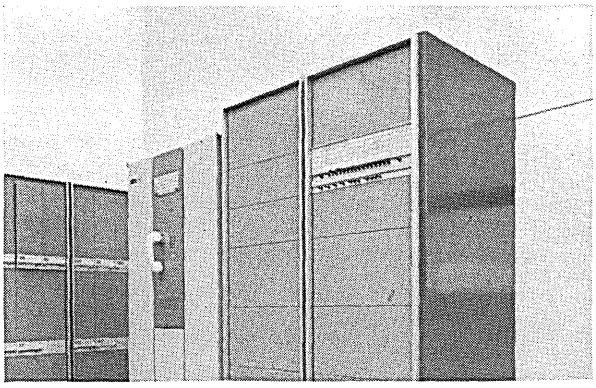
When students ring the Ampex retrieval system for information our SEL 810A answers the call.

Five of these carrels enable 25 students at a time to listen to instructional materials, each to a separate audio program or all to the same one. This Ampex installation is the first true random access audio information retrieval system in the U.S.





This student takes notes on a recorded audio lesson requested seconds before. Engineered and installed by Ampex, the system is controlled by an SEL 810A computer. The console will include a video monitor in a later phase. Requests for aid are directed to the supervisor through the computer and teletype.



Systems Engineering Laboratories' SEL 810A computer provides the memory and control functions between students and all system electronics in the Ampex random access audio information retrieval system. The computer is organized for "hands-off" operation, rejecting improper requests or input which might damage the system.

The Oak Park and River Forest High School in Illinois has the country's first true random access audio information retrieval system. Designed by the Ampex Corporation, the system presently allows 25 students to tap a magnetic tape library simultaneously. Any one of 224 15-minute programs is available in less than 30 seconds normally.

Systems Engineering Laboratories' SEL 810A computer acts as system controller, handling memory and control functions between the students and all system electronics. On request it selects the right program track and orders the student's individual buffer to record the master lesson, using high-speed duplication techniques. The computer program provides a usage log, student ID logging and a daily self-diagnostic routine. The program, using only 4K of core, can handle more than 175 students and 224 programs simultaneously without overload. The computer also fulfills telephone requests for programs.

We produce real-time computer systems to meet unique customer requirements, using almost exclusively our own components and products. If such a company can be of help to you, write P.O. Box 9148, Ft. Lauderdale, Fla. 33310. Or call Area Code 305/587-2900.

Systems Engineering Laboratories

CIRCLE 24 ON READER CARD

TWO MORE FROM DEC

line expands downward

Digital Equipment Corp. announced two new computers this month—the PDP-9/L and -8/L; both are less powerful versions of machines introduced earlier. The 9/L will sell for $19.9K, versus $35K for the 9; the 8/L's price is $8.5K, versus $10K for the 8/S and $12.8K for the 8/i. The 8/L will be rented as well as sold. The monthly charge hasn't yet been announced, but it's likely to be around $385. Deliveries of both new computers are scheduled to begin next October.

The 9/L is "about 10% more powerful" than its closest rival, Honeywell's 16-bit Model 516, and has a "40-50% advantage" over the 16-bit machines offered by Hewlett-Packard and Varian, claims DEC.

The 9/L system is built around an 18-bit, fully parallel processer. The basic system includes a 4K, directly-addressable memory with 1.5 usec cycle time, operator console, automatic program leader, ASR-33 teletype, and four data channels. Core is expandable in 4K word modules up to 32K. Almost all of the 9's hardware options, and all of its software options, are available to 9/L users, notably the background-foreground monitor DEC announced at the last FJCC. The 9, however, has a faster cycle time —1 usec vs. 1.5 usec. The 9 provides direct memory access to its peripherals, while the 9/L accesses through its processor. Also, the basic configuration of the 9 includes a paper tape reader-punch which is optional on the -9/L.

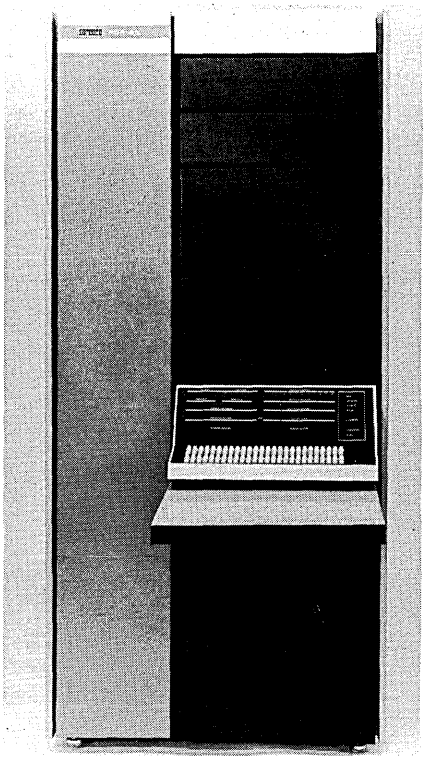
DEC describes the 8/L as "an 8/i with most of the prewired options removed." Both systems utilize. 12 bits/word, fully parallel central processors. Also, each system, in its basic configuration, includes a 4K core and inputs through an ASR-33 teletype. But the 8/L is slower. It has a 1.6 usec cycle time, compared to 1.5 usec for the 8/i. And, while the 8/L's core can be expanded to 8K, the 8/i's maximum is 32K.

Many of the optional extras offered with the 8/i are available to 8/L users —including a high-speed disc system, the DF32, which provides 32K (12-bit) words of storage and can be expanded in 32K modules. The 8/L version of this disc costs $8K, which brings the total price of that configuration to $16.5K. The DF32 that mates with the 8/i costs $6K, making the total cost of that configuration $18.8K.

The PDP-8/L

Among the 8/i options not available to 8/L users are DEC's type 680 data communications system and a "fast extended arithmetic element" which multiplies in 6 usec and divides in about 6.5 usec. The basic 8/i system includes three programmable methods of transferring data between peripheral devices and the central processer. On the 8/L only one of these—the "data break transfer"—is available, and the user must pay extra for it.

OEM's will be a prime market for the 9/L and 8/L, particularly manufacturers of analytic instruments and research-industrial process control systems. Because of its specialized, high-volume production capability, DEC



The PDP-9/L

believes it can build computers for such users more economically than they can do it themselves. Education looks like another big market, said a company spokesman. The 8/L, teamed up with DEC's Focal package, will be promoted for student use, off- or on-line. ■

CIRCLE 238 ON READER CARD

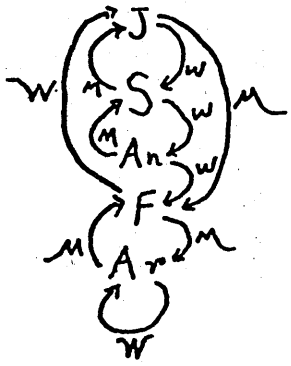
AN INVESTIGATION INTO AN EMOTIONALIZED COMPUTER SYSTEM

by WILLIAM A. LOGAN

With the development of modern day, large-scale computers, much attention has been paid to the design and implementation of executive or supervisory routines. Such routines occupy a substantial amount of the prime memory of the machines, but provide some outstanding advantages to the user. Properly designed, these routines will automatically schedule all of the other programs presented to the computer, multiprocess them, monitor each program's input/output requirements, and communicate via the console message center with the computer operator regarding the status of the various programs and of the peripheral equipment of the computer.

Unfortunately, even with such an efficient and superhuman complex of hardware and software, computers remain cold and emotionless creatures with which to deal. Knowing this, I recently requested and received permission to perform emotional research on and with my company's master computer system. My staff consisted of Mr. Tobias Tarn, Dr. Ward Woo, and Miss Joyce Darnou.[1]

A program was devised and implemented for the machine which accepted as input a large number of psychological case histories. The computer extracted from this input the



2

five most common emotional states of humans and determined how they might evolve into one another based on rewards and punishments being administered. The team rather playfully identified a reward as a martini and a punishment as a whipping. The preceding diagram will illustrate the computer's findings.[2]

J—Joy
S—Sadness
An—Anger
F—Fear
Ar—Arrogance
M—Martini
W—Whipping

Some interesting relationships can be observed in the system as shown. Normal and expected paths are evident:

1. Whip a joyous person and he will exhibit sadness or despondency.
2. Feed a martini to a fearful person and he will become arrogant; etc.

Some surprising paths also became evident:

1. Feeding a martini to a joyous person causes him to become fearful.[3]
2. Whipping a fearful person causes joy.[4]
3. The more one whips an arrogant person the more arrogant he becomes, etc.

The team then wrote a program, based upon the computer derived diagram, which would function as an emotional governor on the supervisory routine of the system. In other words, the emotional governing routine (hereinafter called EGR) would cause the system to perform its duties with emotional overtones.

Incorporated in the program was a subroutine which, at random intervals, would provide the EGR with either a martini[5] or a whipping.[5] At this point in time, Dr. Woo was dismissed from the group on charges of sadism. (In coding the subroutine, he had arranged for only whippings to be administered.)[6] We then recoded the subroutine and set the system in operation. The computer with its supervisory pro-

---

[1] Age 34.

[2] For those in the know, it can be seen that the illustrated system resembles a modified Turing machine. For those not in the know, it looks like a beetle.

[3] This is probably because a joyous state is primarily a naive one and drinking a martini is to such a person an evil act.

[4] Masochism.

[5] Figuratively.

[6] Any individual who is constantly whipped will never exhibit arrogance and that would have invalidated the study.

General Electric is demonstrating the only 3-dimensional information system

High-de

Maybe you're already doing batch processing, remote batch, and time-sharing. But you're using several independent computers. Watch what happens when you replace them with a single GE-600, the *only* information system today that can operate in all three dimensions of information processing:

You'll improve throughput. The GE-600 can handle 63 jobs concurrently through multiprogramming. With multiprocessing, you can handle these jobs even faster.

You'll do more with less system. The GE-600 can flex itself to handle any variety of workload — from 100% batch processing to 100% time-sharing, and any combination between. You don't need several systems, all big enough to handle specialized peak loads. The GE-600 adapts to your changing job mix.

You'll save money at satellite facilities. Compact GE-115 computers and keyboard terminals at your remote operations link up with the central GE-600. This gives your small satellite systems big system capability.

You'll put your organization on line. All your files are contained in a common data base. Every computer, every terminal, in every mode has access to it. With time-sharing, you can give your technical people fingertip access to an on-line computation capability. You can give management immediate access to the facts of the business. You can give your salesmen their order-entry system . . . your warehouses their dynamic inventory system.

You'll put your programmers on line too. They can develop their programs at time-sharing terminals. They can maintain their source program files in the system. They can initiate time-sharing or batch-mode jobs in debugging mode or for production processing.

No waiting for key punch, collation, and batch-mode turn-around.

Discover the three-dimensional world of the GE-600. Ask your General Electric Sales Representative for a demonstration. Or write Room 912, 2721 N. Central, Phoenix, Arizona 85004.

290-25

GENERAL ELECTRIC

CIRCLE 25 ON READER CARD

ARE YOUR D.P. PERSONNEL AS PRODUCTIVE AS THEY COULD BE?

The complexity of third generation hardware and software has created serious problems for everybody from shirt-sleeve clerks up through key executives.

We can solve these problems through data processing education, in two ways.

One is through our Computer Usage Study Course. First, it screens your personnel by requiring them to take one of the most realistic Aptitude Tests in the industry. This test actually allows them to write a program.

Then they learn by doing, either "on-site" or through home study.

After only *3 hours*, a "student" has written a program. The program is then keypunched, run on our computer, graded, evaluated and returned to the student with a copy available to his manager.

By the time he has finished the course, he will have learned more than Coding in Basic Assembly Language, COBOL and FORTRAN. Included are explanations of Sorts & Merges, Multiprogramming, Debugging, Files & Records and a vast array of Background and "real life" Applications, written by the people who designed them. 24 detailed, 4-part lessons in all. 24 programs written. 24 printouts, plus up to 10 re-runs.

Two is through our custom-tailored education services, particularly curriculum design for company in-house teaching. And, course development covering everything from keypunch operating through systems analysis, which can be turned over to your own instructors.

We'll close your education "gap" with viable education programs which best fit your requirements. No "canned" packages.

Result? We'll train your personnel to be more productive. You'll have better, faster man/machine interaction. And, you will control who gets what education.

We're the reliable educators with a mission to provide your personnel with "an opportunity to learn . . . with the greatest possible speed . . . with the highest possible quality . . . at the lowest possible cost."

Consultations invited. No matter what your computer usage education requirements.

Joseph Levy (212) 889-7850

CUC

COMPUTER USAGE EDUCATION, INC.
51 Madison Avenue, New York, New York 10010
a subsidiary of Computer Usage Company, Inc.

CIRCLE 19 ON READER CARD

gram governed by the EGR was judged on three points:

1. Output message content
2. Effectiveness of the execution of the various object programs, and
3. Effectiveness of its automatic scheduling function.

The tabulation of our findings in these respects is presented in Table I.

Because of unforeseen complications, no attempt has been made to carry our investigation any further. Miss Darnou[9], in a burst of romaticism, secretly had programmed a love complex into the EGR, and has now become hopelessly enmeshed in a love triangle comprised of herself, Mr. Tarn, and the computer.

I, in the meantime, have remained aloof from this affair and am attempting to cheer up our despondent card reader by feeding it get-well cards.[10]

Note of interest: Referring to the emotion diagram, Mr. Tarn determined that any entity can be driven from any emotional state to a state of fear by stimulating it with three martinis, a whipping and a final martini. You are welcome to use this finding in your personal life.

JOY

1. Messages pleasant, sometimes ebullient:
   i.e., "WHEE! FORTRAN REALLY GOING"
2. Execution was smooth and easy with moderately good timing (however, not as good as with a system not equipped with an EGR).
3. Scheduling was occasionally incorrect. (In general, one anticipates a program's output to occur *after* its input.)

SADNESS

1. Messages were at all times depressing:
   i.e., "NOTE—COMPILATION COMPLETED, POSSIBLY CORRECT"
2. Execution was very efficient but rather slow.
3. Scheduling was faultless but no executive (internal) decisions were made by the computer.[7]

ANGER

1. Messages were mainly unprintable because of obscenities.
2. Execution was rapid, usually in error.
3. The scheduling was frequently changed by the computer to cause operator frustration.

FEAR

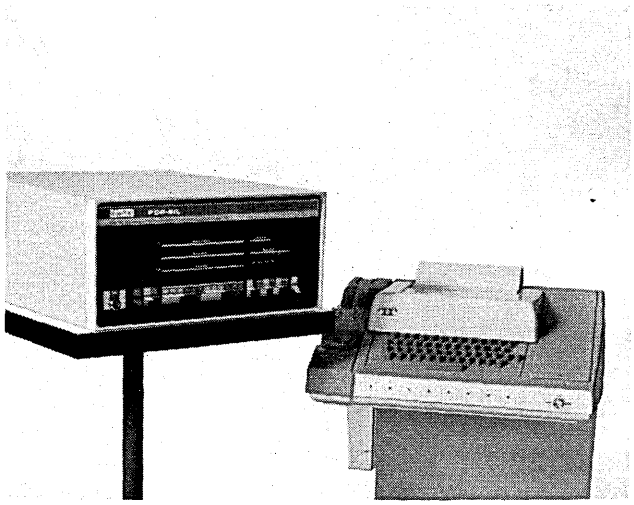
1. No messages.
2. Execution was erratic and unsatisfactory.
3. The schedule, as suggested by the operator, was carefully observed. (We gained the impression that the computer was cowering.)

ARROGANCE

1. Messages were verbose and annoying:
   i.e., "AND NOW, I, I, I, WILL DO SOMETHING ELECTRIFYING"[8]
2. & 3. Many programs were developed, scheduled and executed which were not called for by the console operator. Most programs which we introduced to the scheduling function were returned with torn tape.

Table I

[7] Of course, we have no way of knowing whether or not such decisions may have been made and then sadly cast aside.
[8] He did. The console operator suffered third-degree burns on his fingers.
[9] Age 35.
[10] All of us have learned to like whipped martinis.



The world's lowest cost, full scale, general purpose computer. $8,500 complete.

PDP-8/L

Complete. With teletype. With software 4096 12-bit words. 1.6 usec cycle time. All integrated circuit. On-line, real-time. Expandable.

PDP-8/L is the latest achievement in the history of a company that introduced the first under-$100,000 computer, the first under-$50,000 computer, the first under-$20,000 computer, the first under-$10,000 computer.

PDP-8/L is based on the family of PDP-8 machines, thousands of which have been sold and delivered — to scientists in laboratories, instrument builders, manufacturers of process control equipment, industrial users who have automated their machinery. The PDP-8 family is, without question, the most successful set of small computers ever built. Bar none.

To those of you who have never used computers before, because of price, write to us. A large part of our background is in introducing people to their first computers. We can be extraordinarily helpful.

To those of you thinking of incorporating a computer in another system, or another instrument, write to us. Quantity discounts are available. And our experience includes selling more computers as built-ins than any other company in the world.

digital
COMPUTERS · MODULES

DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754. Telephone: (617) 897-5111 • Cambridge, Mass. • New Haven • Washington, D.C. • Parsippany, Palisades Park, N.J. • Princeton, N.J. • Rochester, N.Y. • Long Island, N.Y. • Philadelphia • Pittsburgh • Cleveland • Dayton • Huntsville • Cocoa, Fla. • Chicago • Denver • Ann Arbor • Salt Lake City • Houston • Albuquerque • Los Angeles • Palo Alto • Seattle. INTERNATIONAL, Carleton Place and Toronto, Ont. • Montreal, Quebec • Edmonton, Alberta, Canada • Reading and Manchester, England • Paris, France • Munich and Cologne, Germany • Oslo, Norway • Stockholm, Sweden • Sydney and West Perth, Australia

CIRCLE 26 ON READER CARD

THE 1968 ACM CONFERENCE AND EXPOSITION

a preview

Although the 1968 Association for Computing Machinery Conference and Exposition in Las Vegas Aug. 27-29 has no theme, it has a flavor—international—and maybe a trend: to include more sessions from the outside world of nonmathematics.

The international accent will appear in two meetings. The first of these is in the morning on opening day, when three papers from IFIP will be presented for those shut-ins who didn't make it to Edinburgh. This session is headed by Francois Genuys of IBM France, IFIP program committee chairman. Speakers are Peter Naur of A/S Regnecentralen, Copenhagen, explaining "Datalogy, the Science of Data and Data Processes, and Its Place in Education;" Sigenori Matsushita, Toshiba Ohme Works, Tokyo, on "A Microprogrammed Communication Control Unit;" and Australian Peter D. Jones now at Control Data Corp., with "Operating System Structures."

There will also be a panel, moderated by Dr. Walter Bauer, on the subject of International Computer Trends and Problems. Participants will be Paul Armer, RAND; Dan McGurk, SDS; Dr. Fumio Baba, Mitsubishi Corp.; R. Deleglise, Compagnie Internationale pour l'Informatique; Prof. Stanley Gill, Imperial College of Science and Technology; Dr. Carl Hammer, Univac Federal Systems Division; and Victor M. Glushkov, Institute of Cybernetics, Ukranian Academy of Sciences, Kiev. Topics will include hardware and software development, standards, and governmental impact on computer development and use.

An example of the attention being paid to everyday, practical matters is the all-day, three-part set of panel discussions on Managing the Economics of Computer Programming. All three will be chaired by George Weinwurm of SDC. Session titles are: The Problem in Perspective; Current Methodical Research; and Synthesis and Forecast. Panelists include D. H. Brandon, C. H. Reynolds, C. W. Clewlow, A. M. Pietrasanta, E. A. Nelson, H. Sackman, M. H. Schwartz, and J. F. Cunningham.

how to teach

Education is also getting a heavy play in Las Vegas. Fred Gruenberger is assembling a group of 13 for a workshop called Education for the Computer Revolution. They will deal with such subjects as how computer technology should be taught, what student groups should receive training, and how extensive the training should be. Two sessions are also scheduled on computer-aided instruction. One is a panel comparing CAI languages, moderated by Peter Calingaert of the Univ. of North Carolina and including participants from both colleges and corporations. The other session, chaired by Dr. Gloria Silvern, offers four technical papers—three on CAI languages and the other about the problems and assumptions involved in estimating costs.

Martin Greenberger of Johns Hopkins has a session on computer utilities, stressing the practical problems that must be solved before their growth potential can be realized. D. S. Diamond and L. L. Selwyn, from the Sloan School of Management, will present "Considerations for Computer Utility Pricing Policies" and M. A. Duggan of the Univ. of New Hampshire will discuss "Computer Utilities and the ESS." This system, AT&T's Electronic Switching Stations, could, according to the author's abstract, be a threat to a competitive computing industry if used for noncommunications purposes, such as a service bureau form of data processing. The meeting will also include a special report by E. Nash of the FCC: "Prospects and Problems of Computer Service Regulation." Another FCC representative, B. Strassburg, will appear at Walter Kosinski's data communications session, with a "Status Report on the FCC Inquiry into Data Communication."

There will also, of course, be a substantial helping of SIG- and SIC-generated material. Information retrieval, artificial intelligence, urban systems, simulation, large files, graphics, and design automation are general headings for some of the other sessions—a grand total of 29 this year.

added attractions

General chairman Richard B. Blue, TRW Systems Group, has arranged various other attractions, packed between and around the technical sessions.

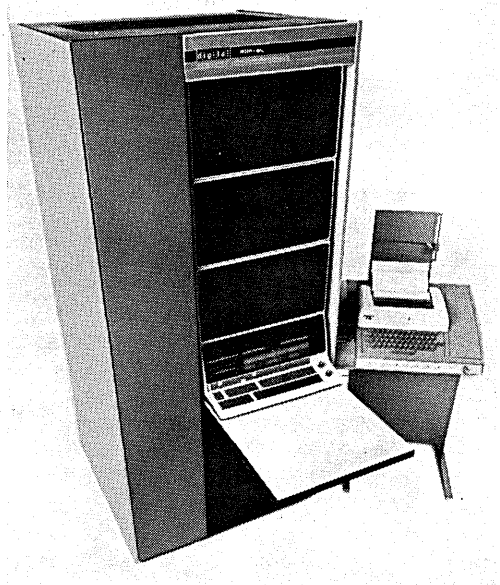
Dr. Richard W. Hamming of Bell Labs will give the A. M. Turing Lecture during the opening session Tuesday, Aug. 27. And Lt. Gov. Ed Fike of Nevada, now running for Senator, will be the speaker at the conference luncheon Wednesday at the Stardust Hotel, conference headquarters. He will talk about NEEDS—Nevada Essential Environmental Design Study. (Acronyms seem to be milder, much milder, these days. Not so much SNAP and BOSS. This conference includes such whimsies as FOIL, TRAMP, GULP, PAL, and SHAPESHIFTER. Perhaps it's the spreading influence of JOVIAL.) A conference reception is scheduled for 6 o'clock Tuesday night at the Stardust. And all the national SIC's and SIG's will be having meetings.

During all this, the exhibits will be going on at the same time. They open at noon Tuesday and close at 5 p.m. Thursday.

The whole thing will cost you—or your purchasing department—$35 if a member or $60 if not; $25 of the latter amount can go for turning you into a member. Students pay only $5 for all three days but one-day passes for ACM members are $15 and, for nonmembers, $20.

If you get to Las Vegas Monday, the Stardust will have registration facilities. On any of the convention days, register at the Convention Center.

DATAMATION's Ingenuity Award of 1968 will go to the first person who arranges a lunch with Howard Hughes. ■



The world's first medium size computer at a small computer price. $19,900 complete.

Never before has a computer with the power of the PDP-9, the 18-bit word length of the PDP-9, the programmability, the multi-channelling, the expandability of the PDP-9 been available at a price near the price of the new PDP-9/L.

PDP-9/L is a leaner version of the PDP-9, but it's a medium size computer by any standards. Expandable 4K memory, with 1.5 μsec cycle time.

Teletype. Standard I-O bus. Eight built-in high-speed data channels. Devices interface directly to the I-O bus by inexpensive FLIP CHIP modules.

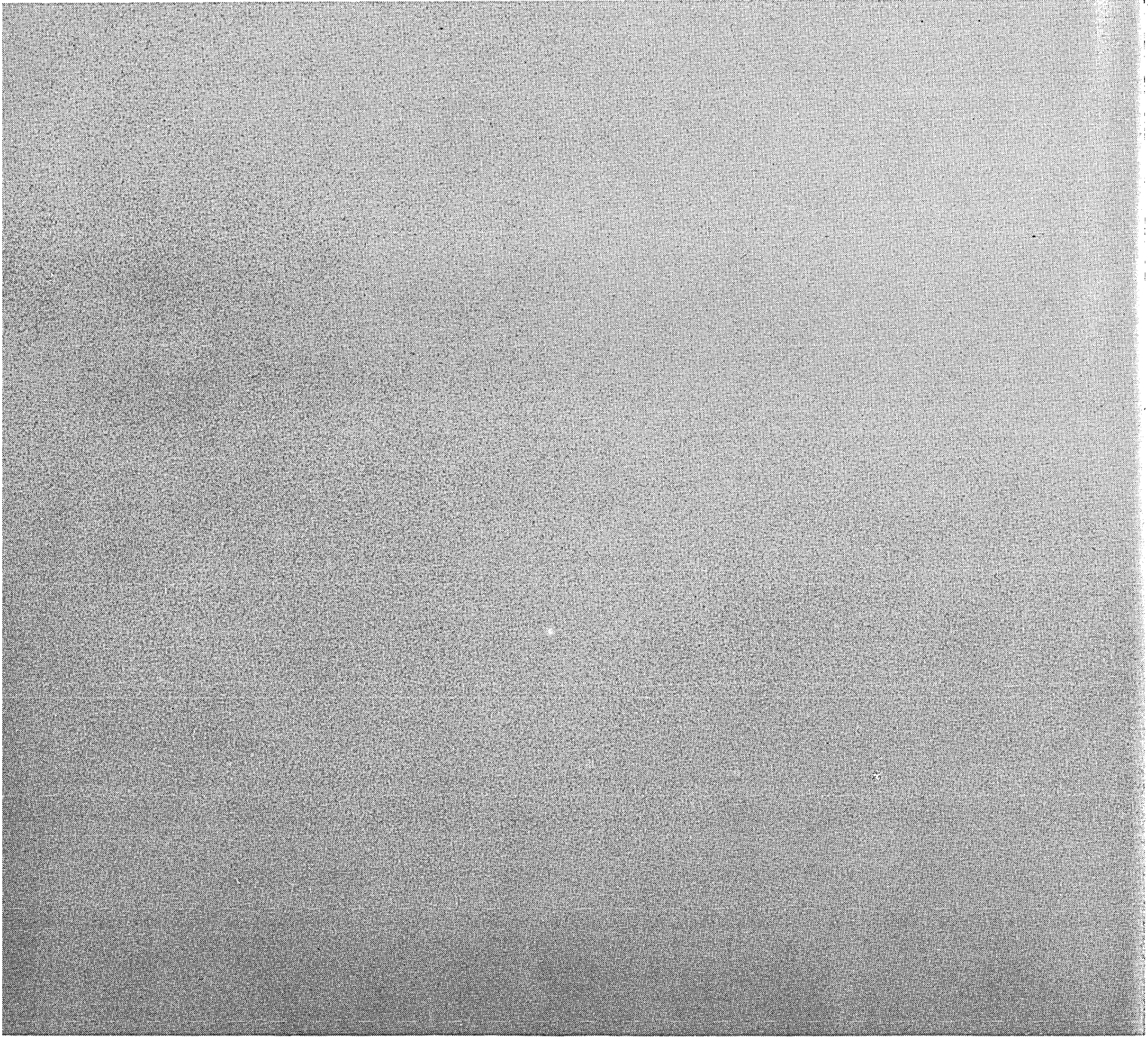
And it can be expanded to 32K memory. When you reach 16K, background-foreground programming becomes available. But even the 4K software includes assembler, editor, debugging aids, math package, and utility programs.

If your investigations require a medium size computer, but you simply couldn't afford one before, write us. The new PDP-9/L is designed for you.

digital
COMPUTERS · MODULES

DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754. Telephone: (617) 897-5111 • Cambridge, Mass. • New Haven • Washington, D.C. • Parsippany, Palisades Park, N.J. • Princeton, N.J. • Rochester, N.Y. • Long Island, N.Y. • Philadelphia • Pittsburgh • Cleveland • Dayton • Huntsville • Cocoa, Fla. • Chicago • Denver • Ann Arbor • Salt Lake City • Houston • Albuquerque • Los Angeles • Palo Alto • Seattle. INTERNATIONAL, Carleton Place and Toronto, Ont. • Montreal, Quebec • Edmonton, Alberta, Canada • Reading and Manchester, England • Paris, France • Munich and Cologne, Germany • Oslo, Norway • Stockholm, Sweden • Sydney and West Perth, Australia

CIRCLE 29 ON READER CARD



PDP-10 has the best time sharing software very much available anywhere.

It's been working since 1965.

So if you're tired of waiting for "next year" promises, we have all the PDP-10 time sharing software operational now. And what it does now surpasses what others are promising for later. We are delivering it to our customers now.

PDP-10 software exists in several versions. The idea is to give you a software system that can grow in easy compatible steps from batch processing to multiprogramming to full time sharing. Our basic time sharing monitor is a user-proven multiprogramming, time sharing system which allows 16 (or more) on-line users to operate simultaneously. The users will be able to compose BASIC, FORTRAN, AID and MACRO assembly programs, edit them using the powerful TECO text editor, debug them using DDT, and run them.

Our advanced time sharing system offers

full range disk swapping time sharing incorporating all the features of the basic system with greatly extended capacity. It increases the number of simultaneous users to more than 64. It allows both batch processing and real time operations to go on concurrently with on-line time sharing. It is operational now.

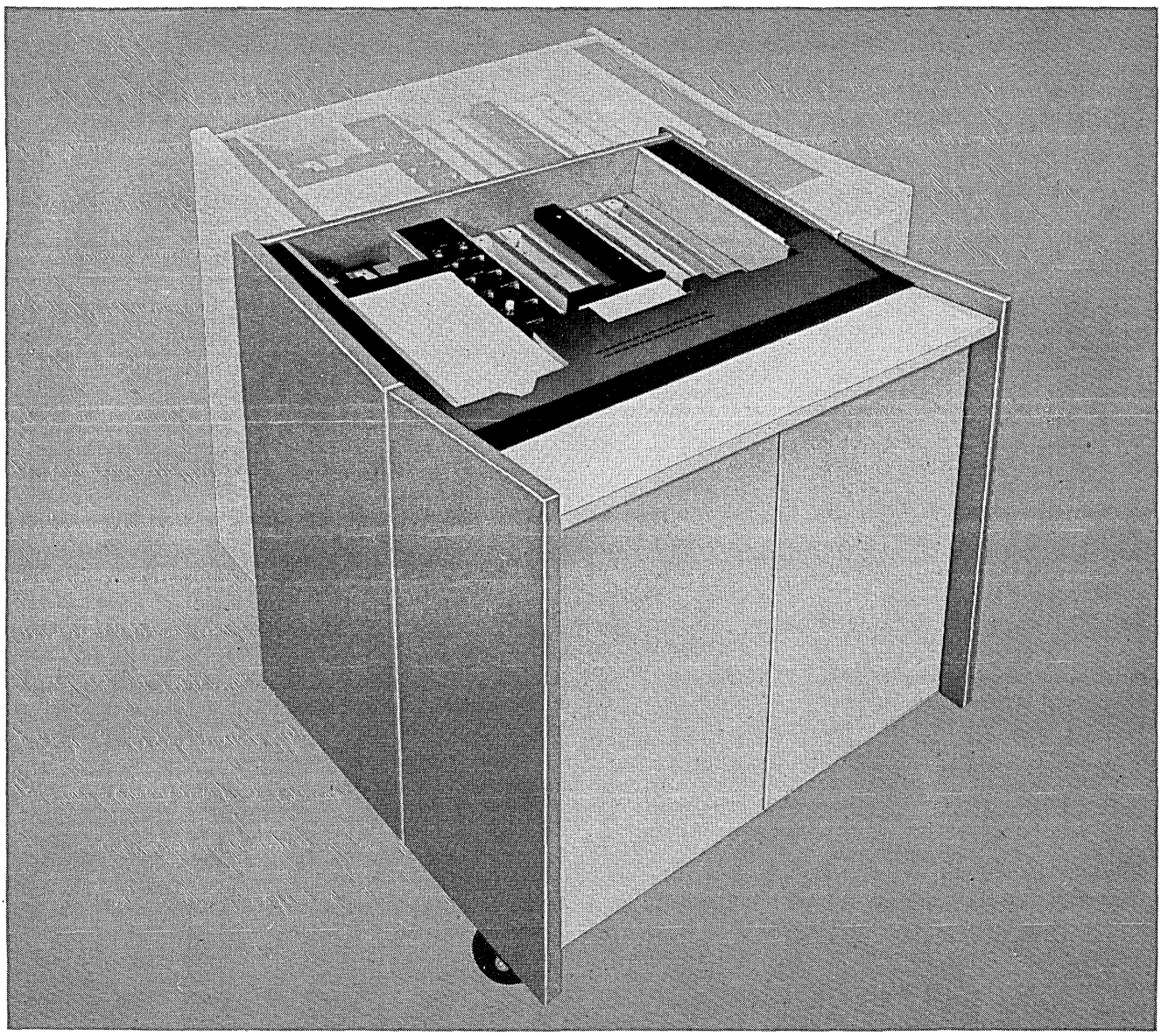
To sum up PDP-10 time sharing is here. Proven by over 1 million hours of console time logged by users. Today you can carry on real-time operations, run batch programs and have on-line time sharing too. PDP-10 is the only computer that is already operating in all three modes all at the same time. PDP-10 is the only computer that can do it all for less than $500,000. And it's available only from us.

digital
COMPUTERS · MODULES

DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754. Telephone: (617) 897-5111 • Cambridge, Mass. • New Haven • Washington, D.C. • Parsippany, Palisades Park, N.J. • Princeton, N.J. • Rochester, N.Y. • Long Island, N.Y. • Philadelphia • Pittsburgh • Cleveland • Dayton • Huntsville • Cocoa, Fla. • Chicago • Denver • Ann Arbor • Salt Lake City • Houston • Albuquerque • Los Angeles • Palo Alto • Seattle, INTERNATIONAL, Carleton Place and Toronto, Ont. • Montreal, Quebec • Edmonton, Alberta, Canada • Reading and Manchester, England • Paris, France • Munich and Cologne, Germany • Oslo, Norway • Stockholm, Sweden • Sydney and West Perth, Australia

CIRCLE 30 ON READER CARD

SEEING DOUBLE?



■ Not really. This one picture represents *two* distinct capabilities. It's the new MSR 1500, a complete Speedreader that reads punched *and* mark-sense cards, and can do *both* simultaneously. The addition of the mark-sense capability does not alter the specifications that have made the Speedreader famous. Accurate data transfer, speeds to 1500 cards-per-minute, solid-state reliability, plug-in modules, low-cost and ease of interface are still a part of the Speedreader. With the mark-sense option, information may be read from virtually any arrangement on the card, permitting the use of modular data fields, printed instruction areas, with provision for manuscript notes.

This is the type of "double vision" that our engineers use to help OEManufacturers solve their customers' problems. Write Data Products, 8535 Warner Drive, Culver City, Calif., 90320, for our latest literature on card readers and punches.

Data Products manufactures LINE/PRINTER™, DISCfILE®, Core Memories, Off-Line Printer Systems, Card Readers & Punches

data products

"the peripheralists"

CIRCLE 57 ON READER CARD

ABA CONFERENCE REPORT

The year's National Automation Conference of the American Bankers Association — "Service of the Seventies"—made a commendable effort to put the computer, the "checkless society," and indeed, the general direction of the banking industry into proper perspective.

The May meeting, which drew over 2,000 commercial bankers to Miami, was an exemplary blend of general and technical sessions, tutorials, and status reports. Overall, they pictured commercial banking as an industry whose internal structure is going through radical and somewhat confusing upheaval, which is spreading far beyond its traditional domain, and which is facing increasing competition from outside institutions for services once thought to be exclusive to banks.

The best overview of the industry was given by Alfred Brittain III, Bankers Trust chairman of the board. "At times our attitude toward innovation has been less than imaginative," he said. "By ignoring consumer lending, we fostered the growth of the consumer finance industry, by avoiding time money and residential mortgages, we encouraged the rapid growth of Savings & Loans and mutual savings banks; and right now we may be contributing to further attrition by helping borrowers evade banks and obtain short-term funds directly through the burgeoning commercial paper market. With this record, it might ruefully be said that the prime beneficiaries of our imagination and foresight have been our competitors."

"But," he noted, "throughout the industry, young adaptable personalities are emerging—men who represent a new generation of bank management, who were reared not in the pessimism of the thirties but in the optimism of post-war growth . . . As precedent and tradition were once implicit in every banking decision, it is being recognized that innovation is now both the price of survival and the means by which banks will continue to earn the right to compete in our modern society."

The "truly major problems that banking must resolve are not merely related to hardware, software, or suitable mathematical decisions models of decision problems," said Brittain. Granting technical feasibility, Brittain is apprehensive about the bank's ability and freedom to exploit its potential because of some huge people problems. Customer acceptance, management understanding of new techniques, and the "traditional reluctance to being labeled activists" are three of these problems. The rest fall under "government." Commercial banking is heavily controlled and sometimes hard-put to find ways to innovate within the bounds of regulatory restrictions—many of which are outmoded. More "debilitating" is the sheer weight of the detailed and inhibiting regulations, which threaten to proliferate even more as new services, like automated payment systems, change the banking operation. Some new services also draw the bank under some control by other agencies, like: the Federal Communications Commission, whose computer-communications inquiry will affect the developing bank networks; the Securities and Exchange Commission, which is watching the broadened investment activity in banking; the Justice Department (watching areas like the bank groupings in credit card plans); and the courts (now ruling on bank activities with service bureaus). Brittain noted that some major changes in state and federal statutes and judicial attitudes may be needed if the bank is to progress. But "since instant success in this direction is doubtlessly improbable, we must be ingenious initially in developing systems that take full advantage of the standards presently in effect."

affected areas

What are some of the banking areas that the computer has affected? James Vergari, vice president of the Federal Reserve Bank in Philadelphia, said that the computer has most impact on internal operations so far: demand deposit accounting, MICR check handling, lock box collections, prearrangement payment plans, operating statistics, trust administration, investment statistical analysis, credit information files, and operations research or management science.

(A good example of the sophistication of some banks is First National City, which uses five time-sharing services for applications of its financial engineering, economics, research and development, bond administration, and petroleum departments.)

Banks in large cities, said Vergari, are now helping customers in their operation with dp bank services, such as processing transactions for savings and loan institutions by telephone; complete on-line mortgage services; demand deposit accounting for smaller banks; accounting, billing, collection, and dp for professionals; payroll and other services for business; and even edp accounting for farmers.

The banks have also gone into equipment leasing and financing, accounts receivable factoring, and financial counseling. They are improving their advisory and fiduciary services, and expanding international financial activities.

Vico Henriques of Arthur Young & Co. added to this list several new services for the '70's. "Banks will serve an important function as fiscal intermediary between two or more parties," he said; meaning for example

the handling of prepayment or time-payment of repetitive trust, utility billing, and insurance payments, as well as money transfers between the government and public agencies and the private sector, such as welfare and Medicare. Another role that should be investigated, he said, is the accumulation of data for regional economic planning.

three services

Many of these services were covered in numerous sessions throughout the meeting, but three of them are of particular interest to the general computer community: service bureau activity, computer leasing, and, of course, the automated payment system.

As noted, the automated customer services are a controversial subject. Two suits have been filed by service bureaus in Providence, R.I. and Minneapolis against the movement of banks into this area, the contention being that such service is not incidental to banking activity. The Minneapolis suit was dismissed but is being appealed; the other is pending.

Banking already has a great financial stake in this business. Richard Mathews of Data Facilities Management estimated that bank income from automated customer services (ACS) fees and balances in 1967 were about $250 million. By 1973, annual revenue should reach $1.2 billion. Bank of America alone has noted it could increase its revenues from over $5 million in '66 to $50 million by '71, and $100 million in '74, with above average profitability.

Today, said Mathews, ACS is applications-oriented, mainly centered in payroll processing. "But this service is undergoing increasingly more price-cutting to the point where many banks are no longer capable of making a profit . . . In the years ahead, the forward-thinking banks will identify industry segments of overall importance to the bank and develop a collection of services for these markets," such as accounts receivable, general ledger, accounts payable, production and inventory control. "A word of caution is in order, for the industry concentration of some bank's marketing areas is so dispersed that large investments in research and development are not feasible."

Mathews saw an opportunity for the larger banks in the development of the central information file of accounts and the offering of this service to correspondent banks. This centralization, he said, permits banks to offer more services than otherwise feasible, increases profits, and "constitutes a logical transition to the ultimate development of the less-check society." Another general area of benefit is facilities management; an example is Industrial National Bank, which took over the data processing facility of the City of Providence. Besides providing revenue, the customer's location could be another base of operation for the bank.

If the bank is a strong competitor for the service bureau, it can also be a partner, according to Fred L. Ritter, Jr. of the Service Bureau Corp. So far, banks have rarely used outside bureaus in performing ACS. Generally, he said, they fear loss of a customer to the service bureau and think subcontracting is too expensive and difficult to justify to management when the bank has internal dp.

But, said Ritter, the service bureau can provide marketing assistance, customer education, relatively rapid implementation of service in areas the bank has not developed, and systems and program analysis capability. Implicit in the talk was that subcontracting is also a way to keep one bank customer happy until the bank can determine if the service he wants has a big enough market to justify offering it on bank facilities.

Banks have been financing computer leasing firms for several years, but it was only in 1963 that the government gave permission for banks to go into direct equipment leasing. The Bank of America alone has $108 million worth of equipment (not just dp equipment) on lease. The activity in computer leasing has not been strong, but several proponents, like Wilber Newstetter of Havenfield Corp., have been urging a stronger attack. His thesis is that too many companies are being oversold by their computer salesman, and "who is in a better position to help assess the future growth and computer needs of a corporation than its own principal bank?" he asked. Too, the banks stand to gain more return on investment through direct leasing than on the conventional loan to a third party lessor. It is also a legitimate way to avoid the legal lending limit, he said. His final warning was that insurance companies are ready to jump into this area, even if the banks aren't.

The "voice of reason" on the subject was George Phalen, First National Bank of Boston. He recommended first that a bank should set up subsidiaries to avoid the problem of a bank owning assets in another state outside the jurisdiction of its normal operations. Unless the bank has a fairly large, expert leasing group, it should not enter short-term leasing (meaning at least 80% payout for banks) as it will be difficult to find second lessees after the first contract is terminated. Properly handled, however, the bank does stand to gain from the residuals in dealing on operating leases. "If the residuals being forecasted materialize, some of the banks that are greatly involved in this are going to make the rest of us look pretty poorly when these residual values come into play in their annual results."

"I would caution you," he said, "to determine just what market you are going to seek—large investment tax credit deals, medium term and amount leases, full payout . . . Also, the dollars invested are tied up for a period of years and at fixed rates. This must not be overlooked as we face tight money and rising rates."

And last, he warned that it is dangerous for a bank to act as a technical consultant on what system the user needs and for how long.

William Rust of the ABA presented a plan of action in leasing that involves the correspondent banks. The lessor bank could provide the correspondent with not only ACS services but the appropriate, compatible I/O processor, on lease, to hook into the central facility. The onus would be on the central bank to increase its dp facilities as volume increases, rather than upgrading the correspondent's equipment. Such a concept would strengthen ties between the banks, minimize input problems, broaden credit card operations, increase ACS income, and benefit the lessee in marketing capability, cost, etc. Further, the nonbank lessor would find it difficult to compete with the bank in this area.

less to say

These and many of the talks given at the Miami meeting drove home an important point: "The individual bank, no matter how large or important it may be, is having less and less to say about its own destiny and is becoming conversely more and more dependent on the direction of the banking industry itself." Dale Reistad, ABA's Director of Automation, and Robert Wilmouth, vice president of the First National Bank of Chicago and ABA Automation Committee chairman, emphasized this in discussing some of the factors affecting development of the "Services of the Seventies," and most particularly the "less-check" system.

The credit card, a stepping stone to the "less-check society," is a case in point, they said. The success of each bank plan, which may involve groups

The first disc pack was great because it was first.

This one is great because it's better.

1. Each pack shipped surface analyzed error-free.

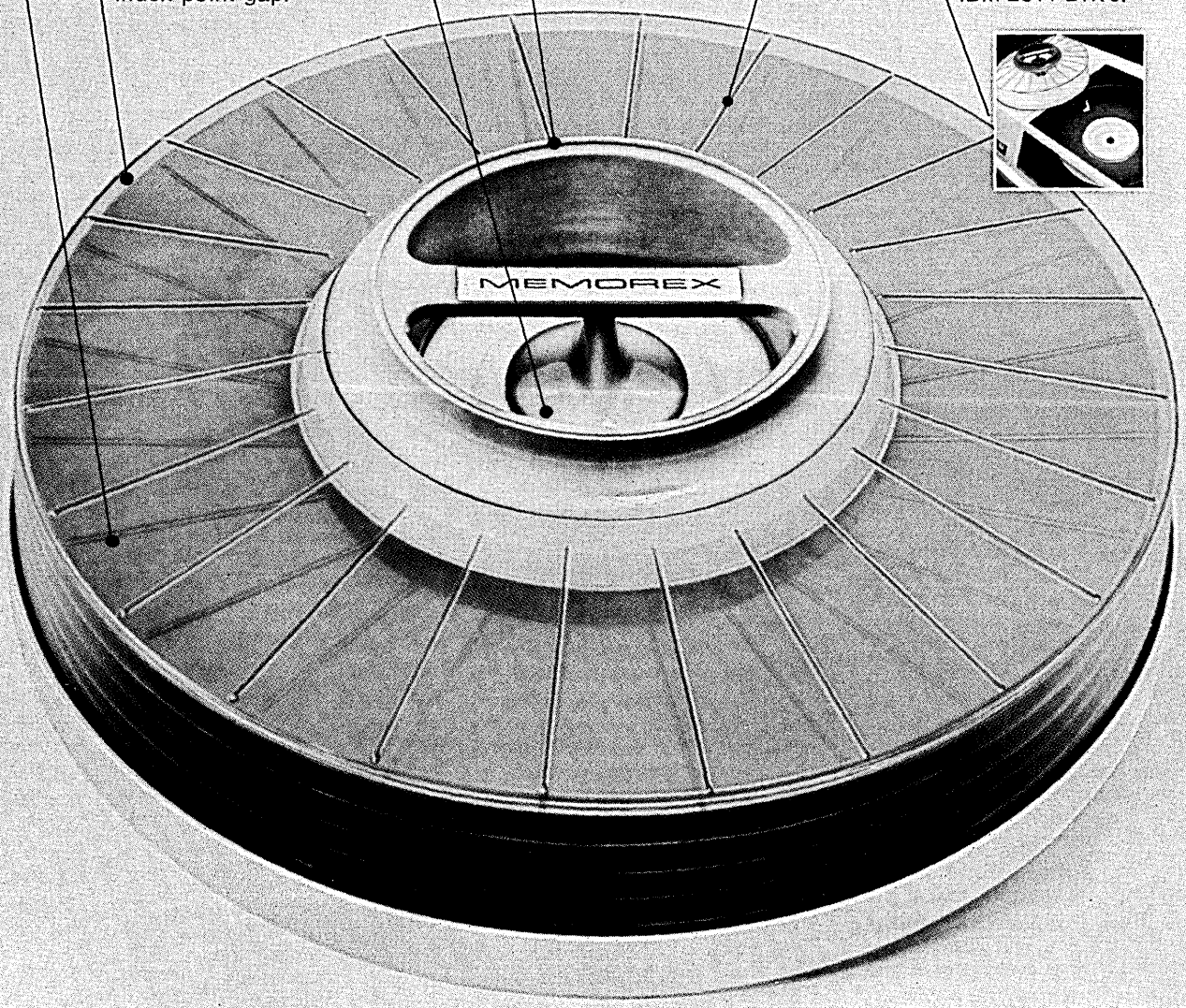
2. Error-free even in the index point gap.

3. Color-coded bezel labels.

4. Stackable.

5. Unburnable, unbreakable cover. Unconditionally guaranteed.

6. Compatible with the IBM 2311 Drive.



The Memorex Mark I Disc Pack.
Better, too, because it comes with a 75% purchase option plan. 2-week delivery. Free trial evaluation.
Just ask us: Memorex Park, Santa Clara, California 95050.

MEMOREX

CIRCLE 31 ON READER CARD

of banks across the country, is in part reliant on the reputation of a competitive plan in the area. Discounting wars and poor operations could ruin profitability. Other aspects outside of a single bank's control are verification techniques development and credit card standards, interchanges, and legislation. Changes and attitudes in the credit bureau and other affected industries also are factors. Both the ABA and U.S. Standards Institute are trying to set up standards. One recommended recently by ABA is the social security number as a personal identifier (in other sessions it was indicated that there is much confusion over how this number will be used). ABA is also seeking a common verification technique, but this too must await further developments in terminals as well as better definition of the shape of the automated payment systems.

In communications, the development of the banks' networks is partly controlled by the common carrier's implementation schedules and the decisions of the FCC. Transmission code standards are another problem. (In the lockbox area for example, standards are being worked on by an informal group of banks which would actually like to have ABA and other bank associations take it over.)

There is no equipment lack in the computer area, said Reistad and Wilmouth, although industry organizations must "interpret the results to date and learn how best to employ what is already at hand." The ABA meeting contributed to this effort by introducing the user group sessions for the first time. In software, however, there is a greater need for intra-industry effort, they said. The Automation Planning and Technology Group of the ABA is trying to help in this area. (For example, an investment planning analysis program developed at Carnegie Tech was handed over free to ABA, and APT is trying to modify and standardize it for industry use.) But APT's total budget for '67 was little more than $350,000, not enough to make a dent in software development alone.

"Some progress has been made this year in APT and through USASI efforts, but no major breakthroughs have been made . . . Let's write off '68 as a year for problem definition. But really, how long can we afford to design the problems we all know exist? A rough estimate of the amount of money being spent on software by ABA—through APT and its standards efforts—is less than $50,000 this year. That's less than $20 for each computerized bank in the country and a drop in the bucket as compared to what just one computer manufacturer will invest in just one application package for just one group of its customers. We're not apologizing for our efforts to date—or the progress we've made—it just points out the old saying that we 'get what we pay for.'"

In the background of this conference, there was a great deal of informal discussion and disagreement about all these services—credit cards and their proliferation ad nauseum, the less-check society and what it is and how desirable it is, the looming threat of groups like American Express moving into bank cards and taking over as the moving force in the automated payment system, the money lost on developing payroll packages that don't work, the privacy issue involved in adopting the social security number as personal identifier and in giving everybody's brother a credit card without request, etc.

But despite any disgruntlement, the commercial banking industry must be credited for its dynamism in setting up new services and for its attempt through its association to come to grips with the technical, legal, and social problems it faces. And for producing a conference the computer industry associations might try to emulate sometime. Proceedings may be obtained through ABA, 90 Park Ave., New York, N.Y.

—ANGELINE PANTAGES

in search of science

CONFERENCE ON PERSONNEL RESEARCH

The ranks of the computer world are being swelled by growing hordes of programmers, systems analysts and related personnel. Educational, performance and professional standards are virtually nonexistent and confusion grows rampant in selecting, training, and assigning people to jobs. The ACM Special Interest Group on Computer Personnel Research is dedicated to the de-escalation of this chaos through two approaches. First, by trying to get managers to share worthwhile experiences. Second, and more fundamentally, by encouraging the development of a substantive body of useful research bearing on computer personnel procedures and practices. Unfortunately, anecdotal accounts still overwhelm the occasional attempts at research, as demonstrated in SIGCPR's 6TH annual conference at the Massachusetts Institute of Technology in June.

This well-organized meeting was attended by about 100 paying customers (a $40 tab was exacted for the two-day session, including lunch). Most of the attendees seemed to be management and administrative types with smaller numbers of educators, researchers, programmers and systems analysts. Proceedings of the meeting will be available in about six months.

the role of programmers

The conferees were most fortunate in having Harvard's Anthony Oettinger deliver the keynote address—the most provocative talk of the conference—on the role of programmers in society. Oettinger formulated key elements of the problem, but offered few solutions. He did not predict whether the number of programmers will continue to grow or whether the programmer, as such, will eventually become extinct in response to the rise of user-oriented computer languages and facilities. He deplored the current practice of hiring programmers with dubious credentials, giving them quickie training in a unique applica-

with the CONTROL DATA® 200 User Terminal

Your computer may be hundreds of miles away, but a CDC® 200 User Terminal puts its computing power at your fingertips . . . gives you immediate access to all the computing power you need, when you need it. Enter information or ask for it. Change or update a file. Submit a computing job. The response is immediate. In effect, the computer is yours alone, regardless of how many others happen to be using it simultaneously.

The CDC 200 User Terminal consists of a CRT/keyboard entry-display, a card reader and a printer. Data is entered via the keyboard. Response from the computer appears either on the screen or as hard copy from the printer.

The entry/display station has a 14" screen with a capacity of twenty 50-character lines (thirteen 80-character lines optional). The photoelectric card reader has a capacity of 100 cards per minute. Its 1,000-character buffer gives it a throughput equal to that of larger, more expensive readers. In line printers, you have a choice between an 80 column or 136 column, 300-line-per-minute printer. Either device may also be used for off-line card listing.

For full details on this and other Control Data User Terminals, contact your Control Data Sales Office or write Dept. H-88 . . .

CONTROL DATA
CORPORATION

8100 34th AVE. SO., MINNEAPOLIS, MINN. 55440

CIRCLE 32 ON READER CARD

tion, and then leaving them to fend for themselves with new applications.

Oettinger's main theme was that we ought to help the programmer to survive by proper education. But who can we look to for such education? Not the new departments of computer science in the universities. These departments are just getting out from under the influence of competing engineering and mathematics departments and they are too busy teaching simon-pure courses in their struggle for academic recognition to pay serious time and attention to the applied work necessary to educate programmers and systems analysts for the real world. The degree of purity of the computer science that is taught, claimed Oettinger, is inversely related to the competence of the department in meeting social needs.

Oettinger felt that the junior colleges might fill the bill by developing practical courses of study for programmers and systems analysts which would lead to accredited degrees in these fields. He suggested the notion of the "software engineer" as a name for the new breed of programmers, a term that underscores the application of knowledge to human use.

When queried on what he would teach the new programmer in the new curriculum, Oettinger essentially answered: basic principles that can be extended to many applications. But this response begged the question; it is the pure computer science of today, taught under the invincible banner of general principles, that robs the practitioner of what it takes to cut the mustard in the real world.

We don't need any more courses in Latin to develop general powers of reasoning. We need to move on to living languages and to mission-oriented problems. If computer science is to become an authentic science, it should be concerned with the scientific method: experimental method certified by empirical verification. And if computer science is to become socially responsive, it needs to become thoroughly humanized—which means the scientific study of the human use of computers—an orientation stressed by Oettinger that is nowhere on the computer horizon today.

other social considerations

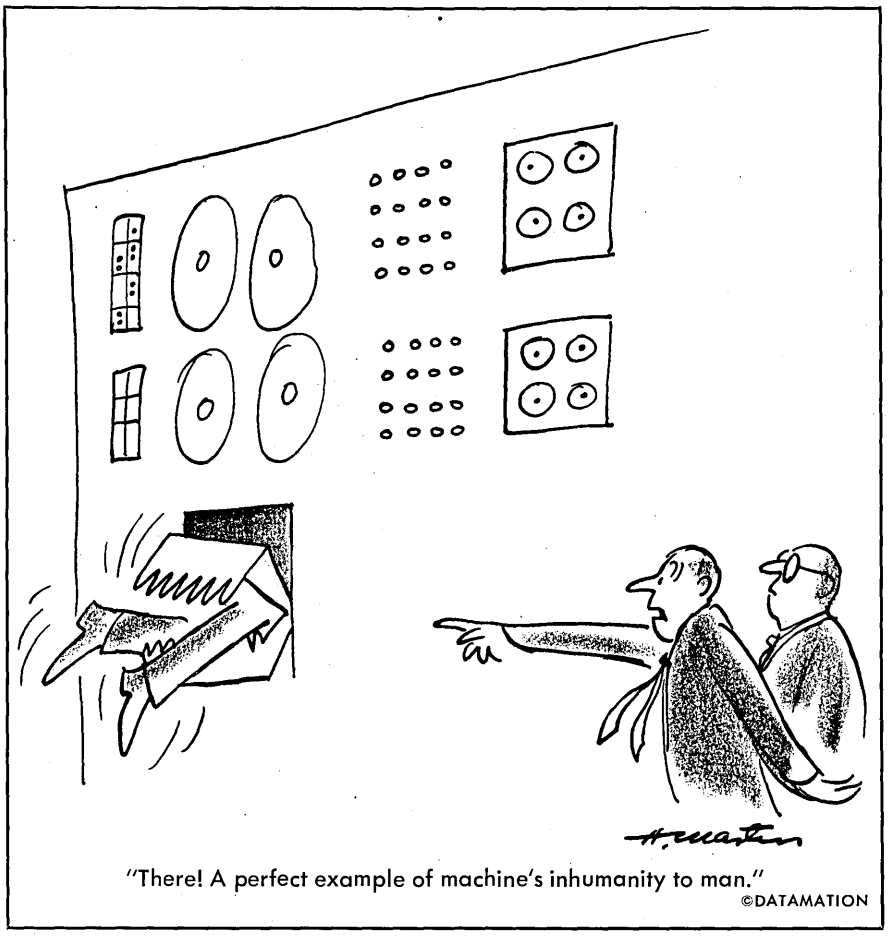
Two other presentations were concerned with social problems in the selection, training and development of computer personnel. One was an address by Arthur Kahn, applications analyst with Westinghouse Electric, toward increased participation and self-help by applicants in selecting and pursuing a career in the computer world—ostensibly a noble and worthy cause. He reported on the findings of an ACM career guidance committee. In a nutshell, this group found that potential college applicants for computer careers were consistently inept in representing themselves in interview situations and in planning effectively for possible jobs. The solution, outlined by Kahn, is to promote a kind of a National Career Corps, modeled after the Peace Corps, to spearhead a crash program to teach students to help themselves in pursuing vocational careers.

The method of choice put forth by Kahn was a cartoon-studded road show in two acts on career development, with a Norman Vincent Peale approach to positive thinking to get the student to think for himself. An unfortunate analogy was made between the sorry state of confused students and Alcoholics Anonymous. This evangelistic pitch seemed to be based on the rather amazing assumption that this committee had suddenly discovered the final solution for career guidance, and on the further assumption that the professional work on career and vocational guidance to date, in and out of the schools, was more or less bankrupt and hardly worth mentioning. At no time was any systematic, quantitative research presented, or even suggested, to back up the numerous allegations. As a matter of fact, existing interviewing and questionnaire techniques were summarily dismissed as a waste of time and as misguided effort.

While few would quarrel that vocational guidance can and should be improved, it seems that crash programs that ignore the responsible work of professionals in education and related social sciences, are probably ill-advised. We need the combined cooperation of all involved in career guidance, and we need to capitalize on the best method and findings of all our experience to date, rather than the hasty efforts of an independent group with superficial and non-scientific methods.

J. C. C. Allen, associated with Rolls Royce, gave a well-organized and informative review of the "Selection and Development of Computer Personnel in Great Britain." The problems were all too familiar—inadequate levels of qualified computer personnel, primitive certification techniques, overemphasis on pure science and underdevelopment of applied computer sciences, a critical shortage of high-level managers, and poor selection, training and placement techniques for computer personnel.

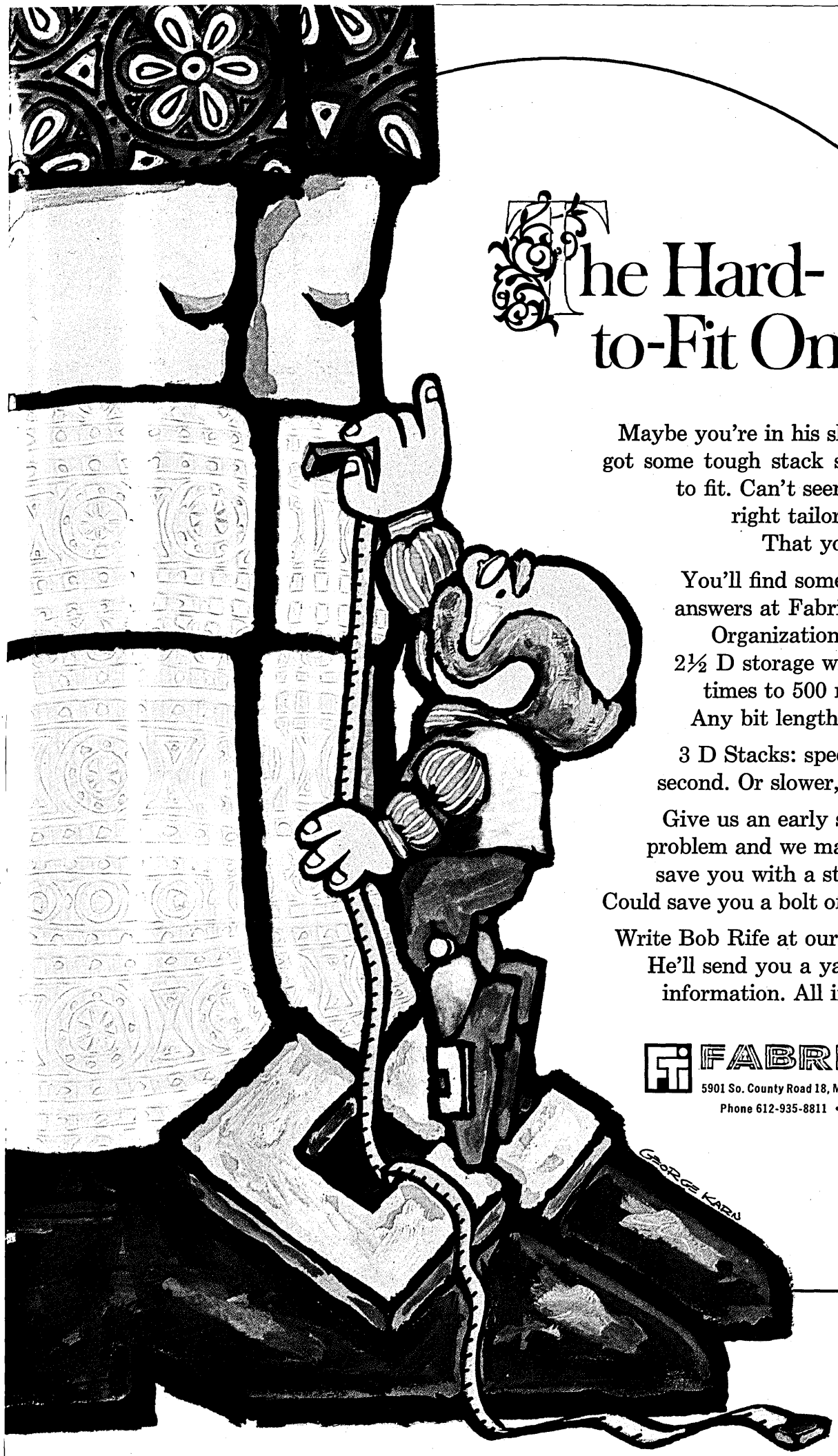
Allen mentioned some notable steps



"There! A perfect example of machine's inhumanity to man."

©DATAMATION

FOR FABRI-TEK CIRCLE 33 ON READER CARD→



The Hard-to-Fit One

Maybe you're in his shoes. You've got some tough stack specifications to fit. Can't seem to find the right tailor to suit you. That your problem?

You'll find some fashionable answers at Fabri-Tek. 2½ D Organization: economical 2½ D storage with full cycle times to 500 nanoseconds. Any bit length or capacity.

3 D Stacks: speed—1 microsecond. Or slower, if you wish.

Give us an early start at your problem and we may be able to save you with a stitch in time. Could save you a bolt of money, too.

Write Bob Rife at our home office. He'll send you a yard or two of information. All in your style.

FABRI-TEK

5901 So. County Road 18, Minneapolis, Minn. 55436

Phone 612-935-8811 • TWX 910-576-2913

Is JCL GIGO bugging you?

Try Colt-360 error disposal & debugger.

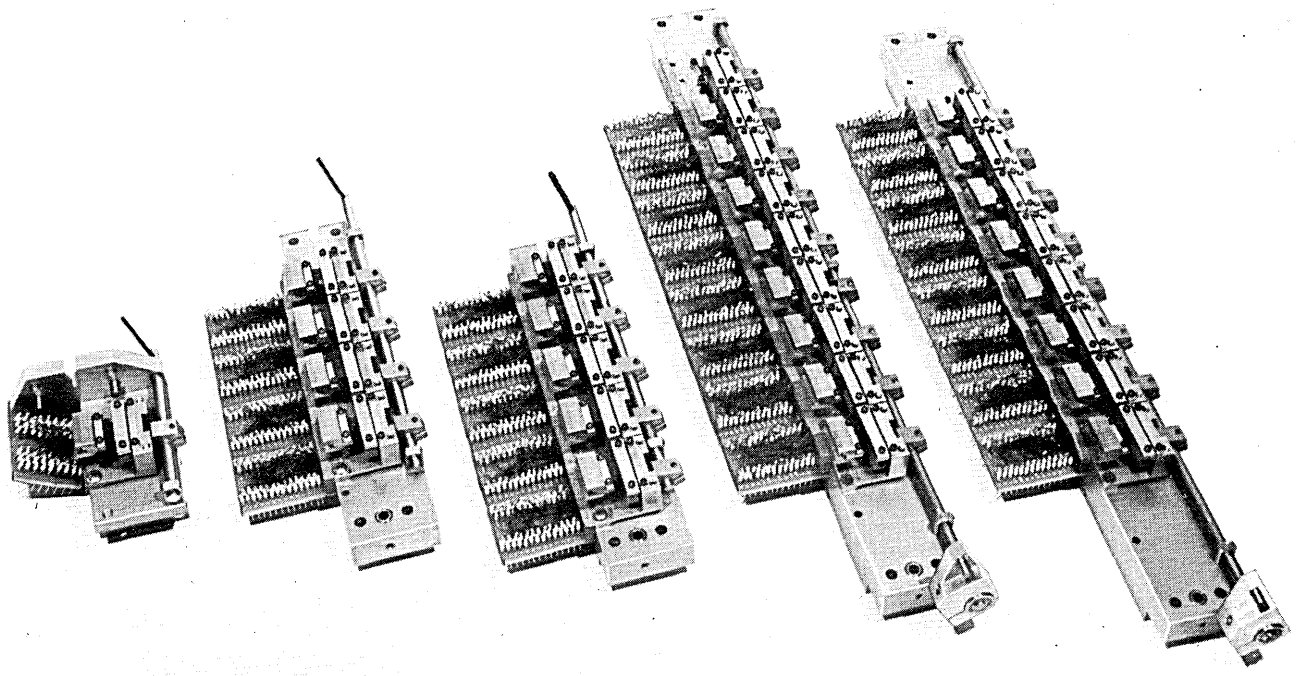
Colt-360, Aim's new COntrol Language Translator, arms you with an automatic control capability for the 360 (OS), utility program and sort/merge program. It's designed for your precise objectives.

Forget about those free, maze-like programmers' manuals. They cost a fortune in time. Forget about GIGO (garbage-in-garbage-out) and debugging hang-ups. Get diagnostics, JCL card listings and the cards themselves without wasting programmer and computer time. And, forget about changing JCL cards for new configurations.

The days of "let's-run-it-and-see" 360 job control are over. In sum, Colt-360 saves everyone's time and money! Write for Aim's detailed Colt-360 brochure today. If it doesn't grind up your problems, nothing will.

Automatic Information Management, 16033 Ventura Boulevard, Encino, California 91316. Aim is a broad-capabilities software organization.

CIRCLE 34 ON READER CARD



Fact:

One Head is better than Five

When you look closely at the head assemblies used on our five standard drums, you can see they're really all the same. The same 16-head flying pads. The same unique compliant-reed mounting. The same connectors. The same spare heads. The same reliable head actuating mechanism. Whether the drum has 128, 512 or 1024 tracks . . . measures 10″ or 20″ in diameter . . . is partially or full implemented.

In other words, the VRC common-design concep means one head is better than five. And the standarc heads are only one facet of this concept. All five oi our standard drums use the same self-clocking interface micro-electronics. All five share the same connector pin layouts . . . the same speed sensors . . . and the same 1-year warranty.

Thanks to common design, VRC drums (2.6 to 67.5 megabit capacities) give you reliable, flexible economical performance. And that means application, installation, training and service costs stay low, no matter which VRC drums, or how many drums, you use.

Computers are known by their MEMORIES

. . . so is **Vermont Research CORPORATION**

DRUM MEMORIES • SYSTEMS • DISK PACKS

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

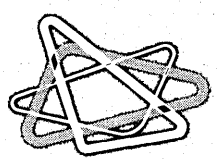
CIRCLE 35 ON READER CARD

When EDP management must evaluate the alternatives . . .

SCERT

THE ACCEPTED STANDARD

...For using computers to manage computers



COMRESS 2120 Bladensburg Road, N.E. Washington, D.C. 20018

Offices: New York, Los Angeles, Chicago, Philadelphia, Pittsburgh, Boston, Ottawa, and London

Circle 36 on Reader Card

that were being taken to alleviate some of these problems. The government-subsidized National Computer Centre has significant support to promote the education and development of computer managers, systems analysts, programmers, and computer operators. In addition, the British Computer Society is developing standards for professional certification. Concurrently, the government is applying a tax-incentive scheme which effectively reduces the tax bill for companies that devote more resources in training personnel for computer skills. Unfortunately, these and related programs are too recent to provide definitive data on how successfully they are working. The notion of national support for the promotion, dissemination, and certification of computer skills is an interesting idea that we have hardly explored in the U.S.—the British experience in this area should be closely followed.

research papers

Only two of the 11 papers in this session were directly concerned with computer personnel *research*—and this is a conference whose last name is Research. Ray Berger, from the University of Southern California, described his current work on a new paper-and-pencil "Systems Analysis Test," and a test battery for programming aptitude. As in his prior development of the Basic Programming Knowledge Test, Dr. Berger has implemented well-established quantitative techniques from the general field of psychological test construction and analysis.

Test items were developed from job analyses based on a systematic sampling of expert opinion. The reliability and validity of the test battery for programming aptitude was tested against a sample of 138 Navy computer personnel. These results provided initial norms for scoring. A number of interesting preliminary correlations were obtained on test performance against such variables as scholastic level, college major, experience level, and civil service GS-level. Independently of the eventual merit and the technical details of this test battery, the blending of well-established quantitative techniques from relevant social sciences to urgent problems in the computer world is a positive sign of growing maturity in computer personnel research.

The other address dedicated to empirical research was given by the author, entitled "Expe[illegible] in On-line Man-Co[illegible] cation." The talk[illegible] ings from some 20 s[illegible] puter problem-solving computing systems and in[illegible] on-line/off-line experiments, the period from early work in second-generation time-sharing tems. While research in man-comput communication is still in a primitive state, the available findings, particularly the most recent work, suggested some fruitful scientific cross-fertilization with the main-stream of the behavioral literature in human creativity and problem-solving.

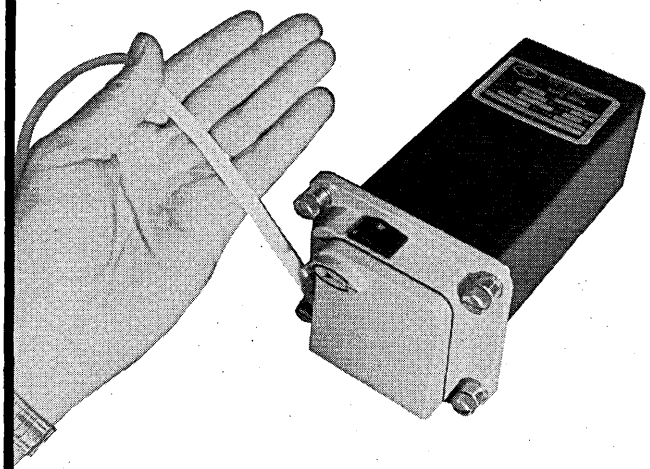
The remaining papers were mostly concerned with individual company experience in selection and training programs and with the early development of personnel testing techniques. On the whole, the audience was quite seriously concerned with the various developments that were put forth, and, in the absence of solid contributions, they sometimes grasped at straws. The computer personnel field is still a major mission in search of science. Only the open, cooperative support of the computer world can match this humanistic mission to improved method.

—HAL SACKMAN

NEED HIGH RELIABILITY?

Only 6 Moving Parts!
on a severe environment Miniaturized Alphanumeric Strip Printer.

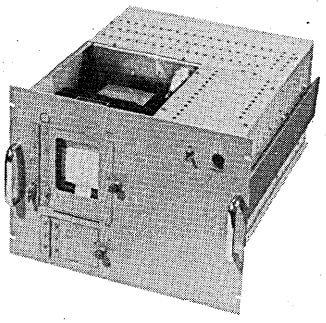
CLARY



CLARY Model AN-16 offers High Reliability and Mil Spec compliance.

- Designed to meet or exceed applicable parts of Mil-E-16400, Mil-E-5272 and Mil-E-5400
- 5000-hr. MTBF in military airborne operation
- Compact — 3" H. x 3" W. x 6¼" D.
- Lightweight — less than 4 lbs.
- Cartridge loading
- 1500 characters per minute
- 64 alpha-numeric (ASCII Code) characters

Ask for Data Sheet No. S-173



CLARY MODEL 2000
Fully qualified Severe Environment Printer
- Up to 21 columns (12 characters per column)

Model 2000 has qualified on many Programs. (Names on Request)

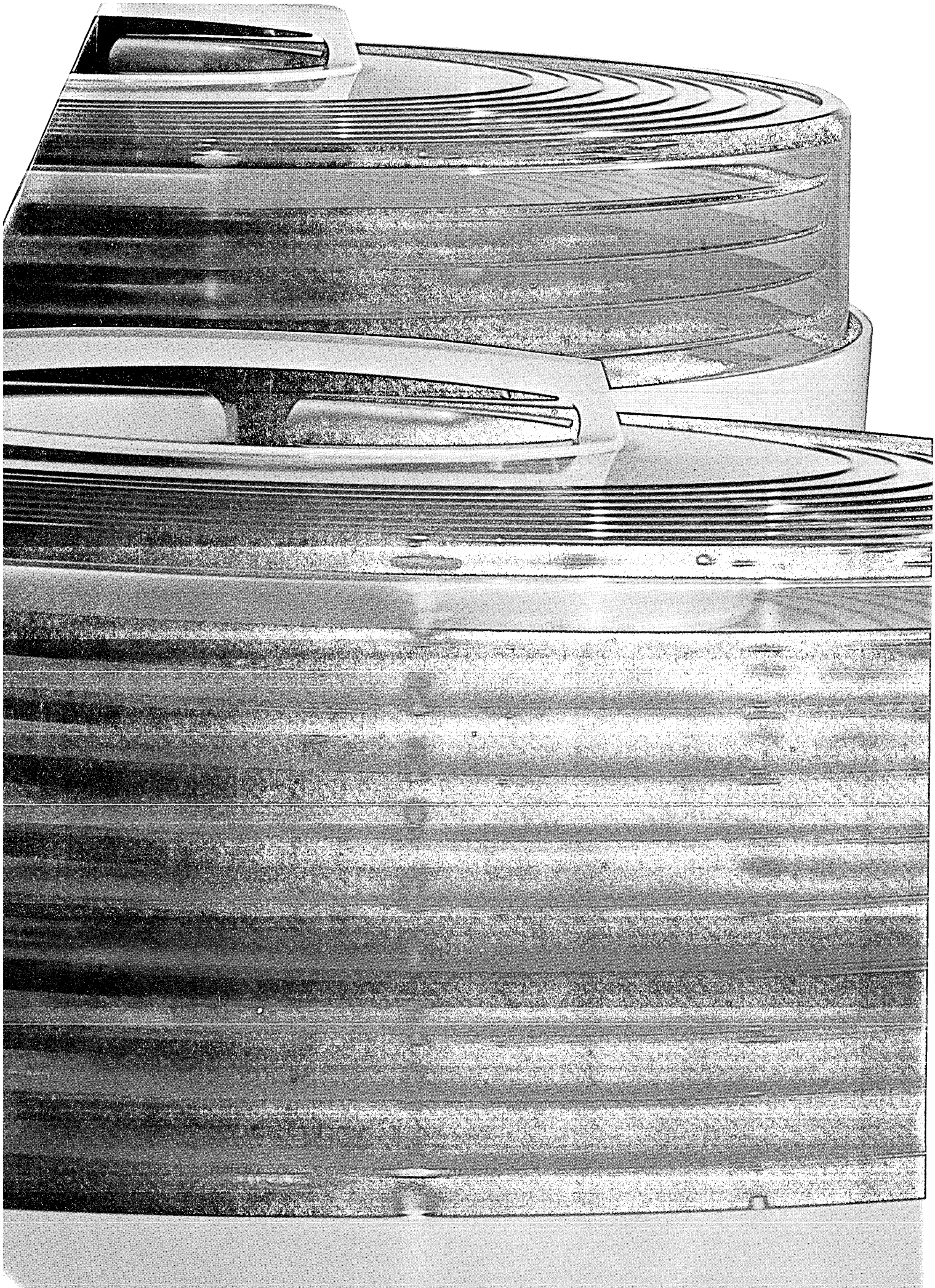
Ask for Data Sheet S-181

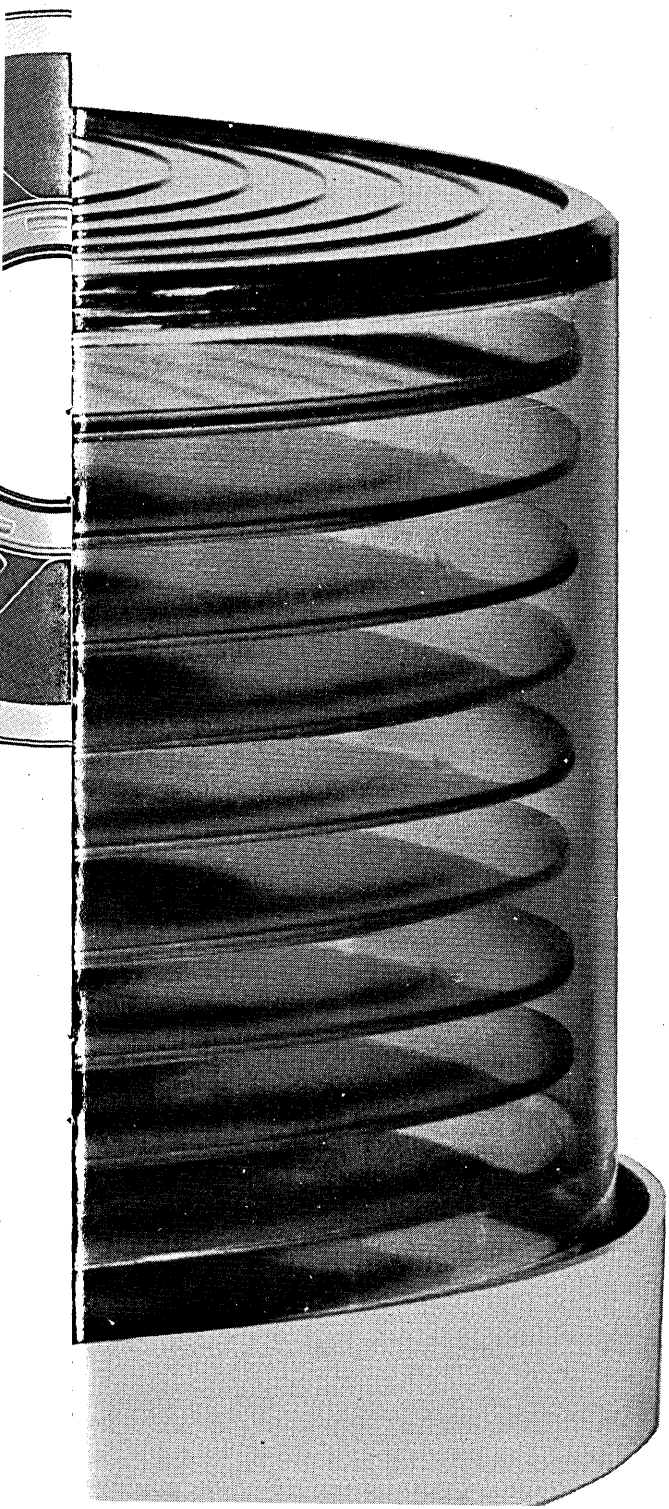
Performance Proven on many Programs

- F111B Aircraft Mark II Avionics System
- RF111 Aircraft — Avionics System
- DMED — Mobile Communications System
- DASC11 — Mobile Communications System
- PERSHING — Mobile Automated Checkout Equipment
- SSCNS — Ships Self-Contained Navigation System
- Advanced HAWK — Fire Control

CLARY CORPORATION
DATA EQUIPMENT DIVISION
370 WEST CLARY AVENUE
SAN GABRIEL, CALIFORNIA 91776
(213) 287-6111 • (213) 283-2724

CIRCLE 38 ON READER CARD





The ATHANA 2316 Disc Pack: We're delivering now!

Leave it to Athana to do it first. The first independent to make 2316 Disc Packs available — now. Both the Athana 1316 and the Athana 2316 Disc Packs are being shipped to installations across the country. But don't take our word for it. Write Athana Corporation: First Union National Bank Building, High Point, North Carolina 27260. Or call (919) 882-6861. Actions speak louder than words, right?

More to come

CIRCLE 37 ON READER CARD

NEW! Designed for the Computer O.E.M.

A simple, reliable and economical computer tape transport that meets the critical requirements of the original equipment manufacturer. It's called the Model 959 Computer Tape Transport, and it's made by Texas Instruments.

Advanced design is the reason why. You get a machine that handles from 200 to 800 bpi at 60 to 120 ips, yet has remarkable simplicity. Permanent magnet reel motors and a printed circuit capstan motor eliminate gears, belts, pulleys, clutches, and other cumbersome mechanical systems. No pinch rollers are used, and tape is automatically loaded without moving the read/write head.

The size and complexity of electronic circuitry has been reduced through the use of the latest linear and digital integrated circuits with advanced silicon power transistors.

Improve your price/performance ratio with the new TI Model 959 Computer Tape Transport. Lower maintenance costs improve system quality with a transport designed for the original equipment manufacturer. For more information, contact your TI representative or Texas Instruments, Industrial Products Division, P. O. Box 66027, Houston, Texas 77006 (713-227-3611).

TEXAS INSTRUMENTS
INCORPORATED

115

CIRCLE 49 ON READER CARD

BURROUGHS SAYS 8500 PROBLEMS SOLVED, EYES ROLE IN THE SUPERCOMPUTER MARKET

Plagued by supercomputer production problems—like IBM, CDC and GE before it—Burroughs Corp. has revealed that delivery of its first 8500 to U.S. Steel (originally scheduled for "late '67") will be delayed.

Major cause of the slippage—about one year—is attributed to poor hybrid circuits produced by another company. But Burroughs notes that some of the slippage is caused by that company's change of plans for the delivery. At first, USS wanted the first cpu and related equipment delivered early for onsite checkout, to be followed by later installation of the rest of the system. Now USS is checking out the first portion of the system at Burroughs' Paoli plant, will install and check out the entire system—now slated for delivery in late '68 or early '69—at one time.

News of the delay brought rumors that Burroughs would fulfill present 8500 orders, turn away any others. Not true, says the firm, which notes that it's building a new 144K-sq.-ft. engineering and production plant for the 8500 in suburban Philadelphia, where production is supposed to start in October.

And the circuit problems have been solved, says Burroughs. "Extremely reliable" hybrids have been delivered by the same firm which produced the faulty ones, and production is back on the track.

8500 evolution

The history of the 8500 is an interesting one. It began with the decision of Burroughs in 1965 to allow its defense systems arm in Paoli to design a large-scale computer for military and commercial use.

At first designed as an assault on the 7094 market, the 8500 has undoubtedly gone through substantial modification since its inception. First of all, U.S. Steel made its suggestions, which have resulted in a six-bit batch-oriented system.

Subsequent systems are ASII compatible eight bit (although Burroughs says it may come up with a model which will work in six- *or* eight-bit mode) and will be more on-line oriented.

Additional modifications have surely been made with an eye to the competition, and to compatibility with the company's B 5500-6500-7500 line of large-scalers out of Pasadena. They're aiming, they say, at 75% or better compatibility with that line (with "some" patching) and will undoubtedly try to achieve it with higher level languages. The 8500, for instance, will use 6500 FORTRAN and COBOL under its own operating system.

internal feuds over

But the products of the company's eastern and western design camps have shown little commonality in the past. Outright rivalry, in fact, has led to head-on design and marketing clashes. Such internecine foolishness is over now, says Burroughs: 25 key Pasadena and field people are working on the 8500, and B 5500 software specialist Lloyd Turner is heading up 8500 software production. Pasadena engineers reportedly had a voice in final system spec reviews. And the 8500 is now a standard Burroughs product . . . no longer has its own separate sales crew. (But 8500's aimed at defense or special applications—e.g., traffic control, airline reservations—are marketed out of Paoli.)

The Big B feels it has an excellent chance to get its share of what they claim is a big market for supercomputers, or machines with a better-than-$5-million price tag. The bedrock of their belief: delivery of error-recovery, "fail-soft" military computers and their experience with multi-processing and multiprogramming on the B5000 and D825 since 1962. They claim their disc has proven to be "the greatest thing around" for time-sharing and communications requirements, and point with pride to terminal computing capabilities, represented so far by the TC-500 (see July, p. 106) remote, which charmed Barclays Bank Ltd. (England) to the tune of an order for 2500 of them for on-line access to a 5-billion-character file.

The 8500, they say, is designed for a broader mix of jobs than some of the large scientifically oriented machines. For this reason, they feel it is better suited to centralized management information systems. And they're betting that a substantial number of large American firms will want to put all of their data processing eggs in one huge basket.

The only reason for a large computer, says top Burroughs dp man Jim McCullough, "is to do a lot of jobs for a large company at lower cost . . . a company with 5-10,000 programs to be run, and on a computer which can handle a variety of them at once, and simultaneously be able to correlate data between a large number of programs more easily." And lots of big companies, says McCullough, are seriously looking into supercomputer centralization.

McCullough admits that such centralization is tricky and difficult, requiring "our brainiest people to solve. We need smart people and reliable hardware." But the economic rewards are sensational, he says. "U.S. Steel will do the same work on the 8500 that they are now doing on 17 different computers . . . at the same cost. But they will have left over computing power equivalent to the 17 now in use. That's rough, of course," he adds.

. . . than a speeding bullet

The machine on which Burroughs is banking to make it a successful challenger in the supercomputer market is still a mystery. The company won't reveal any specs; they're waiting for some patents to pop. And they can't offer a price/performance comparison with their competitors, because the 8500 "isn't priced yet." Presumably, this means a new model, because surely the orders from U.S. Steel, Univ. of Wisconsin, and Barclays carry price tags.

But the company claims that the

8500 will be "more powerful" than the 360/85 . . . not in terms of clock speed, but in terms of memory capacity, multiple processors and communications capabilities. And, they say, the 8500 processor is five times as powerful (that word again) as the 6500 processor, which is supposed to be 10 times as powerful as the 5500 cpa, which is . . . But you get the idea.

Despite the confidence of McCullough and crew, the 8500 faces yet many a hurdle—delivery is one—already cleared by at least a couple of its rivals. The company may be underestimating the problems posed for huge on-line systems with several layers of software . . . tackling new jobs in a new environment with users unused to this strange way of assaulting information management. But Burroughs feels its extensive experience with large on-line commercial and military systems gives it the necessary savvy to avoid such problems.

At any rate, potential customers, the competition and the computing world at large will watch with equal interest as the 8500 slides down the ways into the uncharted commercial waters of the supercomputer.

—R.B.F.

FCC CARTERPHONE DECISION UNSETTLES CARRIERS, ENCOURAGES MODEM MAKERS

The FCC dropped one shoe June 26 when it decided that Ma Bell's foreign attachment restrictions are unnecessary, and unfair to users; last month, computer users and foreign attachment manufacturers were waiting for the other shoe to fall.

Experts familiar with the arcane world of communications utility regulation agreed that the next move was up to the carriers. As one lawyer put it: "the commission has blasted a gaping hole in the tariff wall, leaving the carriers dangerously exposed. At this moment, any user could hang any foreign attachment on his telephone line and not worry too much about getting arrested."

He added, however, that the user would be hurting himself as well as the telephone company. "The carriers lost largely because they couldn't prove that foreign attachments were harmful. Almost certainly, they will now be looking doubly hard for such evidence in the hope of persuading a judge to overturn the commission's ruling."

mumbles from at&t

AT&T's initial comment, after the decision came out, was not exactly informative. "We are reviewing the commission's order . . . and considering what action we should take," said a spokesman. It seemed likely that Bell and the other carriers would go along with the commission's suggestion ". . . to propose new tariff provisions which will protect the telephone system against harmful devices (and which) may specify technical standards."

Basically, this is what computer users and foreign attachment makers have been seeking all along. But developing provisions acceptable to all the parties concerned is almost certain to take considerable time.

It is at least possible that the carriers could get the commission to allow standards which fall considerably short of meeting users' needs. In that case, both users and equipment makers would be only marginally better off than they are now.

Neither of these groups seems to be doing much at the moment to get a definite commitment from the carriers. EIA and BEMA have set up groups to work on foreign attachments standards, but each is reportedly still trying to agree on what to ask from the carriers.

When the commission ruled that the foreign attachment ban "has been unreasonable, discriminatory, and unlawful in the past," it implied strongly that those damaged by the tariff could sue the carriers. This hint was underlined in a later statement that "we make no rulings as to damages since that relief has not been requested."

Carter Electronics Corp. will clearly benefit from these words, since its Carterphone was the foreign attachment that precipitated the FCC decision. But other attachment makers may also be able to sue. For, as the commission pointed out, "the tariff is unreasonable in that it prohibits the use of interconnecting devices which do not adversely affect the telephone system." The Carterphone is only one of several such devices.

no help for carriers

The commission also told the carriers that, if sued, they cannot escape responsibility by arguing that the FCC encouraged them to ban foreign attachments. "We never approved the tariff," the commission said in effect; "we merely allowed a tariff to go into effect that had been developed completely by the carriers."

Carter has a damage suit against AT&T pending in a Texas court. Presumably, this case will now be settled. Other foreign attachment makers undoubtedly will watch the proceedings closely and be guided accordingly.

If AT&T and General Telephone Co., the defendants of record in the Carterphone case, appeal the FCC decision, they are likely to pick at the fact that the commission considered only one attachment, the Carterphone, yet issued a ruling which encompasses many others. An FCC source believes this is a "technical argument" which can be shot down without too much trouble.

all out for modems

The ruling, if it stands, breaks the market for modems wide open, and provides a major opportunity for independent manufacturers in areas like touch-tone keyboards and picturephone type units. There are no authoritative figures on the number of Western Electric's modems in the dial-up network, but one manufacturer says that's where 90% of the business is. Among data set suppliers are General Electric, which announced an extensive line late last year, Automatic Electric, Milgo, Rixon, Collins Radio, and Ultronic.

Users are delighted with the cost-savings potential for on-line systems which cannot justify private lines to all remote points and for the time-sharing services they use. The problem has been that Bell System companies will only rent the modems. Now a $30/month unit from Bell can be bought from an independent in the range of $500, which means substantial savings to the user who plans to keep the data set for two years or more. And this figure can be further reduced if the terminal and the data set are integrated into one package, eliminating separate packaging and power supplies (say 10-15% on a $500 modem).

The user who opts to stay with Bell equipment may also benefit, as it is conceivable Western Electric may cut prices and perhaps parent Bell will coerce its phone companies to charge a uniform rental for the same unit. (The disparity in prices company to company has long been a bane to the user.)

who will fix them?

Some claim that many users will continue to rent from the phone company because of maintenance. First of all, many independent modem makers do not have the service capability to handle the end user market the ruling

opens to them. Secondly, the on-line system user already has enough headaches finding the source of failures—the carrier or the computer supplier—without adding another vendor to the argument.

There are three factors which could offset this. One is the possible rise of maintenance firms, which, because of standardization of these units, could service several different brands. Another is that for the time being only modems operating at up to 2,000 bps are used on the dial-up network, and one manufacturer, Rixon, says the maintenance is minimal on these units. Rixon notes that of 4,000 FM-18 modems (1800 bps) delivered in the last two years, only 75 have been returned because of manufacturing defects and only 10 have had component failures. However, Bell and others are working on higher speed modems for the public system and maintenance will be more critical here.

But even when maintenance is critical, service manpower is short, and the user doesn't want a third vendor around, there is a third possibility. As is already done for private line equipment, the modem could be sold to the oem supplier who would integrate the unit with his terminal and assume maintenance responsibility.

In the meantime, the manufacturers are not yet gearing up, or at least are not admitting it, to attack this new opportunity. Possible appeal to the courts by AT&T could long delay the event, as well as the development of new tariffs and the setting of standards. One modem-maker notes there are several questions unanswered in the ruling, one being whether AT&T will insist that it provide at least the dialing mechanism in the interface.

Besides the interpretation of the ruling, its significance to the marketplace will not fully be realized until some technological advances have been made. One is the noted work in higher speed modems; another is the availability of the long-promised broadband dial-up service. Furthermore, although this ruling does not specifically cover the now-prohibited interconnection between the public AT&T line and other networks, like private microwave, some manufacturers say that it hints the FCC may be leaning toward allowing interconnection. Such a move on the innovative agency's part would further increase the possibilities for equipment makers. So the story really only begins with the foreign attachment decision.

—PHIL HIRSCH
—ANGELINE PANTAGES

JUSTICE DEPT. ASKED TO INVESTIGATE CHARGE OF UNFAIR IBM PRICE POLICY

Senator Gaylord Nelson of Wisconsin suspects IBM is trying to muscle its competitors out of the information processing business. He has asked the Department of Justice to investigate a charge that Call/360: Datatext is being offered at subsidized rates, in violation of the anti-trust laws. Nelson also wants Justice to find out if IBM is violating its 1956 consent decree by operating commercial service bureaus disguised as "data centers."

Nelson's suspicions were aroused by VIP Systems, Inc., a Washington, D.C., service bureau that offers a package like Datatext. VIP President Joan Van Horn contends IBM aims to put her out of business, and she freely admits it could happen.

This isn't the first time competitors of the great gray giant have complained to the Justice Department, but VIP's effort could be more successful than the others.

A knowledgeable source, with contacts inside Justice, says "many anti-trust division attorneys believe the 1956 decree should be re-examined in the light of subsequent technological advances." Time-sharing services like QUIKTRAN and Datatext, he added, "illustrate the advances they have in mind."

An IBM spokesman told DATAMATION that the Datatext user pays $2.15 for each hour of connect time, plus the following additional charges: 24 cents for each 1550 bytes of disc storage, or 16 cents for each 3100 bytes of data cell storage; 8 cents for 70 data transfers between storage devices and cpu, or for 1200 msecs of cpu processing time; $1.60 per thousand records output on tape, $3.20 per thousand output cards punched, and $2.40 per thousand lines of printout. A representative Datatext user pays about $3.50/hr. for connect and cpu time, says a non-IBM source. VIP's comparable rate is $6-7.50/hr., and it asks about five times more than IBM for storage.

pricing framework

IBM is using a 360/40 for Datatext, which can handle up to twice as many communication channels as VIP's 1440, says Miss Van Horn. But the 360/40 costs at least twice as much as the 1440, so the price to the time-sharing customer should be about the the same. IBM is undercutting VIP's price roughly 50%.

One way of pulling this off would be for IBM's manufacturing arm, the data processing division, to provide equipment at a big discount to the company's data centers. Many computer makers "sell" to their nonmanufacturing divisions on that basis. At IBM, the in-house user reportedly pays 40% of what the outside customer is charged.

This discount doesn't collide with the anti-trust laws so long as it doesn't give IBM an unfair advantage over competitors. One way of proving unfairness would be to show that IBM data centers are really commercial service bureaus, as defined by the consent degree IBM signed in 1956. That agreement specifically prohibits the company from operating its own service bureaus, precisely because they would create an unfair burden on others in the same business.

According to the decree, a "'service bureau business' shall mean the preparation with tabulating and/or electronic data processing machines of accounting, statistical and mathematical information and reports for others on a fee basis."

That word "preparation" is likely to prove crucial because IBM reportedly believes that Datatext and other Call 360 services don't require any. What they *do* involve are data *processing*, together with related programs and output—none of which is explicitly barred by the decree.

The counterargument is that technological advances since 1956 have eliminated data preparation, per se, from many dp applications. So, even if IBM is obeying the words of the consent decree, it is nevertheless competing directly with commercial service bureaus and thereby violating a major purpose of the agreement.

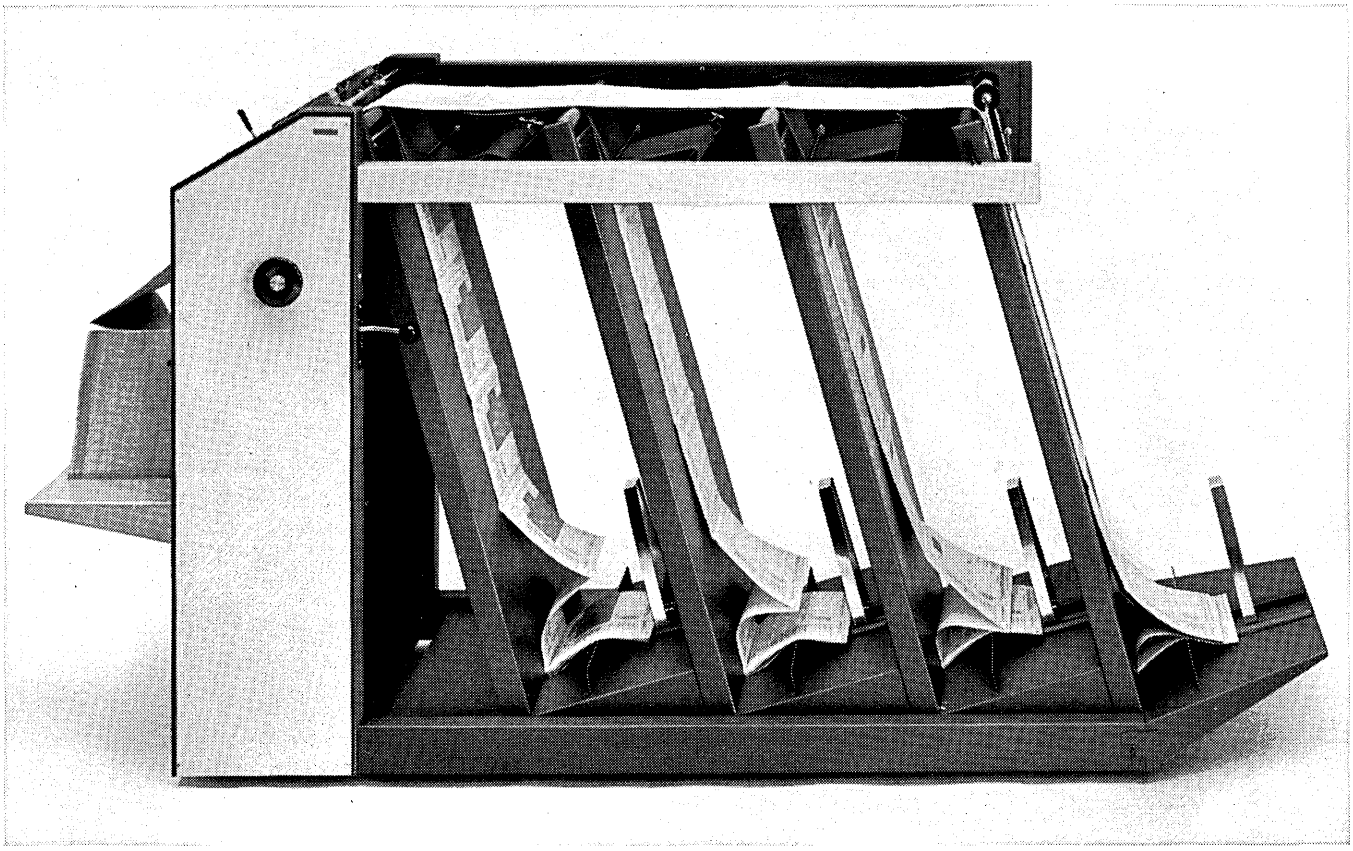
decision may be relevant

Proponents of this argument see support for their cause in a recent U. S. Supreme Court decision. Last May, the high court found that a decree designed to curb monopolistic activities of the United Shoe Machinery Co. had failed to accomplish its purpose, even though United Shoe had done nothing it was explicitly forbidden to do under the agreement. The government was told, in effect, to rewrite the decree and make it airtight.

The relevance of the United Shoe case may be more apparent than real, however. Applying the same logic to the IBM decree would be "difficult," says a Justice Department attorney. United Shoe, he explains, made its peace with Uncle Sam after being found guilty of violating the anti-trust laws. The IBM case never went that far and, as a result, he feels the government is in a considerably weaker position.

—PHIL HIRSCH

A quick end to data processing.



This is our new multi-part forms decollator. The low-cost, easy-to-operate decollator that gets your continuous forms ready for distribution as fast as they come out of the printer. With add-on units, it handles up to 8-part forms.

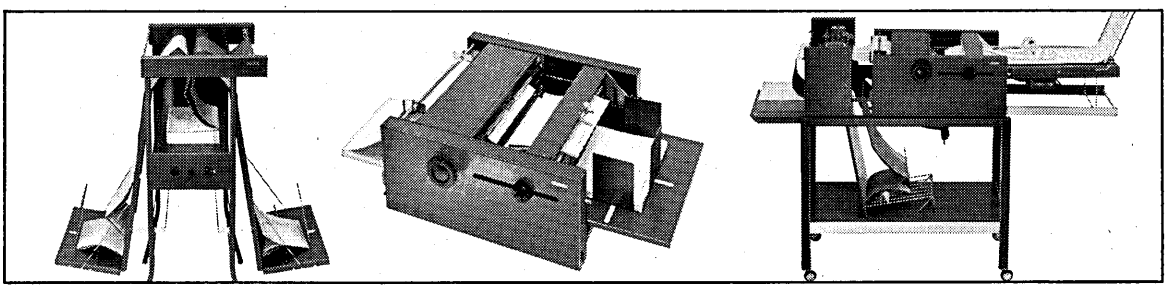
It's easy loading and smooth stacking. It processes **all** types of forms (carbon paper and carbon-backed) at high speeds—with virtually no paper dust. And it offers features that make forms handling a simple, trouble-free, on-time operation. (Like peek-in slitters, adjustable carbon rods, rollabout mobility.)

Why not keep up with your third generation computer? Write us for details on our multi-part forms decollator. At the same time, ask about other Tab forms handling equipment for ending paper processing problems.

Forms processors by

TAB

PRODUCTS CO. 633 Battery St., San Francisco, California 94111



CIRCLE 39 ON READER CARD

news briefs

IBM FOLLOWS A TINY LEADER

Young itty-bitty Standard Computer Corp., Santa Ana, Calif., computer maker, is delighted at the blessing placed on loadable microprogramming by the announcement of the 360/25. Earlier 360's offered only one built-in emulator.

The 25 is the first IBM machine which allows the customer to load multiple emulators, a concept Standard introduced in its IC 6000 series in Jan. '67 (see Feb. '67, p. 77).

This was followed this year by the IC-4000 (Apr., p. 185), which offered a microprogrammed FORTRAN "engine," or compiler.

Now the company offers a 6000-E (for Educational or Experimental), which combines a microprogrammed control memory half devoted to basic, built-in functions, the rest open for user-devised "superinstructions."

Thus, under control of an Inner Computer Assembly Program, the user can combine machine-language and his own microprogrammed instructions in one run. An obvious use: designing experimental machines . . . a list processor, or a special-purpose computer for biomedical or instrumentation applications, for example.

The FORTRAN engine, meanwhile, looks promising. Standard claims that it has outrun the 360/65 on some prospect-provided job mixes. In another case, the machine offered a 6:1 speed advantage over the 360/40 at the same price. And, says Standard, it hasn't moved "all the FORTRAN stuff" into the control memory yet.

Meanwhile, the availability of loadable microprogramming on the 360/25—surely other new 360's will follow suit—raises a couple of interesting questions: Will IBM allow its users to devise their own microprograms? And will they offer emulators of competitive machines?

At any rate, it appears that Ascher Opler's "firmware"—a word coined in a Jan. '67 DATAMATION article—is here for sure.

CSC MAKES ITS COMPUTER UTILITY MOVE

Big, aggressive, Computer Sciences Corp. made its long-awaited move toward establishing a nationwide Time-sharing network last month. Surprisingly, the big push includes no immediate plans for use of the communications facilities of Western Union, which CSC is hoping to acquire (see June, p. 19).

First indication of the plan came with announcement in mid-June that CSC had won preliminary rights to negotiate with the 2400 credit-reporting members of the Associated Credit Bureaus, Inc., to provide computerized credit reporting services.

CSC plans to offer a complete package to ACB members, including file conversion, training, credit searching and reporting. Payments for conversion will start when the system is operational, be spread over 48 months.

The package will include Credipak, credit reporting system (cooperatively developed by ACB and two Texas credit bureaus) to which CSC has acquired the rights.

The credit biz and conversational engineering/scientific computation will be the first services to be offered at 20 computer centers covering 23 market areas across the U.S. Future industries to be offered special packages will include distribution, manufacturing, education, etc.

The Univac 1108 won the nod over the 360/65 for the CSC equipment order, worth an estimated $50 million. First test site will go into L.A. in October; a second in the east is due in April, with the rest to follow one month apart. The centers eventually will house dual-cpu 1108's, to be upgraded with unannounced Univac gear.

ATHANA SLASHES DISC PACK PRICE

Cheaper random access storage has been high on the list of industry

BE THE FIRST ONE ON YOUR BLOCK WITH A STOCK TICKER

If you can't wait for the morning paper stock lists to find out how much your 10 shares of Control Data are worth, Trans-Lux has the answer in the form of a small, programmable stock ticker suitable for the home or office. The puzzling picture above shows Trans-Lux Corp. president Richard Brandt sitting by the T-L Personal Ticker. The small roll of tape represents the day's output of quotes on 20 selected stocks and the mound of paper he's leaning on is the day's report on all listed stocks. Insertion of small keys into slots controls the selection of issues wanted. The user can also switch back and forth between a printout of the whole list and his favorites. First production units should be ready in the fall. They cost about $75 a month, plus line charges. For information:

CIRCLE 239 ON READER CARD

needs, and the Athana Corp. made a significant move in this direction simply by slashing the price of its 1316-type disc pack from $450 to $300.

The action stunned other disc manufacturers, which have kept close to the "de facto" price standard of $490 set by IBM about six years ago. And that's the crux of the reason for the cut: Athana wants to be a dominant factor in its industry and sees no reason why the price should be the same as it was when the disc-making business was in its infancy and manufacturing costs were higher. The 1316 is the smaller of the commonly used packs (six discs) and is not as difficult to make as the newer, 11-disc 2316. Athana does not plan any price cuts in the $650 2316 as yet. (The firm only began delivery of this model in July.)

Other manufacturers have taken a "wait-and-see" attitude on this action. How significantly it will impact them will be determined by Athana's production capability. IBM itself sells about 200,000 packs a year, industry sources say, other manufacturers divvying up the remaining 10-20% of the market. Athana says it has facilities to produce up to 5,000 a month right now, and could gear up for 10,000.

The Athana Corp. was set up in High Point, N.C., in March under its present name and management (president George Athanas was Mac Panel's president). But its plant in Torrance, Calif., has been in operation developing and testing prototypes for two years under Memory Magnetics International. The director of the 114-man manufacturing effort is W. G. Powers, formerly with Ray Tee Co., the original supplier of aluminum substrates for IBM's discs.

The other question is how much quality does the user get for $300? Athanas says his 1316, which the firm began delivering a few months ago, is "as good as IBM's and better than everyone else's." As in most cases, the Athana product is pre-tested and delivered 100% error free, although there is some error buildup on all packs with use. The pack is guaranteed against manufacturing defects, however.

Should the price cut significantly affect other disc makers, they will have to move to become "more competitive," said one user. Many already offer quantity discounts which bring them into the $400 range. But the firms that could most be hurt are those that market another firms' packs under their own name, like Kee-Lox and Wright Line. Their price and profit is determined by the discount price of the supplier.

GROSCH OUTLINES NBS CENTER GOALS

The Federal government spends about $3-4 billion a year on computing activity. This amount will continue to grow about 20% a year for the next 15-20 years—"consuming a sizable portion of the national budget." In view of these facts, Dr. Herbert Grosch, speaking before a New York chapter of the Association for Computing Machinery, asked and partly answered this question: "What can be done to control and optimize this growth for good government, trade, and society?"

The problem, Grosch said, is that the industry "doesn't have the opportunity to digest progress before it becomes obsolete." The answer does not lie in more innovation, but in the efficient and expert use of the more conventional side of the business. And for Grosch, a major instrument which can provide this leverage in the government is the organization he directs —the Center for Computer Science and Technology at the National Bureau of Standards. The charter for this group is that of an adviser, currently only for civilian agencies. But in this advisory capacity, Grosch envisions a major role for the center in standards, training, system and programming conversion, and qualifying of some software and hardware products.

Grosch has a staff of 200 in these technical areas, and a $5 million budget. But only $1.5 million comes from Congress, the rest put in the hat by agencies, earmarked for specific projects. This means minimal control by the center over what it does. Grosch aims to "get around this by calling on industry."

In standards work, rather than a company being selected to research an area using its own engineers, equipment, and facility, Grosch suggests that there be a central facility at NBS. Several companies would share in providing the capital, manpower, and equipment, cutting their own expenditures. The engineers would constitute a managing committee which would develop one report on the standards research, instead of many. And, hopefully, the manufacturers would donate the equipment to the NBS lab after all this. The money donated for these projects would be "sterilized" by going through USASI (the U.S. Standards Institute), which would keep, say, 10% for its activity.

Conversion is another problem. The government cannot afford to "replicate the agonies of the 360 hundreds of times." (Emulation is a case in point. The manufacturer provided emulation, says Grosch, as a "crutch to be sawed off an inch at a time until the user could stand on his own legs, but the fat-headed user has been sawing off his legs instead.") Grosch proposes a federal conversion center under NBS that would provide the training and estimate the system and software problems before the machine arrives at an agency's installation. Hopefully, the Business Equipment Manufacturers Assn. could arrange the loan of the computers to the center for hands-on experience.

Training is another problem area. The government needs thousands of "upgraded intermediate workers"—people who can move from coders to programmers, systems analysts to senior systems analysts. The snafu is that the agencies that really need the help are the less imaginative and tight-fisted. They won't send an employee into training for six months or a year and pay him, as well as a training fee to the Civil Service. Grosch proposes that his group and the Civil Service cooperate. Civil Service would select and train the people and the NBS Center would provide the real life problems and real machines for them to work on. The center would be paid a fee for the development of problems; the fee would be put into a "training revolving fund" to help pay the cost of training.

And, of course, as a proponent of separate software and hardware pricing (see June, p. 72), Grosch intends the center's experts to be the qualifiers of all packages put in the federal pricing schedule of the General Services Administration. AUTOFLOW, MARK IV, and MAC/RAN are all on the way to being on this schedule.

In order to accomplish these goals, Grosch is hoping for 60% annual growth in his group—so that five years from now the center's budget will be $50 million, and when it reaches one per cent of the total federal computer activity budget, it will level off and grow as the total budget does. By then perhaps even the Defense Department will cooperate with the NBS Center.

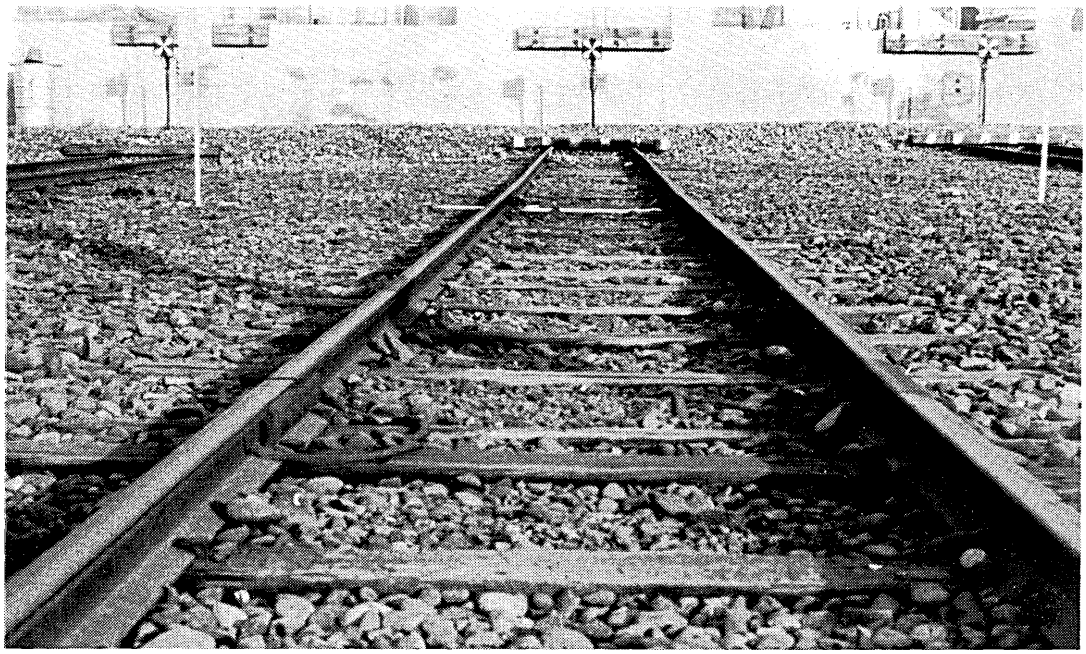
SDC SHOWS ADEPT-50 SYSTEM TO PROSPECTS

System Development Corp. and the Dept. of Defense demonstrated the ADEPT-50 programming system for about 500 government representatives during a two-day symposium at Andrews Air Force Base, Md.

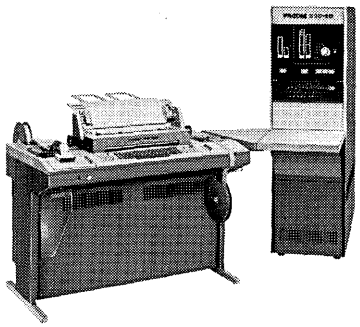
Developed by SDC under a two-year, $3.3 million contract from the Advanced Research Projects Agency, ADEPT-50 is designed to give military

(Continued on p. 95)

The end of the line



is the point where FACOM 230-10 starts to put on a terrific performance.



The end of a data communication line was exactly what we had in mind, when we designed the 230-10—a small economical model peerless as dependent or independent satellite computer of large-scale data centers.

With every 230-10 installation we provide a complete software package: library programs, service routines, program and operating manuals. The wide variety of FACOM assemblers, compilers, utility routines and application packages permits the perfect choice for your hardware configuration and applicational need. We call it "tailored" software; the most effective method for simplified programming and one of the elements in FUJITSU'S "best cost/performance ratio."

Call us before *your* data communication problem *has* reached the end of the line. We'll use one of our computers and end your problem.

FUJITSU LIMITED

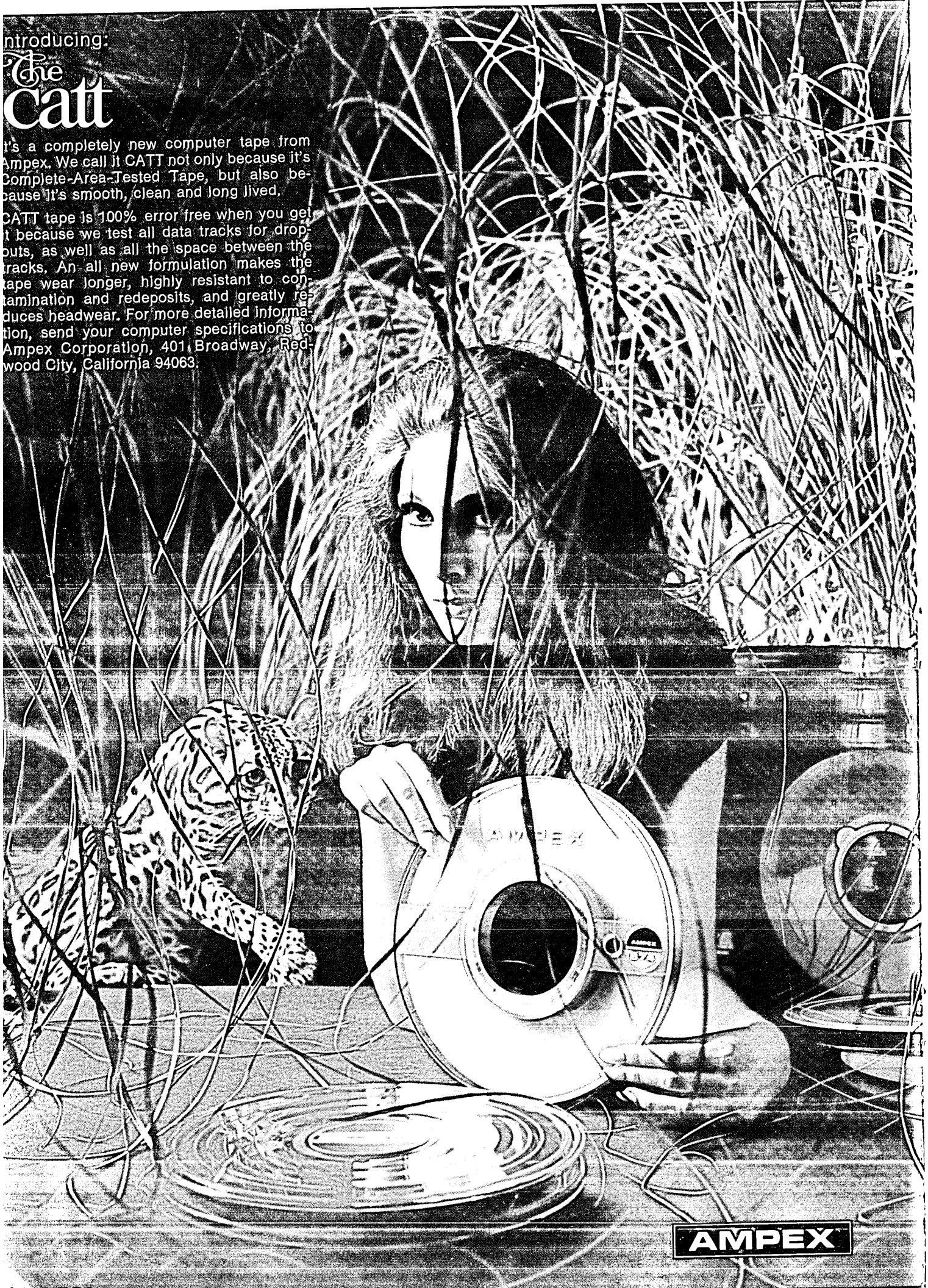
Communications and Electronics

Marunouchi, Tokyo, Japan

Main Products: Telephone Exchange Equipment ☐ Telephone Sets ☐ Carrier Transmission & Radio Communication Equipment ☐ Space Electronics Equipment ☐ Telegraph & Data Communication Equipment ☐ Telemetering & Remote Control Equipment ☐ Electronic Computers & Peripheral Equipment (FACOM) ☐ Automatic Control Equipment (FANUC) ☐ Electric Indicators ☐ Electronic Components & Semiconductor Devices.

CIRCLE 41 ON READER CARD

FOR AMPEX CIRCLE 42 ON READER CARD ➔


ntroducing:
The
catt
t's a completely new computer tape from Ampex. We call it CATT not only because it's Complete-Area-Tested Tape, but also because it's smooth, clean and long lived.
CATT tape is 100% error free when you get it because we test all data tracks for drop-outs, as well as all the space between the tracks. An all new formulation makes the tape wear longer, highly resistant to contamination and redeposits, and greatly reduces headwear. For more detailed information, send your computer specifications to Ampex Corporation, 401 Broadway, Redwood City, California 94063.
AMPEX

The catt: COMPLETE-AREA-TESTED TAPE

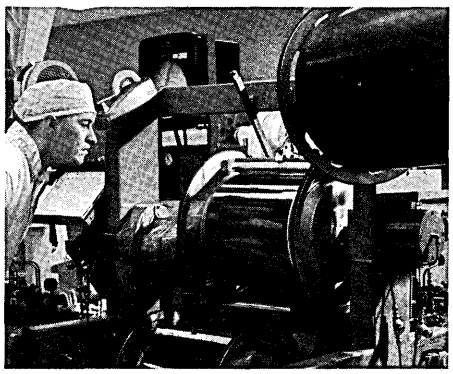
Every time your computer stops due to a parity error, valuable computer time (and money) is lost. And at the higher bit densities developed by third-generation computers and the new ultra high speed NRZ formats, the minutest foreign matter can cause costly errors. That's the reason for CATT tape: to assure you the tape you use is 100% error-free when you receive it and that it runs cleaner as you use it.

Tape which bears the CATT label has been fully tested across the entire width of tape on every reel—this means all recording tracks plus all the space between the tracks. During final tests, the tape is recorded and read back at its certified packing density. If a single uncorrectable error or dropout occurs, the entire tape is rejected.

Staggered 9-track heads test Ampex computer tape across the full width of tape on each reel.

THE CATT: A Ferrosheen® tape that protects heads, prolongs tape life, eliminates errors

Our exclusive surface finishing process not only levels out the microscopic hills and valleys that might cause dropouts, but it also prevents shedding and lowers head wear.

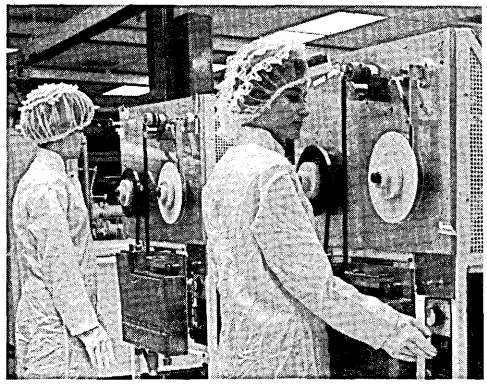


CATT computer tape also bears the trademark Ferrosheen®—an exclusive, controlled, surface finishing process that provides an ultra-smooth surface with a minimum amount of oxide exposure.

THE CATT: Supercleaned for error-free operation

Just before we package Ampex computer tape, we wash it in an inert fluid to eliminate all surface contamination or loose oxide particles that could cause problems. We call this procedure Supercleaning because it totally eliminates from the tape all foreign matter that could cause costly parity errors.

Ampex computer tape is passed through a special Supercleaning process during final winding.



THE CATT: A new formulation for long tape life and fewer errors

The Ampex new, exclusive coating formulation produces tough, smooth surface that's highly resistant to the impac ing of particles that could become embedded in the tap and cause permanent errors and costly "write skips."

We have run exhaustive comparative tests of computer tap for endurance. Hundreds of thousands of passes hav shown that Ampex CATT tape has the lowest error buildu rate of any tested tape. Costly read errors and data reco struction problems are, therefore, greatly reduced.

Ampex computer tape comes in 7- and 9-track formats, with bit packing densities from 556 cpi to 1600 cpi/ 3200 fci.

For complete information and specifications, fill out and mail this coupon:

Gentlemen:

Here are some facts about my computer operation. Please tell me more about CATT tape.

Type of computer(s)_____

Number of computers in operation_____

Type of tape presently used_____

Bit density certification_____

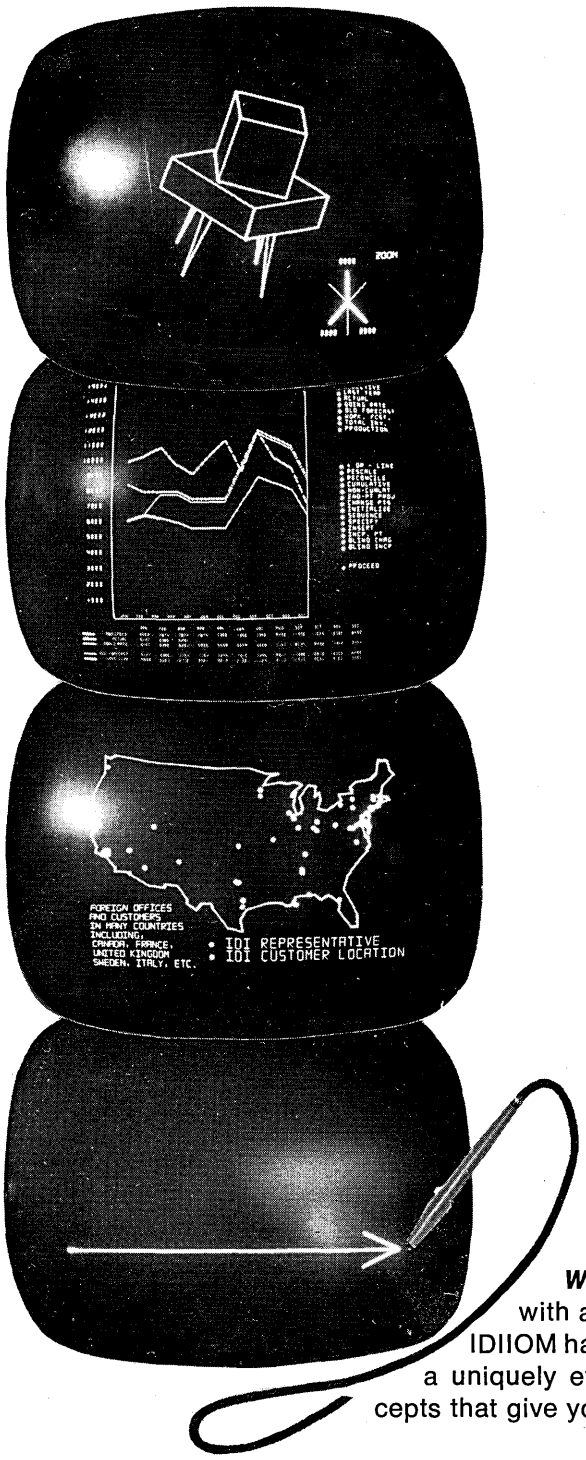
NAME_____

COMPANY_____

ADDRESS_____

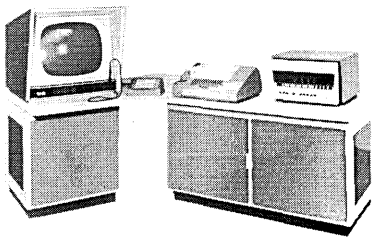
CITY_____ STATE_____ ZIP_____

Mail to: Ampex Corporation, 401 Broadway, Redwood City, Calif. 9406



draw your own conclusions . . .

We say IDIIOM is your best interactive display—freestanding, with an IBM 360, a DDP 516, Sigma 7, or any digital CPU. ***We say*** IDIIOM has an optimized balance of hardware and software functions; a uniquely efficient Display Processing Unit; and special design concepts that give you maximum programming convenience and use versatility.



But see for yourself! We've assembled the specifications for ALL available interactive displays in our newest IDIIOM brochure. It also includes brief descriptions of the significance to you of each major system element. We've tried very hard to be objective. In fact we'll bet you won't know it's an IDIIOM brochure until you compare the data.

INFORMATION DISPLAYS, INC.
333 N. BEDFORD ROAD, MT. KISCO, N. Y. 10549
(914) 666-2936 TWX-710-571-2179

WRITE TODAY FOR IDI'S COMPARISON BROCHURE OF INTERACTIVE DISPLAYS

CIRCLE 43 ON READER CARD

installations access to a central computer through terminals to store, retrieve, manipulate, and update data. The system consists of a time-sharing executive program, the company's TDMS data management package, and a user's construction/debug set of programs.

SDC says the system is now operational on the firm's 360/50 in El Segundo, and it's being evaluated at test installations by the National Military Command System Support Center and the Air Force Command Post. Right now 10 users can be handled at once, with Teletype, 2741, 2260, 2250, or CCI terminals. Response time is 2 to 4 seconds for brief computing jobs of less than 1 second cpu time. A mod 65 version in preparation will take an estimated 30 to 40 simultaneous users.

SDC says the query language used can be learned by non-programmers in a few hours of instruction. Teaching new users to deal with more complicated jobs takes longer, but within two days of instruction they should be competent to generate reports.

Estimated delivery time for ADEPT-50, expected to be of interest mostly to military customers, is January of next year. Financial details are a little foggy at this time. Since the project was mostly funded by ARPA, the system is available to DOD users without payment. On the other hand, if they want it for machines other than the 50 and 65 they might have to pay for further work by SDC. And changes or improvements may also bring charges.

CSC HAS SUPPORT CONTRACT FOR NEW MEDLARS VERSION

CSC has won a $2 million software supply and project management contract from the National Library of Medicine. It will bring the MEDLARS medical literature analysis and retrieval system into the third generation and provide extensive OLRT capabilities.

An initial version of MEDLARS II will be operational by mid-1969, says an NLM release, and an on-line version should be running by mid-'70. Progressive improvements will be made under the contract through 1971.

An IBM 360/50 will replace the present Honeywell 800-200 configuration. The new central complex will have an H-type (262K-byte) main core, and an auxiliary, low-speed 1-megabyte core, plus two data cells holding a total of 2 billion characters, 8 Mod 2314 discs with 200 million characters of additional storage, six tape units, and a 2703 communications controller. Seventy to 80 terminals within the NLM building will be linked to the central facility initially and, later, about 200 more will be added. The latter are intended to serve MEDLARS users throughout the country. The on-site terminals will consist of KSR 37 Teletypes, supplemented in several cases with Univac's Uniscope crt's.

The software contract includes development of a new data management system, COSMIS, plus conversion of MEDLARS' vast tape file to disc and data cell formats. This task is complicated by NLM's 93-character data set and by the need to use a different bit configuration. Several cataloging and bibliographic search programs are also included in the software contract.

MEDLARS II will provide for an integrated, automated system for the performance of all major functions of the library, reports Director Martin M. Cummings, M.D. Automated support and control will be provided from the time material is ordered from a publisher, through cataloging and indexing, to its appearance in a library publication or in response to a search request from an individual practitioner, scientist, or educator.

IEEE COMPUTER GROUP CONFERENCE FEATURES LSI

"LSI Will Impact You" was the theme of the Second Annual Computer Group Conference held June 25-27 at the International Hotel in Los Angeles, sponsored by the IEEE Computer Group. LSI, or large scale integration, is the technology of batch fabricating many interconnected circuits. This is an extension of present integrated circuit technology which employs batch processed silicon wafers which are then finely diced into chips less than one-tenth of an inch square, each chip having a few interconnected circuits.

According to Don Meier, conference chairman, 750 professionals were in attendance, including a few from Europe and Japan. There was little to distract the attendee from the technical substance of the conference. Although there was a room of displays, there was no general exhibits area in the manner of the JCC's. Dr. Harold Petersen of RAND, program chairman, planned single thread day sessions, with parallel "dig deeper" sessions in the evenings.

While the conference covered many aspects of LSI—device technology, trade-offs, computer-aided design, and machine organization—a theme that

am ne sia (am nē′zhə or am nē′zhiə) loss of memory due to a 10% voltage swing. *n.*

Raytheon Computer's 300 memory keeps right on reading and writing data reliably even when operating voltage and drive currents vary as much as ±10%. And over a full temperature range of 0°C to 50°C. The 300 is a 2½D 900 nanosecond core memory for general data systems use. ■ If your definition of memory is: high performance, high reliability, high capacity, and delivery in 60-90 days, see us. Raytheon Computer, 2700 So. Fairview St., Santa Ana, Calif. 92704. (714) 546-7160.

RAYTHEON

CIRCLE 44 ON READER CARD

became abundantly clear could be paraphrased as "LSI Memories Will Impact You Before Long." Session 3, chaired by Paul Low of IBM, was dedicated to the topic of LSI memories. It appears that all major semiconductor manufacturers, as well as some of the systems houses, have made significant progress in this area. Both bipolar and MOS implementation were discussed, with application to high speed scratchpad, large main memories, read-only memories, and, of course, serial memories. Papers described memories that ranged from one or two thousand bits per chip (Texas Instruments, General Instruments), to a few hundred bits per chip interconnected in a hybrid manner on a substrate (Fairchild, Bell Telephone Labs). Assessments by several speakers centered on 1970 or 1971 as the time at which LSI memories will be widely available at attractive prices.

A last-minute addition to the conference that drew 300 people on the last night of the conference was a session on the IBM 360 Model 85. As described by Don Gibson and Dr. W. L. Shevel, this newly announced computer contains a 16K byte semiconductor memory (the "cache") that operates at an 80 nanosecond cycle time. Performance and capacity tradeoffs were described in relation to the 85's main memory, these having been simulated in what may be the greatest effort in the industry to optimize performance between major system elements. The cache is a hybrid near-LSI memory, built up from 256-bit chips.

Another facet of LSI that was brought into focus by the conference was the high degree of interrelation between hardware and software. In session 4, Norman Kreuder of Burroughs warned the hardware community of their need to upgrade themselves and to interact more strongly with software people if they expect to contribute to the fourth generation of computers. That this might be important even sooner was evidenced by a talk in the following session by Stan Mazor of Fairchild Semiconductor. He is a programmer who decided to try his hand at logic design and found a great deal of applicability of conventional software techniques.

The discussion of custom LSI logic arrays was carried from the meeting rooms to the hallways, but a consensus viewpoint never evolved. The pessimists say the penny-a-gate circuit is still years away, and that custom second-level metallization is still a tough problem. The optimists pointed out that some of the toughest problems, like high speed automatic mask generation, are just being solved and the decks are now cleared for real action.

Session 6 brought together three industry experts—J. Presper Eckert of Univac, Brian Pollard of RCA, and Max Palevsky of SDS—to discuss LSI economics (see following story).

The luncheon speaker was Dr. Abe Zarem, a vp of Xerox, and a dynamic, colorful, and technically-qualified personality of national fame. He views the computer field as just about to begin its infancy, and suggested that computers will ultimately be a strong social force.

The Third Annual Computer Group Conference will be held in Minneapolis next summer.

COMPUTER EXPERTS FINGER LSI PRICE TAG AS OBSTACLE

The final day session of the Computer Group Conference of the IEEE brought together three pioneering industry experts—J. Presper Eckert of Univac, Brian Pollard of RCA, and Max Palevsky of SDS. The subject of the panel discussion, chaired by Gerhard L. Hollander of Hollander Associates, was the engineering and economic aspects of LSI in the next computer generation.

In general, the three were in accord that there will be no sudden, dramatic conversion to LSI because it is not economical at present and will not be for at least five years. In his opening remarks, Hollander said that the question no longer was "why LSI" but "whether LSI." Eckert answered in part that he thought LSI would be used over the long pull and that its impact on the design of computers will be great—as more hardware logic is put into the machines, the architecture will change. Palevsky disagreed with this, stating that the architecture of computers had changed little since the beginning and would continue to be essentially the same.

Palevsky further stated that aside from the expense of LSI components, the costly maintainability factor of such a system should be considered. How, he asked, does one disconnect in an LSI system? He broke down present hardware costs as 30% for componentry, 20% for frames, and the remainder for mounting and interconnect, and he cited the difficulty of achieving true modularity. He felt that it would be a long time before LSI could be economically justified in the logic of commercial machines, and that two far more important and immediate problems facing the industry are standardization and software. He recommended increased research and development in these areas.

Pollard refused to be labeled conservative (although at one point in the proceedings a questioner from the floor dubbed the panel "chicken") but thought the change to LSI should be cautious and evolutionary. He predicted that the major use of LSI would be in areas where the application required much repetition and logic simplicity. Otherwise, he said, the cost per gate will not be competitive because LSI will be difficult to debug.

In answer to questions from the floor as to whether the panelists would recommend LSI to their own companies for use in the fourth generation, Palevsky answered possibly in memory, Eckert thought it would be an added feature in certain cases, and Pollard could not give a positive yes. The consensus from the floor was that there are more things on heaven and earth, Horatio, and that LSI somehow would soon be put to work on a large scale. But Palevsky concluded by wondering how LSI costs in five years would compare with advanced magnetic systems now under development. Eckert and Pollard wondered with him.

CDC/CCC MERGER READY FOR STOCKHOLDERS' VOTE

Managements of Control Data and Commercial Credit Corp. (one of the largest independent financial companies in the country) have agreed to have CDC acquire CCC. Stockholders of both companies will vote on the proposal Aug. 15.

Should the acquisition become reality, the cash available from the finance company will let CDC accelerate its expansion plans: more leasing, faster establishment of a worldwide network of data centers equipped with CDC 6600's, and more support services.

Commercial Credit has other goodies, including personnel familiar with the computing business. A totally owned subsidiary, Computer Financial Corp., already has $75 million committed to computer leasing. Although CDC has its own leasing subsidiary, it is very small, and Computer Financial would greatly enhance leasing capabilities.

Another CCC subsidiary, formed at the turn of the year, is Central Information Processing Corp. CIPC is 60% owned by Commercial Credit and 40% by RCA. It has been formed to open

(Continued on p. 99)

Start learning CALL/360: BASIC after breakfast and you can share our computer before lunch.

You can now learn how to solve problems with a computer in about two hours. Because you instruct the computer from a typewriter terminal in simple English.

With CALL/360: BASIC, we've combined the power of a large-scale System/360, the simplicity of a new version of the BASIC time-sharing language originated at Dartmouth College, and the convenience of typewriter terminals.

To solve a problem, you communicate with the computer through the terminal in plain English and algebra. You get your answers in seconds. With up to 14 decimal point precision.

If you're a technical problem-solver using older calculating methods, or need faster turnaround than your company's central computer can provide, CALL/360: BASIC can free you for more productive work.

You can dial into the system—12 hours a day—right at your desk. The IBM typewriter terminal provides for easy data entry—as well as rapid delivery of your printout. You can also communicate with the system with either of two models of Teletype* terminals.

With CALL/360: BASIC you have a library of programs available. But the BASIC language is so easy to use you'll soon be writing your own. Your programs and data are stored in the computer, and you easily retrieve them with a password that identifies you as their qualified user.

CALL/360: BASIC starts at $100.00 a month, plus terminal and line charges. Send the coupon or call us for a demonstration and we'll show you how solving problems by computer is as easy as hunt-and-peck typing.

*Trademark of Teletype Corp.

805-B17

IBM Corporation
Information Marketing Dept.
112 East Post Road, White Plains, N.Y. 10601

Please send more information on CALL/360: BASIC.

Name_____

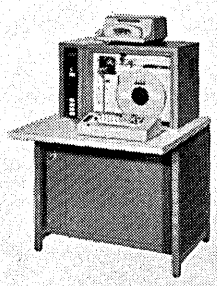
Title_____

Company_____

Address_____

City_____ **State**_____ **Zip**_____

IBM®



Your branch office is not only remote from the home office, it's remote from your home office computer. That means if your branch office needs hard copy reports, i.e. payroll or inventory information, it's days away. Conversely your computer never has the up-to-the-minute data from your branch offices it needs to serve you efficiently.

NCR has a solution. The 735 Magnetic Tape Encoder. We designed it to provide two-way electronic communication with other Magnetic Tape Encoders. The NCR Data Communicator transmits 1200 bits per second using a data subset over ordinary telephone lines. And up to 2400 bits per second over a private line between your branches and home office.

The 735 avoids using costly computer time for communications. The 735 gives you complete verification logic and, for hard copy capability in your branches, a high-speed printer can be added.

The 735-301 is freestanding and can perform normal tape encoding and verification when it's not communicating. During data preparation, it permits immediate data correction, deletion and shifting. Its mag tapes are compatible with any make of computer. And many other models provide additional capabilities, such as card and paper tape reading, as well as data communications.

The versatile 735-301 Data Communicator is only one solution to your data communications problem. Your NCR man can tell you about the others. Call him.

NCR

THE NATIONAL CASH REGISTER COMPANY, DAYTON, 45409 ®

The end of the remote branch office.

and operate 30 data centers using Spectra 70 equipment. Obviously, RCA would lose interest if CIPC comes under Control Data ownership, said Harold H. Hammer, vp finance for CDC, in a telephone interview.

"The financial company-computer maker combination is a natural," said Hammer, "for computer manufacturing is a very expensive business, and having a financial house is an added plus for the computer maker."

Commercial Credit will continue its operations under present management except that after the acquisition it would be a totally owned CDC subsidiary, according to Hammer.

CDC had previously explored acquiring CIT, another large financial firm. Commercial Credit had been the target for takeover by Loew's Theatres, a hotel and theater chain. And a lawsuit by Loew's to prevent the CDC merger was filed but soon dropped.

FIRST AUSTRALIA COMPUTER MAKER BEING ORGANIZED

The Australian public company which plans to become the first locally owned manufacturer of computers in Australia has been registered in Canberra, the national capital.

The new organization is Information Electronics Ltd., and has a nominal capital of $1 million. The company will begin production early next year of the IE 10,000 computer, based on the design of the Intergraphic computer which is being completed by a research team at the Univ. of New South Wales. The Intergraphic machine, the first computer of its kind, offers a new design, technology and development in the computer field.

At a later stage the company will produce other computers to its own design for the specialized requirements of Australian universities, government departments, commerce and industry.

Malcolm Macaulay, an American businessman and computer expert, will be managing director of Information Electronics. The remainder of the board of directors will compromise Australian businessmen.

Macaulay negotiated the sole world rights from Unisearch Ltd., the research and development company of the Univ. of New South Wales, to manufacture the IE 10,000 machine in Australia and market it commercially. He said the management was examining several sites for the new company, which already has secured strong financial backing; further capital is being arranged for future development.

Macaulay said that, based on a comparison of American and Australian computer trends, he believes that at least $250 million will be spent on purchasing computers in Australia in the next 10 years.

DRINK MIXERS, GARMENT COUNTERS, AND COMPUTERS

A new computer, selling for $15K and featuring an expandable 64K character random access memory, was introduced recently by K&M Electronics Co., Baltimore. This company is possibly the smallest cpu maker in the business—occupying 12K sq. ft. on the second floor of an old loft building in Baltimore's clothing district. K&M is also one of the nation's most diversified computer makers. It has two other products—a device that mixes and dispenses liquor by the drink automatically for bars and country clubs, and a system that clothing manufacturers use to count their garment inventories. The garments, stored on ordinary hangars, are tallied by a mobile optical scanner.

The KM-220 computer is designed primarily for unit record users whose volumes can't justify even the smaller models of the big computers. Applications include accounts payable, accounts receivable, inventory and other common bookkeeping chores, as well as scientific calculations. The system has a data link which permits it to operate as a remote peripheral to larger systems.

Programs are stored on punched tape and/or 80-step program cards, which are read directly as the data is processed. The random access memory can also hold program instructions.

This unit, developed by McGraw-Edison and improved by K&M, consists of a 6-in.-wide continuous roll of mag tape. Records are semi-automatically selected by the operator, in a maximum of 5 secs and an average of 3, according to the company. They also can be automatically selected through keyboard entry of an identifying code.

The memory is separated into 1,000 records, each containing a maximum of eight 8-character fields. Up to "six or seven" additional memory modules, priced at $1.5K each, can be added. The memory unit has an automatic record advance feature which allows information to be dumped or updated automatically.

Data can be read in from either punched paper tape or cards, or, through the data link, from another computer system. The basic data transfer rate into or out of the cpu is 10 characters per second.

The KM-220 operates internally in ASCII format, which should enhance its suitability for federal government applications; ASCII is now a federal communications code standard. Only one other computer, NCR's Century, is designed to process ASCII formated data directly.

Within the KM-220 arithmetic unit are four storage registers, two accumulators and three working registers. It will perform the following single command functions: addition, subtraction, multiplication, division, square root, squares, natural logs and anti-logs. Data moves in and out of the cpu in 13-bit words containing 8 bits of data, a start bit, two stop bits, decimal point and sign notation.

Output consists typically of continuous forms or tabulations printed by a Mod 33 or 35 KSR Teletype on an 8-in.-wide roll. Punched card and punched paper tape outputs are also available.

The basic configuration includes the cpu, one module of random access memory, Teletype, two paper tape readers, paper tape punch, and data link. Optional software features include conditional branching, subroutines, looping, and comparison logic.

Programs are written in a proprietary symbolic language.

K&M's president is Stephen R. Krause, who developed the system in his grandmother's basement. Krause, 30 years old, is a self-taught electronics engineer who previously worked in his father's uniform manufacturing business. K&M's marketing vp is Irwin E. Granville; he previously held marketing management jobs with ITT Data Services and with the Service Bureau Corporation.

K&M became a corporation in 1964, when 100 investors subscribed $3300 apiece. The company went public in 1966. Its stock initially sold for $2 a share, and now, according to Granville, is worth $5-$6. About 1 million shares are currently outstanding; they're in the hands of about 3K stockholders.

No firm orders have been signed yet for the KM-220, but the company's two-man sales force is reported to be "seriously negotiating" with several prospects, including a large pharmaceutical firm where K&M hopes to tie its midget computer into an extensive IBM system.

The company plans to offer the KM-220 on a rental basis in the foreseeable future, but terms have not been worked out yet. For information:

(Continued on p. 100)

CIRCLE 240 ON READER CARD

news briefs

MOHAWK EXPANDS LINE WITH THREE MORE FIRMS

Mohawk Data Sciences Corp. has teamed up with three more manufacturing firms. Further adding to MDS capabilities in data acquisition and conversion is the purchase of Ohr-Tronics, Inc., and a marketing agreement with Colorado Instruments, Inc. And its first entry into the supplies business is accomplished through the buying of inked ribbon maker H. M. Storms Co., Brooklyn, New York.

The acquisitions involve $10 million (July 2 market value) in MDS stock. Via these three agreements and increased sales, MDS expects revenue to jump $50 million to $55 million for fiscal '68 (ending Aug. 1) and to over $90 million for '69.

Ohr-Tronics, formed in '62 by Nathan Ohrbach, founder of Ohrbach Department Stores, makes System 80 a line which moves MDS more strongly into the retailing market. The equipment prints, perforates, reads and converts tag data to paper tape. The Data-Recorder will be added for paper tape to mag tape conversion. Ohr-Tronics also makes paper tape readers and punches that range from $200 to $2000, below the higher performance models ($2000 to $9000) MDS provides through its acquisition of Soroban. H. M. Storms' line emphasizes high-speed computer ribbons. These two companies, both small and privately held, add about 130 people to the MDS staff.

The marketing agreement with Colorado Instruments, Inc., Broomfield, Colo., will allow MDS to use stations and multiplexing equipment in conjunction with the recorder, making up the 4400 source data gathering system.

The main CII input unit is the C-Dek announced back in 1963. It contains an 80-column card reader and numeric keyboard used primarily in entry of job data at plant stations. Up to 10 logic programs, tailormade for specific applications, can be wired into the unit. A badge reader may be integrated or packaged separately for employee attendance data. The multiplexor, with a data transfer rate of 10,000 characters/second, can handle up to 32 input stations. In the 4400 the multiplexor would transmit source data to the recorder for writing on magnetic tape. A typical system would consist of 12 job data stations, four attendance recorders, a multiplexor, and data recorder. Cost: $88,000 for purchase or $1,600 month.

The MDS agreement calls for a purchase of not less than $4 million worth of CII equipment a year after the first year. (That is a list price; MDS will purchase with discount.) This means a considerable hike in the revenues of CII, which has not grossed over a million a year for these systems since starting in business in 1961. CII has also developed products for other manufacturers.

NEW TIME-SHARING FIRM QUIETLY SLIPS INTO MARKET

In the 1968 annual report of a textile lamination and bonding firm is the announcement of plans for a time-sharing service bureau.

In July, E.L.I. Computer Time-Sharing, Inc., a subsidiary of E.L.I. Industries, Inc., began operation under the leadership of Len Kreuter, formerly Burroughs' corporate product manager for its data center program. Although the equipment has not been selected, the E. Paterson, N.J., firm intends to be up and running before the end of '68.

The first application area will be mathematical time-sharing, a la Com-Share, Tymshare, etc., and ultimately proprietary packages will be developed for t-s use by specific industries. The first installation will be in the New York area. The firm is also talking to various universities about either locating equipment on the university site and sharing E.L.I. facilities or using the school's equipment.

Other principals of the firm are ex-University Computing Corp. salesman Frank Feitz (director of operations) and Pal Schmelzer (director of technical services), who helped develop QUIKTRAN at IBM. E.L.I. Industries which is providing the financing, also owns E.L.I. Computer Systems, Inc., a New York consulting, systems analysis, and programming firm, which began operations in March.

ON-LINE EMPLOYMENT SERVICE DEVELOPED BY ISI

A nationwide on-line computer service which will match the unemployed in the ghettos with job opportunities is being offered commercially by Information Science, Inc., New City, New York. The firm's JOBSystem, as the service is called, has the support of the National Association of Manufacturers.

Essentially, JOBSystem works in this way. A civil rights or other organization, like CORE, or NAACP, in a city or state can contract with ISI to sponsor JOBSystem in that area. Since job skills differ from area to area, a special vocabulary of skills must be developed. Thus, ISI will take narrative resumes from the first 300-500 applicants and develop the skills list for use in subsequent application forms.

The sponsoring organization will pay ISI $10/individual for the initial group of applicants. The next step is printing brochures (instructions on how to fill out the form) and the forms, and the keypunching of these forms for computer input. If ISI provides these services, the cost per individual after the first 300-500 applicants is $4.30/individual. If the sponsor obtains them elsewhere, the ISI fee is $2; this includes input, storage, and printouts of the resume for the applicant and sponsor.

Since Telex and TWX are already used in thousands of locations, ISI will provide the on-line service over these networks. An employer will be able to input job requirements on the terminal and receive the resumes of applicants matching them; or the firm may go to the offices of the sponsoring organization, which will also have one of these terminals. The costs to the employer will be $7.20 for the file search, $3 for each resume, and the transmission charge from the ISI system (360/30) in New City to the remote terminal. ISI estimates that the employer, who usually pays between $250 and $900 to find an employee for lower level jobs, will achieve a hire for under $50 through the service.

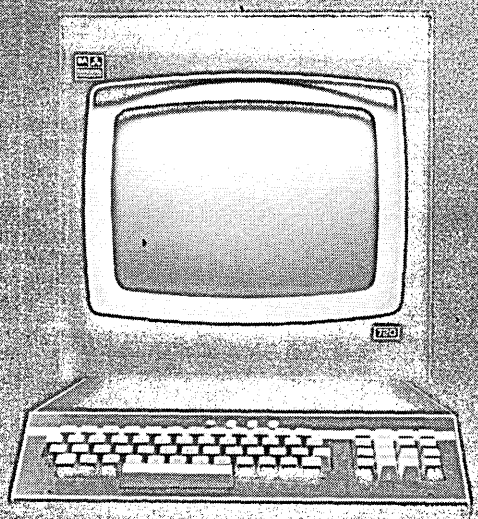
JOBSystem came about via a feasibility study the NAM asked ISI to do in Indianapolis early in 1966. (ISI already has its PICS matching system for professional-level personnel.) Using data on 600 unemployed people in the area, ISI simulated the matching of these personnel with entry-level jobs and training opportunities. Based on this, the non-profit North Carolina Manpower Development Corp., with Office of Economic Opportunity funds, contracted with ISI to develop a pilot system for Greensboro, N.C.

After progam development, collection of skills data on applicants, and experimentation with employment tests, the corporation tested the system with local employers. About 140 job descriptions were entered and matched against 600 resumes, several applicants being hired. Now the Manpower Development Corp. is expanding the system to state-wide operation and is trying to decide if ISI or another organization will run the service. The programs ISI developed for the North Carolina experiment are OEO-owned.

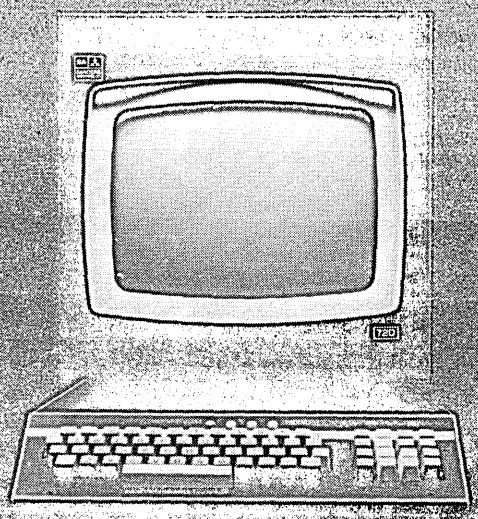
CDC GETS BIGGEST AUSSIE COMMERCIAL COMPUTER ORDER

Australia's steel giant, the Broken Hill Proprietary Co. Ltd., has placed the

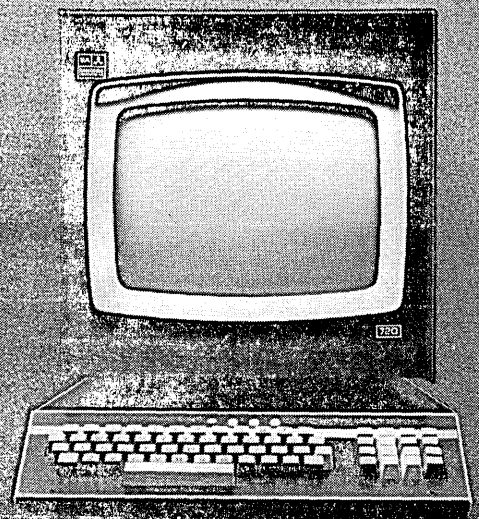
This data display
can produce hard copy.



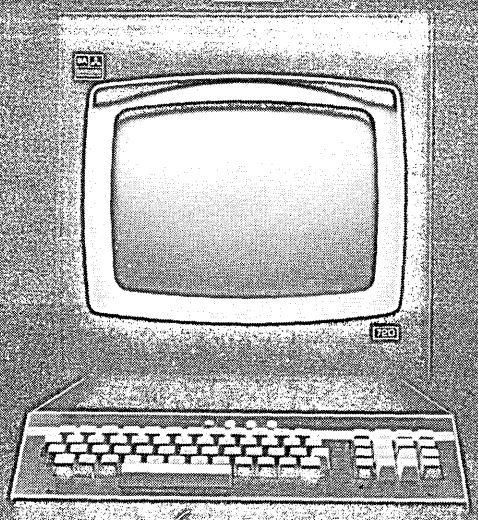
This data display punches
and reads paper tape.



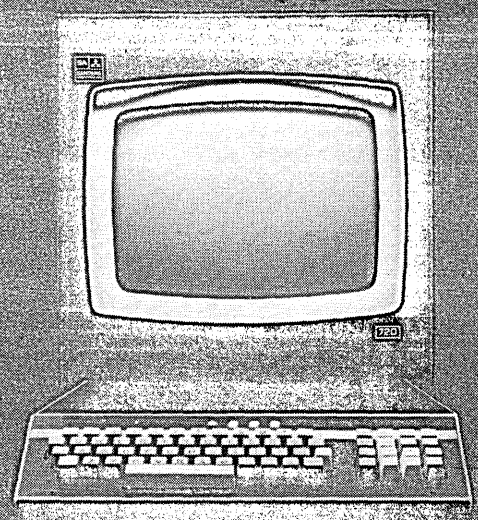
This data display
displays 84 characters per line.



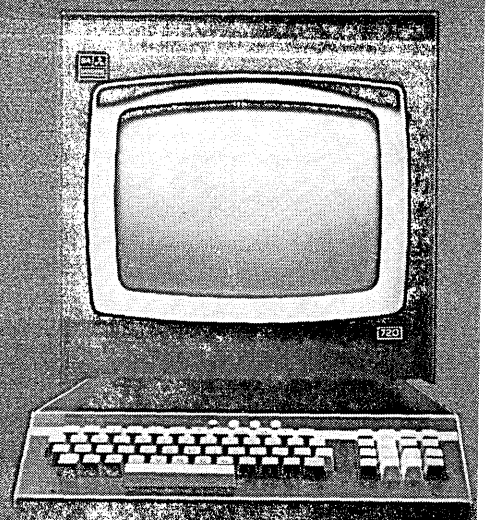
This data display
utilizes the entire screen.



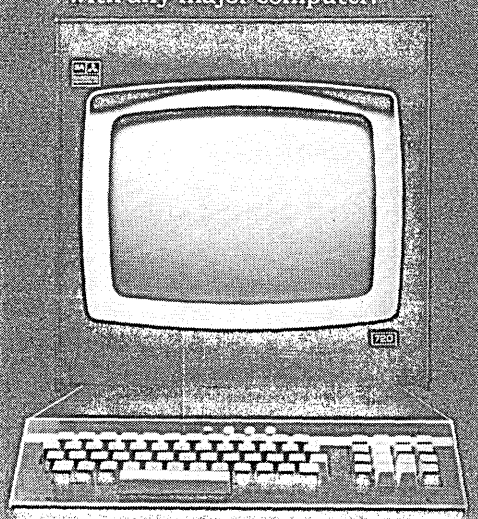
This data display has
maximum editing capabilities.



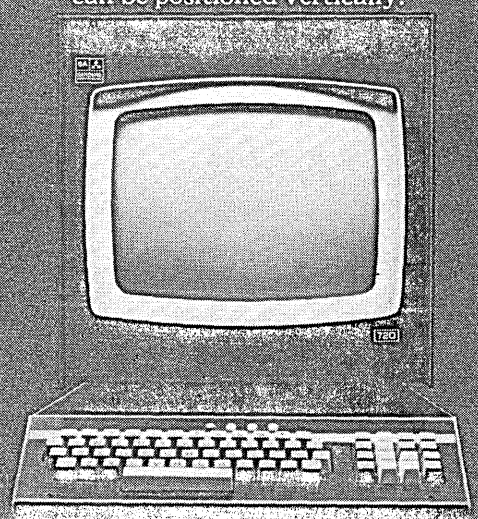
This data display has
complete format flexibility.



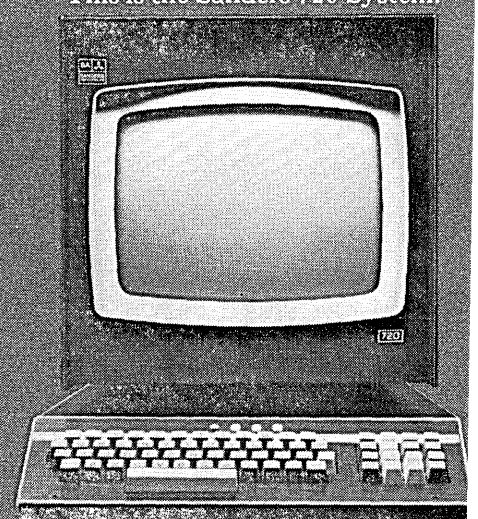
This data display works
with any major computer.



This data display screen
can be positioned vertically.



This is the Sanders 720 System.



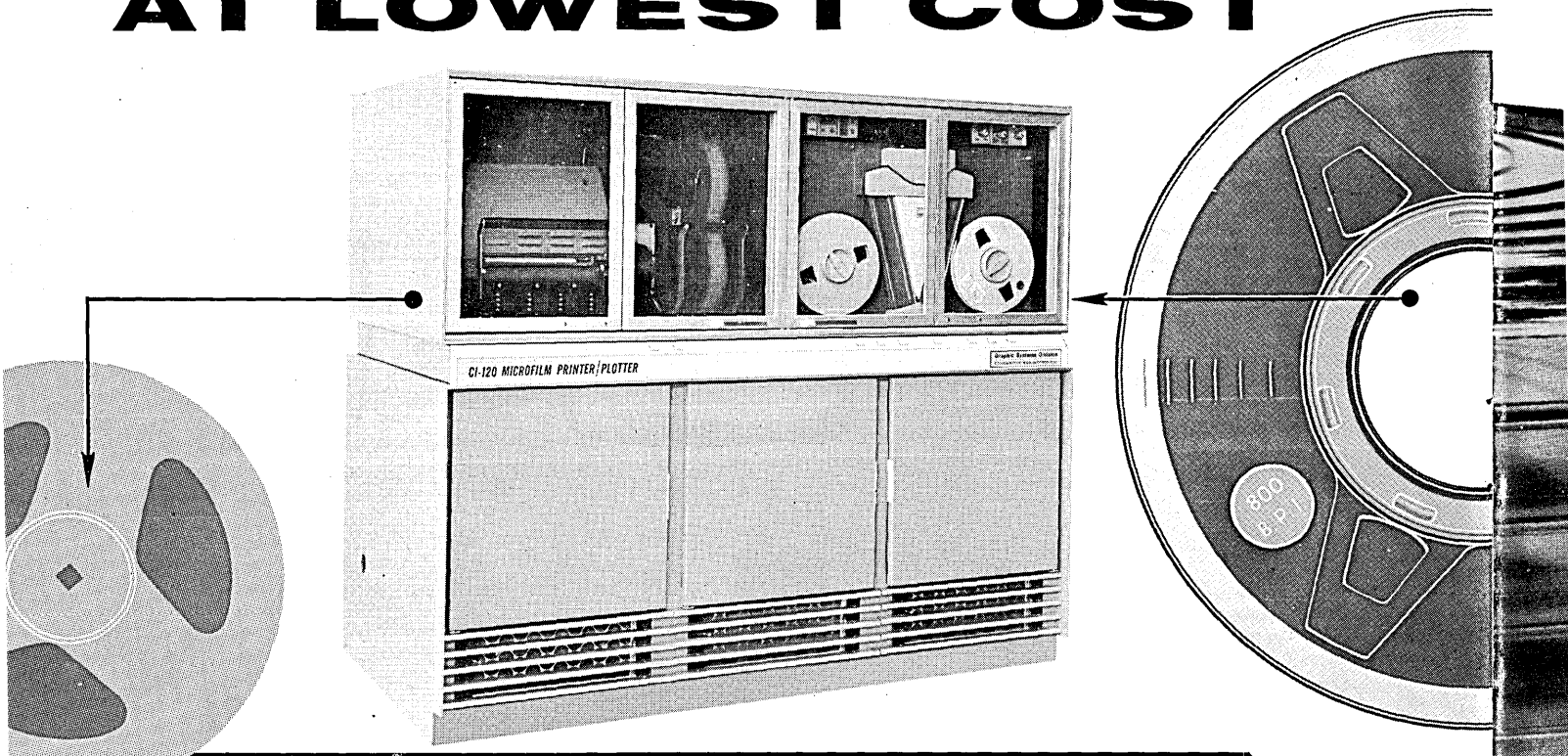
The logical choice in data displays.

Sanders: NASHUA, N.H., NEW YORK, N.Y., WASHINGTON, D.C., CHICAGO, ILL., LOS ANGELES, CALIF., HOUSTON, TEX., ATLANTA, GA., TORONTO, ONT., CAN., PHILADELPHIA, PA., DETROIT, MICH., MIAMI, FLA., NEW ORLEANS, LA., MINNEAPOLIS, MINN., DALLAS, TEX., SAN FRANCISCO, CAL.

CIRCLE 46 ON READER CARD

MAG TAPE TO MICROFILM

AT LOWEST COST



LOWEST COST — FASTEST THRUPUT — SIMPLEST OPERATION — PROVEN SOFTWARE

CI-120 MICROFILM PRINTER/PLOTTER provides independent off-line operation; 120 pages per minute; 5 film formats from 16mm to 8½ inches; functions include symbol plotting, axis and vector drawing; generates up to 192 characters; quick-look copies in 4 seconds; 7 or 9 track; print tape compatibility; extensive software available.

Model CI-180 MICROFILM PRINTER is available for applications requiring high speed printing.

REQUEST PRODUCT-LINE LITERATURE

Computer Industries Inc.

Graphic Systems Division
PIONEERS IN COMPUTER GRAPHICS
14761 Califa St., Van Nuys, California

CIRCLE 47 ON READER CARD

largest nongovernment order in Australia with Control Data Aust. Pty. Ltd.

BHP will lease four 3300 computers, to be used for steel order processing, scheduling of rolling mills, invoicing and inventory control, quality control, and R&D. They will be installed in the third quarter of 1969.

CDC was chosen after an 18-month study. Because of the lease basis, the exact worth of the contract is hard to determine, but industry observers say that a 3300 unit usually costs about $1 million. CDC was already well established in Australia with substantial government orders from the defense establishment and the Bureau of Census and Statistics.

MICHIGAN POLICE GO ON-LINE, STUDY VOICEPRINTS

The Michigan State Police, East Lansing, went on-line in early July to the NCIC (National Crime Information Network) with the hookup of the LEIN (Law Enforcement Information Network) B5500 to the NCIC's 360/40 in Washington, D. C. This brings to 42 the number of states connected to NCIC, some through computers and others via Teletypes.

The move allows any of the 140 TTY 28's (sheriffs, city police, etc.) in the Michigan LEIN system to make one query for both state and nationwide information.

LEIN files contain information on suspects by name, alias, fingerprints, date of birth, physical characteristics, and vehicle information. Vehicle information search at the state level expanded with the connection made in early August to the B5500 at the Michigan Secretary of State's office. The widened base will allow more thorough search by registration, driver license or car license, although it will be 1969 before the complete files are automated at the Secretary of State's end.

The Michigan Police are also working on voiceprints and have been able to identify five suspects this way since the department received a "Voiceprinter" spectograph last December. In one instance the police made a negative identification by showing that a young suspect could not have been the person making obscene telephone calls.

There have been no cases taken to court, so it is not known whether voiceprints would be admissible evidence in Michigan courts. However, Lawrence Kersta, who originated the analysis technique for voiceprints, has testified on such voice identification in five different jurisdictions and his evidence was admitted.

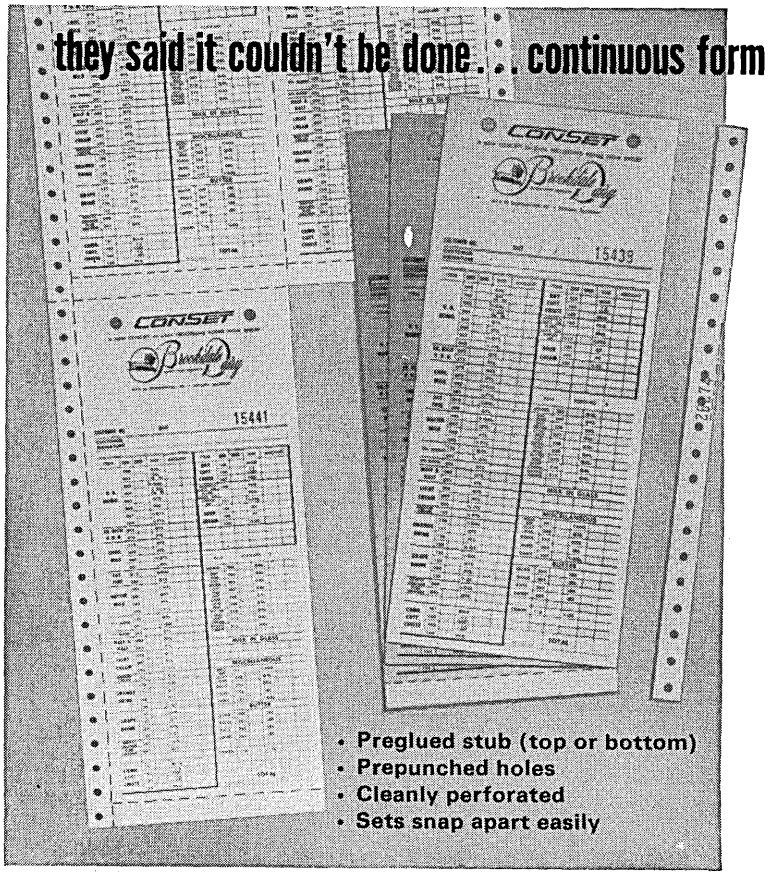
The police have become convinced that voiceprints could have an important role in law enforcement. But there are a number of questionable areas in the legalities of voiceprint use, so they have suggested that a study of this entire area be undertaken. In July the Dept. of Justice launched a three-year, half-million-dollar study. The first phase will operate under a $146K grant to the MSP, as prime contractor, and take one year. Subcontractors are Michigan State Univ. and Stanford Research Institute.

MSU's department of Audiology and Speech Science will examine such spectographs through 40,000 recordings involving 260 talkers recording at spaced time intervals and under varying conditions. Data gathered will be processed at MSU's Computing Lab, with Dr. Oscar Tosi as principal investigator and coordinator.

MSU's School of Police Administration will take the results of voiceprint experiments and see how voiceprints can be applied to law enforcement. If

(Continued on p. 106)

they said it couldn't be done... continuous form sets with preglued top or bottom stubs



Shelby did it with...

CONSET™

CONSET . . . a unique continuous form that features snap-apart carbonless sets with preglued top or bottom set stubs (not at the sides as with most continuous designs). ■ CONSET provides easy horizontal reading... fast, accurate for key punching. ■ CONSET fits most sales binders . . . handy for field use. ■ CONSET is ideal for re-entries... feeds easily into accounting machines or typewriters. ■ Sizes and styles, 2 or 3 forms wide, for every data printer.

CONSET™
another innovation by Shelby

FOR DEMONSTRATION OR SAMPLES...
Call your local Shelby man—
he's listed in the yellow pages
QUALITY FORMS SINCE 1904

gaf **SHELBY BUSINESS FORMS, INC.**

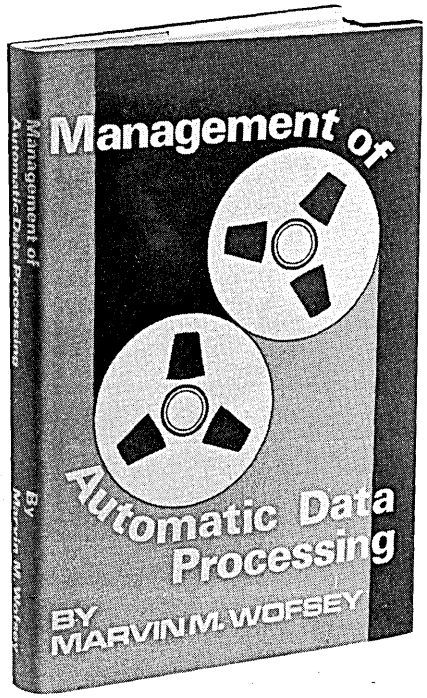
A Subsidiary of G A F Corporation
Shelby, Ohio 44875

A-2107

CIRCLE 48 ON READER CARD

Why are we so happy?

Because **THOMPSON** now offers a new and outstanding publication in the EDP field.



Management of Automatic Data Processing Systems

215 pp.
illus. 6 x 9
$12.00

Computer equipment and computer programming language have undergone tremendous improvement through the years—but little has been done on how to manage computers and computer-based systems. This publication has done just this. A glance at the chapter titles makes this clear: Objectives of Data Processing, Organization, Selection of Personnel, Systems Design, External Relationships, Training, Costs, Review and Evaluation, and Outlook.

R. C. Elliot, Executive Director, Data Processing Management, says: "Readers may not agree with all Dr. Wofsey's definitions, ideas, methods, and suggestions. However, if they are prudent, they will try the recommendations, evaluate the results, and modify them to fit particular situations."

OTHER THOMPSON PUBLICATIONS AVAILABLE

Data/Information Availability
edited by Ralph I. Cole
183 pages, 6x9 illus. $8.50

Faith, Hope and Parity
edited by Jack Moshman
177 pages, 6x9 illus. $5.50

Computer Graphics
An informatics inc publication
292 pages, 6x9 illus. $12.00

Proceedings of 21st National ACM Conference
545 pages, 8½x11, illus. $14.40

Proceedings of 22nd National ACM Conference
604 pages, 8½x11, illus. $15.50

Annals of Reliability and Maintainability
984 pages, 8½x11, illus. $25.00

AFIPS

Proceedings of AFIPS Spring Joint Computer Conference, 1967, Volume 30
795 pages, 8½x11, illus. $20.20

Proceedings of AFIPS Fall Joint Computer Conference, 1967, Volume 31
832 pages, 8½x11, illus. $20.70

Information Retrieval: A Critical View
edited by George Schecter
282 pages, 6x9, illus. $11.00

Computers: Their Impact on Society Part II, 1965 Fall Joint Computer Conference
200 pages, 8½x11, illus. $6.00

Numerical Analysis
edited by J. Walsh
212 pages, 6x9, illus. $12.00

Computers and Pattern Recognition
by A. G. Arkadev and E. M. Braverman
115 pages, 5½x7½, illus. $5.50

Algebraic Number Theory
edited by J. W. S. Cassels and A. Frohlich
366 pages, 6x9, illus. $16.00

Information System Science and Technology
edited by Donald E. Walker
410 pages, 8½x11, illus. $12.75

Electronic Handling of Information
edited by Allen Kent
300 pages, 6x9, illus. $10.00

Information Retrieval Among Examining Patent Offices
edited by Harold Pfeffer
606 pages, 6x9, illus. $30.00

Law Enforcement Science and Technology
edited by S. A. Yefsky
985 pages, 8½x11, illus. $35.00

Proceedings of the American Documentation Institute, Volume 4
310 pages, 8½x11, illus. $7.50

The Transition to On-Line Computing
An informatics inc publication
edited by Fred Gruenberger
232 pages, 6x9, illus. $9.00

Decisions from Data
A BEMA publication
262 pages, 6x9, illus. $7.25

Office Machines Systems Devices
A BEMA publication
196 pages, 6x9, illus. $6.00

Developing the Total Office Environment
A BEMA publication
120 pages, 6x9, illus. $4.75

Functional Analysis
edited by Bernard R. Gelbaum
247 pages, 6x9, illus. $15.00

ORDER THESE TIMELY PUBLICATIONS TODAY!

Thompson Book Company — National Press Building, Washington, D. C. 20004

Please send me.....copies of.....

Name.....

Address.....

City.....State.....Zip.....

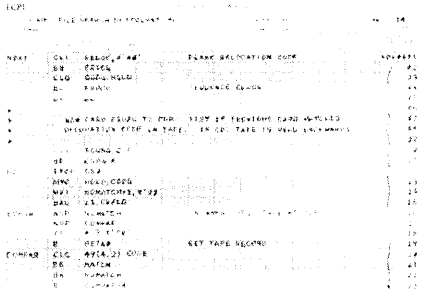
( ) Check
( ) Cash
( ) Money Order
Total.....

CIRCLE 76 ON READER CARD

By the time an ECPI student writes 21 programs like this, you know [illegible] pretty well de-bugged.

You know that it takes lots of hard work and hands-on experience to become a skilled programmer. And since we know it too, that's exactly what an ECPI student gets. If he can take it.

We run the toughest obstacle course in the business because we know you need programmers who've been toughened the hard way. So when you interview an ECPI graduate, you know he's been over the hurdles. He's sweated through hundreds of hours of programming classes and several hundred more of homework. He's struggled with 5



rugged exams during the life of the course, and then passed a gruelling three-hour final.

But we know it takes more than just the best textbooks to learn programming. So we make sure our students get the practical experience they need. We make them write 21 programs in third-generation languages. And then give them [illegible] generation equipment to verify what they've written.

That's a pretty tough test for even a veteran. But the student who gets through it has got something going for him.

Because by the time he's done, the knowledge is in. And the bugs are out.

1905 Electronic Computer Programming Institute, Empire State Building, N.Y., N.Y.

ECPI ELECTRONIC COMPUTER PROGRAMMING INSTITUTE

The toughest obstacle course in the business.

CIRCLE 50 ON READER CARD

proved feasible, the school will write a guide for other law enforcement agencies in the use of such prints.

The third subcontractor is Stanford Research Institute, which will evaluate the state of the art and possible equipment.

The voiceprint analysis technique was developed by Kersta while he was at Bell Labs. (He left in April, 1966, to form Voiceprint Laboratories, Somerville, N. J.). Speech is recorded on magnetic tape and translated by spectograph into a three-dimensional pattern. The 40 possible sounds in the English language are expressed in a variety of energy measures by each individual; this variation accounts for the uniqueness of each voiceprint.

Kersta thinks there is a large field for voiceprints in check cashing and credit card identification. He will serve as consultant to the study. Another field of sound identification in which he believes his techniques would be useful is in the medical area. He has worked with physiologists in body sounds, especially in the heart sounds.

The Voiceprinter work has been largely in the 3500 cycle range, the range transmitted over the telephone, although the Voiceprinter can be used in up to the 7000 cycle range. They see possible use of the wider range with recorders in supermarkets and banks that could be turned on at the threat of a holdup.

RUSSIA IN MACHINE-DRIVEN MUSIC RACE

According to a recent article by I. Gutchin in the newspaper *Moscow News* (Russia), the Ural-2 electronic computer has composed music from programs compiled by Rudolf Zaripov, a Soviet mathematician, that is equal to or better than that turned out by human tunesmiths. In an experiment, eight machine-composed songs and eight melodies by well-known Soviet composers were evaluated by "20 film workers with higher education" who did not know the purpose of the experiment or the sources of the songs. The machine, on a scale from "bad" to "excellent," pleased its listeners slightly more on the average than did the mortal composers, and dominated the "excellent" category by a score of 22 to 9.

The article states that most people cannot rid themselves of the influence of the artist's name in responding to the art he creates. They want to feel "the artist's soul, his emotions, life story and so on." Gutchin contends that the emotional state of the composer when he wrote the work is not important, only the hearer's feelings as he listens. Thus he reasons that arguments against mechanical creativity can be scrapped. He acknowledges that output of this sort can only be an imitation of a work of a certain genre, but if it finds its own audience, whose artistic taste develops as it listens, then this music should be granted the same recognition as that composed by humans.

Because only simple forms of musical creation were modeled, Gutchin does not contend that the computer could produce sophisticated compositions that were better than man's, but he thinks the experiment "allows us to hope that in the future the machine will be able to help man in his artistic activities."

It would be especially helpful to know Rudolf Zaripov's soul, his life story and his emotional state when he programmed his music.

NEW VERSION OF 360/20 TO BE AVAILABLE IN '69

IBM has announced a more powerful version of the 360/20, with twice the storage capacity and three times the internal speed of the original, at prices approximately 3-8% higher.

The new computer is available with five memory capacities ranging from 8K to 32K bytes of one character or two decimal digits with a cycle time of two usec for two bytes of data. Up to four 2311 disc storage drives can be attached to provide a total of 21.6 million bytes of direct access storage. The machine leases for around $3.5K monthly and can be purchased for from $165K to $180K. Deliveries are scheduled to begin in the second quarter of 1969.

"LESS-CHECK" LEADER STARTS NEW COMPANY

Dale Reistad, the American Bankers Association drum-beater for the "less-check society," has resigned his position as director of the ABA Dept. of Automation to form a consulting firm which hopes to help implement the concept. The New York-based Payment Systems, Inc., getting underway this month, will provide consulting and educational services to any organization involved in payment systems —from the retail store and bank to government agencies like the Internal Revenue Service and the U.S. Post Office.

Reistad, who was also ABA's deputy manager, says PSI will handle three different types of systems: the input payment system, which involves such items as receivables, taxes, and revolving credit; the output system for such areas as large payrolls, dividends, welfare checks; and the operating system, as represented by money-movers like banks, other financial institutions, and the post office. While the main focus of the staff will be the automated on-line system as envisioned in the "less-check" concept, the Reistad group will offer aid in improving any payment system—manual or automated.

Under most contracts PSI will do an overview study of the system, after which the client's "team" will come to the New York facility for two to three weeks of education by staff and outside specialists. And as the client moves into implementation, consulting will be available on retainer. The PSI staff now has six consultants, primarily from the banking area, and will expand to 12 by next summer. Reistad noted he already has about six contracts in the offing. A London office is also planned.

LIBRARY OF CONGRESS WILL OFFER MAG TAPE CATALOGS

The Library of Congress plans to offer a computerized cataloging service on a regular basis beginning next October. The system is ultimately intended to encompass most of the nation's libraries.

Catalog data will be recorded on mag tape and sold to subscribing libraries; they will then convert the data automatically into catalog cards. The tapes will generate several other kinds of records, plus specialized bibliographies. Most of this work now must be done manually, and some of it isn't being done at all as a result.

L/C catalog tapes will sell for $600/year. The subscribing library will receive one tape per week—containing about 1500 records—for 50 weeks. Seven- and 9-track tape formats are to be offered—with densities of 556 and 800 bpi, respectively. It is anticipated that 100 libraries or library centers will subscribe the first year. Many of them will prepare cards, and perform related chores, for libraries in their areas. University library centers in Ohio and New York are reportedly planning to do this work at least partly on-line.

The new system is the final phase of Project MARC, which was launched about two years ago by the Library of Congress and 16 participating libraries. This pilot effort, besides demonstrating the feasibility of the basic idea, evolved the ASCII code format which will be used, beginning next October, to record catalog data on tape. Last June, the Library of Congress, National Library of Medicine,

(Continued on p. 108)

Have you lost your memory lately?

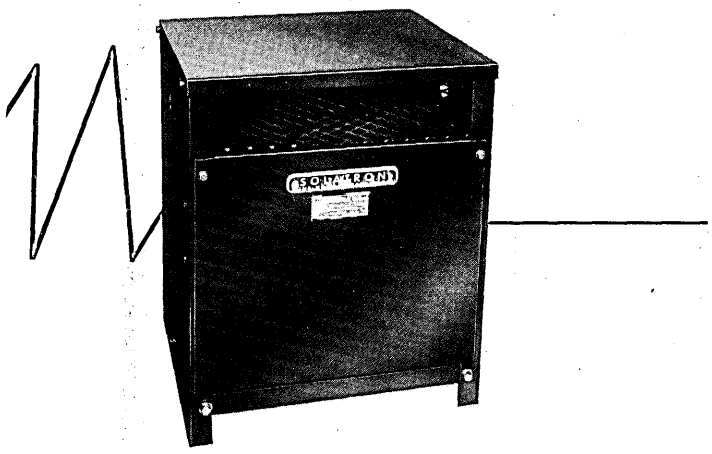
. . . Or perhaps you've experienced digit drops . . . parity loss. These problems are common to EDP equipment exposed to input voltage dips. Conversely a sudden surge of voltage can damage components and printed circuit cards. Either way, computer down time is costly! You can't afford voltage fluctuation problems.

You're protected against these problems if your EDP equipment is protected with Solatron® Line Voltage Regulators.

Solatron® Regulators—designed for EDP equipment—protect by maintaining voltage input within ±0.5% for line changes. Should a sudden dip or surge occur, Solatron® Regulators begin correction in the first half cycle and complete regulation within 1/5 second.

Solatron® Line Voltage Regulators are available for any EDP installation, central processor or peripheral equipment.

If you've lost your memory lately, why not call your analyst . . . Sola Electric's Computer Regulation Analyst, Mr. Carl L. Love. Call 312-439-2800, Ext. 248 or write: SOLA ELECTRIC, 1717 Busse Road, Elk Grove Village, Ill. 60007.



SUPPLIERS OF CONFIDENCE
TO THE INDUSTRIES
WE SERVE

SOLA ELECTRIC

DIVISION OF SOLA BASIC INDUSTRIES

IN CANADA: SOLA BASIC LIMITED, 377 EVANS AVENUE, TORONTO 18, ONTARIO

OTHER DIVISIONS: ANCHOR ELECTRIC • ENGINEERED CERAMICS • HEVI-DUTY ELECTRIC • LINDBERG HEVI-DUTY • NELSON ELECTRIC • SIERRA ELECTRIC

CIRCLE 51 ON READER CARD

and National Agricultural Library adopted the new MARC II format as a standard. They also adopted standard catalog data input specifications. All three libraries are, or soon will be, producing this information in machine-readable form. Standardization should enable the three to exchange records, and to serve outlying libraries jointly.

Programs to convert the new L/C tapes into cards and related outputs on a 360/30 have already been developed by the library as part of the pilot project. These programs are to be distributed through SHARE. Users with different equipment will have to do their own programming or obtain it from other sources. One participant in Project MARC, the Georgia Tech library, had a Burroughs 5500; the others used 8K 1401's or 360/30's.

The American Library Association is reportedly discussing ways for MARC users to exchange programs and programming ideas. Meanwhile, at least one publisher, Science Press, Ephrata, Pa., is offering libraries a periodically updated book catalog prepared from MARC tapes.

Besides book catalogs and catalog cards, the L/C tapes will enable libraries to prepare book labels, card pockets, accession lists, and purchase records. Bibliographies should be a particularly valuable output. For example, Harvard Univ., one of the pilot project participants, has assembled medical and religious bibliographic lists from L/C catalog tapes.

TYPEWRITER NEEDS TAB

With a grant from Kansas Univ.'s general research fund and support from the university's computer center, Carl Leban, ass't. professor of oriental languages and literatures, has invented the first true Chinese typewriter. Well, not a typewriter, exactly, but a system called SINCO (Synthetic Index for Chinese Orthography), which contains a set of 36 elements that can be assembled to form all Chinese characters. When the machine is actually built, it will be called a SINCoder, but thus far, interest in such a project seems to be lacking.

Leban's work on his typewriter began five years ago when he discovered there were no automatic methods to research his dissertation on Chinese history and that there was scanty knowledge in the western world of Chinese literature. So, he invented his system and two KU student programmers succeeded in simulating the typewriter with a digital computer and an incremental plotter.

Leban maintains that the same machine could write Japanese and Korean, and could improve international communications, but he is having trouble finding financing. "It makes everything available to us in Chinese," he said, "that is now available to us in English."

INTERNATIONAL SYSTEMS MEETING IN ST. LOUIS

Sponsored by the Systems and Procedures Assn., the 1968 International Systems Meeting will be held Oct. 20-23 in St. Louis, and 2,500 management systems and data processing people from the U.S. are expected to attend.

Forty seminars are scheduled on topics divided into three main sections: management, technical, and new developments, and speakers include some of the top authorities in the systems field and edp. Among the seminars are the following subjects and speakers: "Information Retrieval for Internal Reporting," George R. Trimble, Jr., Computer Usage Development Corp.; "Systems Investigation —A Prelude to Systems Design," Robert B. Parsons, Jr., Computer Sciences, Eastern Air Lines; "Planning Systems Conversion," Robert L. Harmon, Robert C. Aubuchon, and Donald C. Mengerson, McDonnell Automation Co.; "Systems Documentation and Reporting," C. P. Lecht, Advanced Computer Techniques; "The Total Systems Concept—Near or Far?," James G. Rude, Pillsbury Management Systems Co.; and "Defining Management Information Requirements," Robert G. Stevens, director of banking services with Touche, Ross, Bailey & Smart.

NEW FIRM HAND-HOLDS ON-LINE EXECUTIVES

Helping the harried executive and manager use the computer to his personal advantage is the basic philosophy of a new firm recently incorporated by Richard Sprague, formerly head of the Advanced Business Systems Dept. of Touche, Ross, Bailey & Smart. Personal Data Systems, Inc., temporarily headquartered in Hartsdale, N.Y., will offer consulting, educational, and on-line data services to top-level management.

Sprague complains that management information systems and the like are being developed from the bottom up, without sufficient attention being given to the information needs of the executives. PDS will not only help the executive get the right files from the corporate data base, using an on-line terminal, but will also help him set up personal files in either the corporation's computer or a PDS-supplied system. (PDS plans to both rent time for this service and install its own system.)

In addition to this information retrieval, PDS will also obtain or provide such office services for the client as on-line text editing (for example, IBM's Datatext). Where necessary, Sprague will provide the terminals, communications language, and other software, as well.

NEW HOPE FOR OWNERS OF LOST LUGGAGE

Computers are at last tackling the thorny problems of everyday life . . . like the winter clothes you shipped to Duluth that were finally recovered in Phoenix in April. Although the gremlins that perpetrate these mysteries will still exist, a service inaugurated this month by National Data Corp. will match "over and short" reports from trucking firms using a computer/communication system.

The system, which had 390 letters of intent from freight companies (approximately 37% of U.S. truckers) at time of writing, receives "over and short" information at four regional centers: Cherry Hill, N.J.; Reno, Nev.; Westchester, Ill.; and Atlanta, Ga. The three former centers are linked to the dual Univac 494's at NDC's Atlanta headquarters by leased data lines.

Each subscribing trucking company receiving a waybill without its freight transmits a shortage report to NDC; freight received without the waybill is reported as overage. The computer compares all reports; if a match is indicated, the subscribers reporting the shortage are notified of the location of their shipment. Freighters can report by phone, mail or Teletype.

In Atlanta, operators (NDC calls them "formatters") input the reports to the computer and receive a response on Uniscope crt displays. The displayed information is then relayed by phone to the concerned parties.

In addition to the two 65K 494's, the system includes 262K and 786K drums, a 25-million-character FASTRAND II mass storage unit, mag tape units and a 1004 processor.

Additional aids to the freight business planned by NDC are systems that will trace shipments and account for equipment in interchange.

BCA ANNOUNCES ALC TIE-IN, PACKAGE PLANS

Basic Computing Arts, Inc., a software house formed in June, 1967, in Mountain View, Calif., will distribute Applied Logic Corp.'s ALCOM time-sharing system on the west coast. BCA will also provide customer training and

(Continued on p. 111)

FOLLOW THE LEADERS TO...

SYSTEMS AND PROCEDURES ASSOCIATION

INTERNATIONAL SYSTEMS MEETING

ST. LOUIS, MISSOURI — OCTOBER 20-23, 1968

The annual International Systems Meeting, considered the finest of its kind, will offer 40 seminars on topics ranging from basic systems to the most advanced techniques. Here is an opportunity to learn the latest developments in systems and EDP from the LEADERS in the field and view exhibits on equipment, supplies and services. For a complete program and details on registration, use the coupon below.

Mail to — SYSTEMS AND PROCEDURES ASSOCIATION
24587 BAGLEY ROAD
CLEVELAND, OHIO 44138

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY, _____ STATE, _____ ZIP. _____

D-1

CIRCLE 52 ON READER CARD

You don't have to wrap a thing. That's the point. This case doesn't fly into uncontrolled writhing when you flip back the latch, so naturally you won't have to tame it to get it back around the reel.

Ours opens benignly — just enough so you can lift out the tape. The case stays connected at the latch, ready to welcome back the reel. Drop it in. It rests on a patented shelf, aligned with the dust seal as you click it closed.

And ours is just as thin as the others, has an optional hook for suspension storage systems, a finger hold for roll-in storage, and the toughness to survive people who are always dropping things.

But it doesn't cost any more.

Data Packaging Corporation
205 Broadway, Cambridge, Mass.
Tel. (617) 868-6200
TWX 710-320-0840

The Wraparound you don't have to Wrap

CIRCLE 40 ON READER CARD

support for the system, which will be linked to Applied Logic's Princeton, N.J., computer center via concentrators.

BCA, until recently a consulting firm specializing in software for real-time simulation under a contract from NASA-Ames, is headed by Edward A. Jacoby, formerly with GE and Electronic Associates. Forecasting sales at $500K for FY '69, BCA is now operating under an expanded contract from NASA valued at $125K. The company also plans to develop packaged programs as a major product line; FAMILY I, a critical-time simulation operation system for EAI 8400 computers, is the first offering.

COMPUTER TAKES RAP IN SECURITIES SWINDLE

Three ex-employees of the Beaumont, Texas, office of E. F. Hutton & Co., a major New York securities firm, have been indicted by the U. S. government on 30 counts of fraud, mail interception and conspiracy.

The trio—an account executive, a margin clerk and a cashier—allegedly engineered a securities swindle said to involve more than a half million dollars over a period of several years. Nothing especially startling in that story except that the three indictees purportedly used the shibboleth line of "computer error" as a cover story for their jugglings.

Hutton clients in Beaumont who received statements produced on the firm's computers in New York revealing fiscal hanky panky were allegedly told by the defendants that the dumb machines had boo-booed, a fable which received instant credibility. Trial date is set for Sept. 30, raising the prospect of teleprocessed testimony from the maligned Hutton computer kludge in New York, which includes two 360/40's, a 30 and an RCA 501.

An interesting aspect of the case is that Hutton customers so readily accepted the tale of computer error as the reason for the out-of-line statements, even while the faithful machines were grinding out the straight skinny. The U.S. Attorney's office in Beaumont notes, however, that the computer ploy was only one of many allegedly utilized by the defendants to cover up their shenanigans.

SIMULATION METHOD DEVELOPED FOR STUDY OF VIRUS GENETICS

A geneticist at the Univ. of Pennsylvania is using computer simulation in studying the genetics of viruses, particularly testing various hypotheses about the breaking and recombining DNA molecules.

Dr. Andrzej W. Kozinski's computer model includes the assumption that the DNA molecules of the T4 virus are "circularly permutated" (if the genes were numbered and bent into a circle the circle would always be in number sequence) and "terminally redundant" (a few positions at the beginning of the molecule will be repeated at the end).

Terminal redundance is an important safety factor in the structure of chromosomes. A DNA molecule can be a little longer than necessary and still produce the right trait. If molecules are terminally redundant then there is a good chance that extremely long molecules break and recombine to form a recombinant molecule. (Kozinski's earlier work proved that parent molecules break and recombine to form a recombinant molecule.) The DNA fragments could combine into very long molecules and an enzyme could then break the long molecules into short ones that are packed inside each virus—a procedure that would make good use of terminal redundance.

The computer model has been used to test a theoretical model to see if long molecules are generated.

● The Matrix Corp., El Segundo, Calif., now provides programs and services for remote batch processing via Teletype terminals, a hospital accounting system, and electronic circuit analysis. The batch system operates with the firm's GE635. The hospital accounting system, HOSPACT, provides required Medicare data, detailed proration and billing of multiple insurance company cases, automatic aging of receivables, and controlled follow-up billing. The circuit analysis program enables the user to generate plotted output and may be used on-site or through terminals.

● In the next six months NCR will double the number of its on-line data centers to 10 in a $3 million expansion. Already signed to use the new on-line facilities are banks and savings and loan companies having a combined total of a million accounts. A new center will be opened in Atlanta and on-line services added at existing centers in San Francisco, Baltimore, Dayton and Montreal. These will be equipped with 315 RMC's telephone-linked to Class 42 teller terminals at subscribing institutions. Five centers—Chicago, Boston, New York, Los Angeles and Pittsburgh—are currently handling more than four million customer accounts on-line. Software involved in these operations are NCR's NEAT and BEST. Data center business increased by 40% last year in the company's 25-center United States-Canada network. Abroad there is another network of 31 data centers.

● Harvard and MIT have announced the formation of a nonprofit corporation, University Information Technology Corp. (UNITEC), to be headed by Carl F. J. Overhage, director of MIT's Project INTREX. UNITEC will concentrate on four major activities: development of a CCTV system by which lectures, seminars, etc., at either school can be seen in classrooms of the other institution; research and experiments in teaching using computers, films and TV; sharing of computer facilities through data links, and shared use of some data files and programs; and collaboration in research on information transfer between the two schools' libraries. This latter objective should receive considerable impetus from INTREX, which is a program experimenting in the application of information technology to the library of the 1970's.

shortlines . . .

Pentagon researchers estimate that inflation—in salaries and equipment costs—will automatically increase DOD procurement expenses 5 or 6% this year. . . . Two more university time-sharing networks have been established: In New York, SUNY at Buffalo is the center of a nine-campus network using a CDC 6400. And in October, 16 colleges will connect to the 360/65 at the Univ. of Iowa. . . . Correction of June '68 shortline item: Comress owns *no* part of 1st Investment Planning Corp. . . . This September the School of Vocational-Technical Education, Idaho State Univ., begins an 11-month course in data processing technology designed to give potential programmers hands-on training and experience in teleprocessing. . . . The National Catholic Educational Assn., under a $60,800 Ford Foundation grant, is investigating long-range planning techniques for Catholic schools. An initial group of 100 people are being trained in eight archdiocesan cities at seminars conducted by NCR. . . . Rep. Emilio C. Daddario blasted the "irrational and sometimes emotional budgetary attack on government R&D simply because it is not aimed at producing a specified tangible product" during a recent debate over $6 billion in spending cuts for FY '69.

machines that make data move

data's first class economy set

It's the Model 33 line. Low-cost terminal equipment that gets data off the ground and keeps it moving. Accurately. Reliably. Day-after-day. It's another answer from Teletype R&D for making data ends meet with utmost economy.

* * * * *

The Model 33 line's complete: RO (receive-only), KSR (keyboard send-receive), and ASR (automatic send-receive) sets and the options you need for utmost versatility. You can weave the equipment into a data system that will meet whatever your business communications requirements demand. And the most surprising element of the Model 33 line is cost. The terminal's cost is really low. So is the cost of operation.

Travels with ASCII

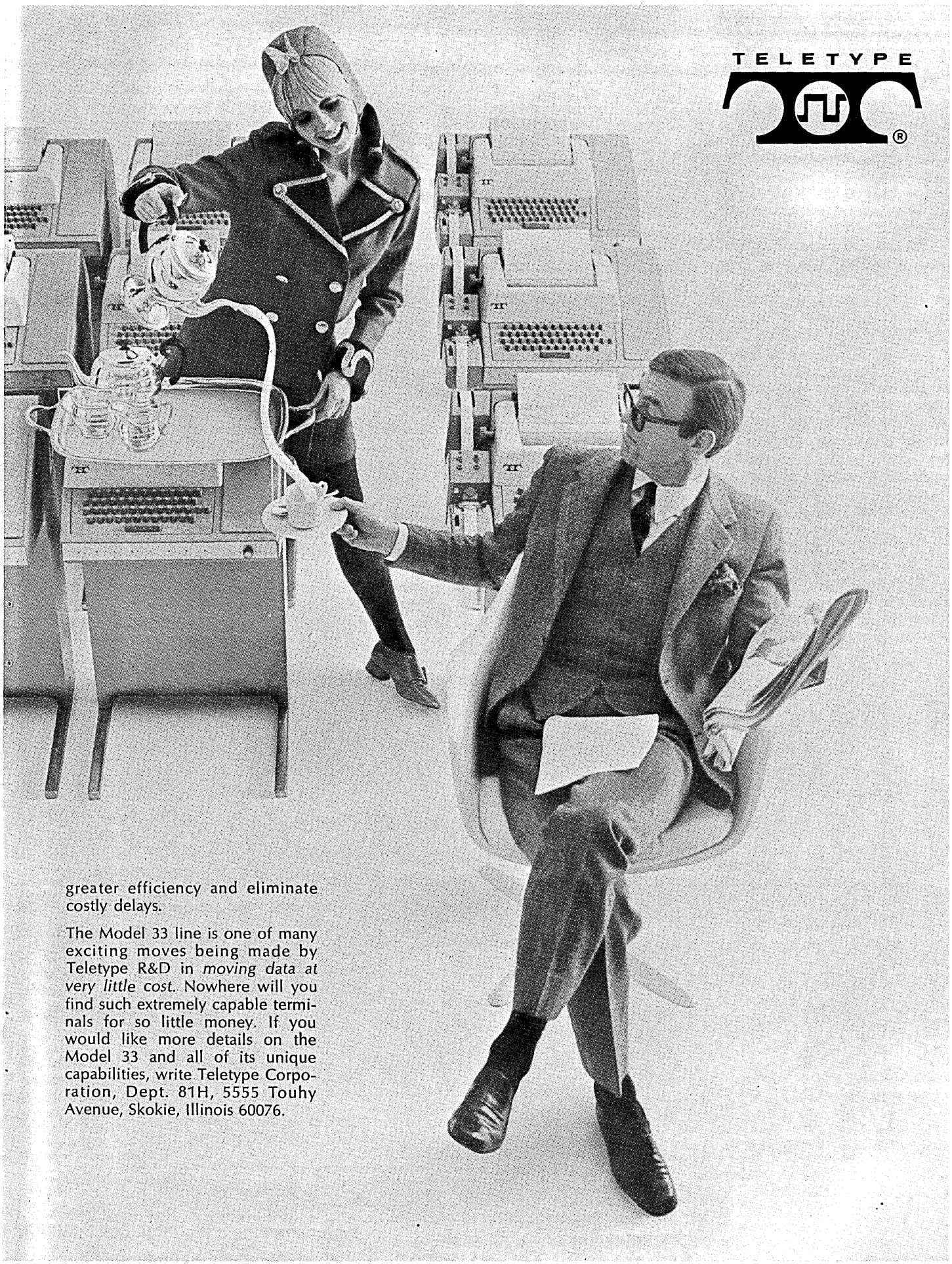
The Model 33 line communicates in U.S.A. Standard Code for Information Interchange (ASCII). Which means you can utilize it as a computer input/output device and with most other business machines. As a data link, these terminals can bring distant branch office data home in minutes. Help process orders, track inventory, provide tighter production and delivery control. Keep all the vital data management needs for timely decisions accessible.

Keeps forms on the fly

Optional sprocket feed platen on Model 33 equipment enables an operator to type multiple-copy business forms on-line. Send to any number of remote locations. Simple 4-row typewriter-like keyboard makes data preparation easy.

Paper-tape, too!

The Model 33 ASR set with paper-tape reader and punch keeps data on the flight path more economically, too. The set can receive data from its own keyboard or tape-reader, or from distant sets, as page copy with or without tape. And forms that fly by wire at an automatic 100 words per minute mean



TELETYPE

greater efficiency and eliminate costly delays.

The Model 33 line is one of many exciting moves being made by Teletype R&D in *moving data at very little cost.* Nowhere will you find such extremely capable terminals for so little money. If you would like more details on the Model 33 and all of its unique capabilities, write Teletype Corporation, Dept. 81H, 5555 Touhy Avenue, Skokie, Illinois 60076.

CIRCLE 54 ON READER CARD

TEC MAN/MACHINE INTERFACE INNOVATORS

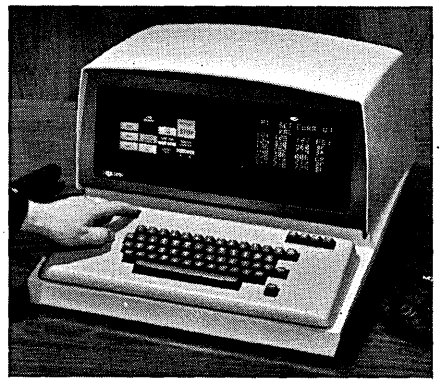
Unique concept at the *Washington Daily News!* Printing, bundling and loading of newspapers are now computer matched to constantly changing distribution needs. Such a specialized system is where TEC excels. TEC engineers custom-designed the solid state display and IBM 1800 interface system to meet the unique requirements of the *News.*

IBM 1800 USERS...COME WHERE YOUR DISPLAY/CONTROL ANSWERS ARE READY...TEC!

☐ And that's likely the case whether you use an 1800 or another process control computer. For instance, TEC's DATA-SCREEN Display Terminal offers a high degree of interface and display flexibility. It's designed to do what *you* want it to, not merely what we think it should. In addition, TEC's display and control concepts, such as DATA·PANEL® Display Systems, are completely unique—offer new dimensions in visual impact and display versatility. Let *you* do what others can't. Send for brochure describing the complete spectrum of TEC display and control systems and devices, or call (612) 941-1100. Transistor Electronics Corporation, Box 6191, Minneapolis, Minnesota 55424

TEC LITE®

Transistor Electronics Corporation



TEC's new 512 DATA-SCREEN Display Terminal is custom-designed, completely self-contained and compatible with most EDP and communications links without additional equipment. It's the answer where high speed, clarity and legibility are of prime importance in displaying critical operating information. TEC's DATA-SCREEN Display Terminal is used in an IBM 1800 display/control application at Emerson Electric Co.

CIRCLE 55 ON READER CARD

new products

data input devices

The Keytape source-data-to-mag-tape devices have been increased by 28 new models. Six of the new models—three in the K-700 series (7-channel, ½" tape), and three in the K-900 series (9-channel tape)—add a line printer, adding machine and check digit function to the previously announced secondary capabilities of a communicator, pooler and card reader. The other 22 models—11 in each series—combine two of these six secondary capabilities in a variety of ways. All of the new units have the standard features of data entry and verification, search, program entry and verification, 80-character core memory and record length. The K-700 series records data at 556 bpi; K-900, at 800 bpi. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 160 ON READER CARD

data set

The DigiNet TDM-114 frequency-shift keyed acoustically-coupled data set transmits (full duplex) asynchronous binary data serially over telephone circuits at speeds up to 300 bps. The

unit is compatible with the DigiNet TDM-111 and 103A2 data sets; it also has a hookswitch that locks acoustic seals, releases MARK-HOLD received data signals to the printer, and connects transmitter output. GE COMMUNICATION PRODUCTS DEPT., Lynchburg, Va. For information:

CIRCLE 161 ON READER CARD

display control unit

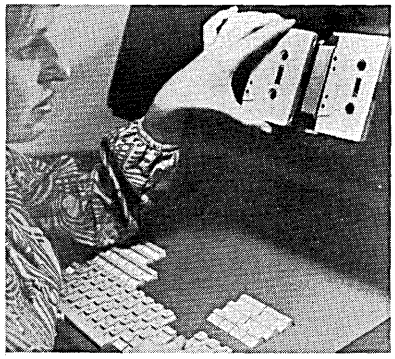
The Videograph Series 990 information display control unit is compatible with closed-circuit tv and data processing systems; the controller provides 22-line resolution through the use of a 11 x 9 dot matrix for character formation. The 990 accepts ASCII 8-bit data and generates an EIA-compatible video signal. The unit has a 4096-bit, 512-character core memory; a refresh rate of 60 cycles/second; and a display format of 16 lines x 32 characters. The unit links a computer with a CCTV system; it also can be used in data generation and system control applications such as classroom and transportation systems. A. B. DICK CO., Chicago, Ill. For information:

CIRCLE 162 ON READER CARD

remote meter reader

The DT-1000 Data System permits remote reading of gas and electric utility meters by a receiving terminal at a central location linked to a transmitting terminal at the meter. A standard Series 500 telephone handset is required at the remote location for communication and the meters must be equipped with a dry contact closure for output. The receiving terminal operator may read the remote terminal meters by dialing the telephone number for that location, which is auto-

PRODUCT OF THE MONTH



The first two products of the Systronics, Inc., terminal line are a data entry and conversion system, Key-Cassette, and a programmable crt/keyboard unit. Both contain the same basic modules: crt display, 128-character keyboard, logic unit, and three types of storage, including delay line, read-only memory, and tape cartridges (optional on crt terminal).

The Key-Cassette is in competition with keypunch equipment and all systems for direct conversion from source data to a computer storage medium. On a single unit basis this $18K system is price competitive with the Communitype 100SR system and IBM's Mod 50 data inscriber (both over $29K). Like them, the Key-Cassette first stores data on a tape cartridge, then it provides either a converter for translation to 7- or 9-channel IBM-compatible tape or a converter with adapter for direct entry into a 360 cpu for disc or tape storage.

In quantities of at least 6 terminals ($6K each) with one converter (12K$), the Key-Cassette becomes competitive with the Honeywell Keytape, Mohawk Data Sciences data recorder, and Sangamo data station, all in the $7-8,500$ range and offer source data to computer tape, using a core buffer.

The Key-Cassette is the first such unit to offer a crt (214-character) for displaying input and instructions. There are two Cassettes and recorder. The Data Cassette stores up to 600K characters recorded serially, 800 bpi at 2400 bps. The second Cassette contains programmed instructions for the user's application. For example, when a particular form is being worked on, instructions for it are transferred from this tape to a delay memory. Format fields and error detection are automatically displayed from this, but special instructions can be called up by the operator by pressing the "Assist" key. A read-only memory (512 8-bit bytes, 100 nsec access time) serves as a character generator and stores macro-level instructions called for by special function key.

The programmable crt remote is simply the Key-Cassette without a converter. Basic cost is $5300; optional Cassette for on-site storage costs $6,000. The read-only memory is used to generate the communications code. Systronics says the terminal could be outfitted with two read-only memories to serve as both a remote and a conversion system, but believes market is not great for the dual application. SYSTRONICS, INC. Ann Arbor, Mich. For information:

CIRCLE 163 ON READER CARD

It's Congruous!

SANGAMO INTRODUCES THE T201B 2400 BPS DATA SET for leased and private voice band circuits.

The Sangamo T201B is a high-speed, synchronous, phase-modulated transceiver. It sends and receives serialized digital data at 2400 bits per second.

Features include:

COMPATIBILITY. The Sangamo T201B data sets are compatible with all features and options of Western Electric's 201B data sets and will operate end-to-end with Western equipment.

BAND COMPRESSION. The high-speed transmission of the T201B is facilitated by encoding of serial data to be transmitted as pairs of binary bits called dibits thus halving the transition rate.

JITTER TOLERANCE. High tolerance to phase jitter and other transmission impairments, such as frequency offset, is insured with the differentially coherent quadrature phase modulation technique.

FLEXIBLE CONFIGURATION. The Sangamo T201B can be supplied in an attractive desk top cabinet or a standard 19" equipment rack mounting shelf. A special key telephone is also available for applications requiring alternate voice/data.

OPERATION. All strapping options are easily accessible on printed circuit cards—no front adjustments are required.

Write or call for Bulletin 5309 or an active demonstration at your facility today.

Information Systems Division
Communication Systems
SANGAMO ELECTRIC COMPANY
Springfield, Ill. 62705 • Phone 217-544-6411

T68-14

CIRCLE 56 ON READER CARD

new products

matically answered after several rings. The data is transmitted via magnetic coupling, sequentially and continuously for 2.5 minutes and then the phone is automatically hung up.

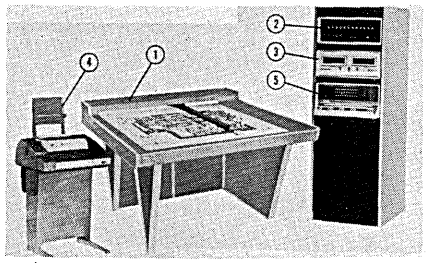
Data inputs from the transmitting terminal may be pulses, analog signals, status/alarm points, manually entered digital data or digital data in 24 decimal information bits. Data outputs are selectively displayed from a computer buffer. The visual readout is a 6-digit decimal display, and only data that passes the security checks is displayed. Analog input signals are converted at the receiving terminal and the signal is displayed with an accuracy of ± 1.0%.

Other applications of the DT-1000 are in traffic counting, remote reading of tank levels, and monitoring of items in baggage control. APPLIED PERIPHERAL SYSTEMS, INC., Houston, Texas. For information:

CIRCLE 164 ON READER CARD

digitizer programmer

A computerized digitizer programmer, the UPD-2, is designed for automatic preparation of 8-channel EIA punched tape that will serve as a final program



for direct use in a numerically-controlled positioning machine. The system consists of: (1) a coordinate digitizer table, (2) input buffer and control circuitry, (3) a bidirectional counter with position display, (4) an ASR-33 Teletype for program-command input and data output, and (5) a PDP-8/S computer with complete program control software.

The UPD-2 system is capable of establishing and recognizing grids of .025, .050, and .100 inches in both X and Y directions, and an operator can extract precise coordinate data over a large area by positioning a reticle over each desired point and actuating a readout switch. Additional function coding is provided by the Teletype keyboard, programmed to the desired format. The origin of the grid lines may be established arbitrarily for each job, and the grid reference frame remains fixed for the duration of the job. DATA TECHNOLOGY, INC., Watertown, Mass. For information:

CIRCLE 165 ON READER CARD

2311-type disc drive

The Potter DD4311 is plug-to-plug compatible with the IBM 2311 disc drive and reportedly costs $18,100—or about $7,500 less than the IBM product. The new drive has a comb-like access mechanism that contains a separate read/write magnetic head for the 10 recording surfaces in each pack. This plus a cylinder or track mode of data organization makes the unit suitable for random or sequential processing. Each of the 200 tracks on the discs' surfaces can store up to 36K bytes. Repositioning time averages 75 msec. and transfer rate is 156,000 bytes/second. The integrated-circuit unit has a three-speed hydraulic detente mechanism that locks magnetic heads into position, preventing the generation of strong magnetic fields. POTTER INSTRUMENT CO., INC., Plainview, N.Y. For information:

CIRCLE 166 ON READER CARD

facsimile accessory

The Model 904A tape recorder operates with any facsimile system and is used for storing, forwarding and speed translating of facsimile transmissions. It records and stores up to 90 minutes of transmission on each side of a 7" tape, operates over a frequency range from 30 to 14,000 cps, and forwards data over telephone lines from 3 to 10 kHz. The tape can be played back at either 5 or 10 ips, locally or remotely, with hard copy recordings made concurrently with taped recordings. ALDEN ELECTRONIC & IMPULSE RECORDING EQUIPMENT CO., INC., Westboro, Mass. For information:

CIRCLE 167 ON READER CARD

peripheral system

CartriFile is a data systems peripheral that combines four mag tape transports and their controller in a single cartridge-loaded unit. Each cartridge contains two ¼" standard audio tapes. Compatible with small computers and data terminal systems, the device offers selectable word length, variable record length and simple interface. CartriFile reads and writes data simultaneously on any two of the four tape files; transfer rates are up to 1,200 4-bit words a second. Reliability is provided through redundant phase-encoded recording and a read error-correction system. Control circuitry interfaces with 4-, 6-, 8- or 12-bit parallel I/O. The unit measures 17" x 7½" x 13½", and is priced at $5,200; deliveries will begin next month. TRI-DATA CORP., Mountain View, Calif. For information:

CIRCLE 168 ON READER CARD

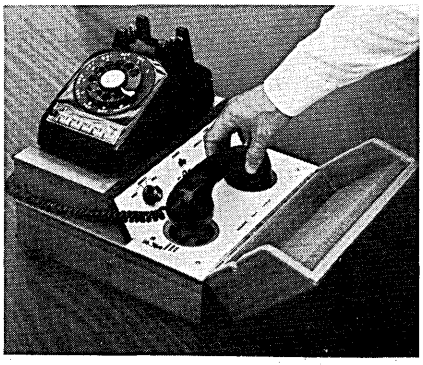
heart device

The ElectroCardioAnalyzer (ECA) is a portable digital/analog computer for use as a mass screening aid in the detection of heart abnormalities in the adult. The machine is programmed with certain criteria of normality, and the subject's heart is measured against these parameters by means of five leads attached to his limbs and chest. The computer analyzes the signals on a real-time basis and a light system on the front panel indicates areas of possible malfunction. The operator, who requires very little training, fills out a form that corresponds to the panel configuration and circles the areas where irregularities are shown. A subject who exhibits an abnormality is then referred to a doctor for further diagnosis and treatment. Time for the test and reading is under 5 minutes. The machine is intended for mass screening in industrial environments to detect incipient heart disease. The price is around $10K. HUMETRICS DIV., THIOKOL CHEMICAL CORP., Los Angeles, Calif. For information:

CIRCLE 169 ON READER CARD

acoustic coupler

The ADC 300 originate/answer acoustic data coupler enables the time-sharing user to communicate in the originate mode from a remote location over ordinary phone lines and in the answering mode with other terminals. In full duplex operation, punched tape or keyboard information can be trans-



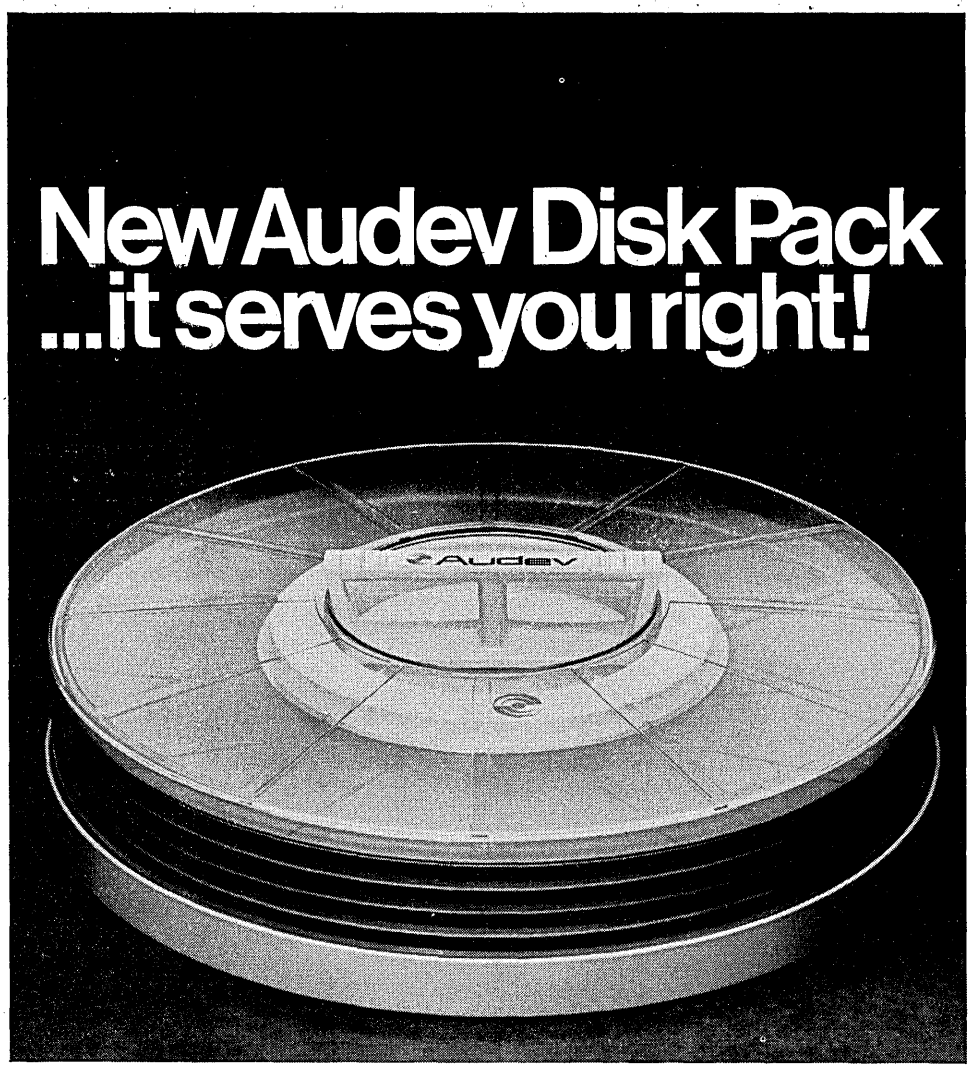
mitted in both directions simultaneously. It is compatible with the 103-A Dataphone or with the ADC 260 originate mode acoustic data coupler. Its data rate is 300 BAUD. ANDERSON JACOBSON, INC. Mountain View, Calif. For information:

CIRCLE 170 ON READER CARD

medical processor

The TI MED system is designed to gather and process physiological data for a variety of medical applications, including the processing of data from up to 32 sensors simultaneously for in-

Not another disk pack?



We're not satisfied just to lease or sell you an Audev Disk Pack. Maybe you won't be satisfied just to have a unit that meets the most exacting physical and magnetic parameters in the industry? Possibly, you need more than Audev's complete compatibility with all existing 100 and 200 track drives. That's why a full measure of old-fashioned Audev service is packed with each Disk Pack.

Through the years, this desire to give our customers better service has helped us sell a lot of computer tape. We expect to sell a lot of Disk Packs too.

Audev
DISK PACKS AND COMPUTER TAPE

Audio Devices, Inc., a subsidiary of Capitol Industries, Inc., 235 East 42 Street, New York 10017

tensive care units; remote cardiac diagnosis; rapid data reduction during cardiac catheterization; and data reduction and presentation for EEG. The system is built around a small digital computer, Model 980, and its elements include amplifiers for the gathering of physiological data, input multiplexers, A/D and D/A converters, and magnetic and drum memories. The system is adaptable for enlargement in modular form from a variety of applications. The basic computer costs $20K, with varying prices for the system, depending upon the application. TEXAS INSTRUMENTS, INC., Stafford, Texas. For information:

CIRCLE 171 ON READER CARD

crt phototypesetting

The Fototronic-CRT typesetter is a computer-driven, high speed system that composes complete pages of type by photographing characters generated on the face of a high-resolution crt. The system is basically an area composition device that can compose magazine, book or directory pages at a rate of 2 to 10 per minute, depending on the size and complexity of the page. Speed of operation depends on the size of type being set; the smaller the type, the faster the speed.

The machine can be used with computers made by any major manufacturer. It produces type on film or photo paper in sizes from 4-point to 24-point. Maximum image width for various models ranges from 8½" to 16". A built-in digital memory system provides access to 40 different faces of type, or approximately 40K characters.

The company expects principal users of the system to be computer-oriented, high-volume producers of full page composition. Such a system could be the coming thing for publications that require little revision with time, such as telephone directories, college class schedules and premium books. Price of the Fototronic-CRT system ranges from $300K to $500K. HARRIS INTERTYPE CORP., Cleveland, Ohio. For information:

CIRCLE 172 ON READER CARD

software dictionaries

PLAN (Problem Language Analyzer) is a package of programs intended to make the language of the computer more the language of the specialist who uses it. The package is designed to enable a professional to create a dictionary of terms he uses in his work and enter it into a computer for future computations. PLAN may be used with an IBM 1130 under the disc monitor system, or a 360/25 or larger under OS/360 or DOS/360. The programs used to define entries in the dictionary can be written in assembler languages or FORTRAN. The company will make available three ready-made PLAN dictionaries for designers of optical systems, prefabricated structures and mechanical linkages in the first quarter of 1969. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 173 ON READER CARD

source data recorder

Templapunch 500 series is a source data input device that imprints and punches onto tab cards directly from keyboard entry with data templates or embossed credit cards. It produces imprinting and up to 40 Hollerith punches in one operation, the number varying with the five models in the series. Punching may be performed in any and all 80 columns of a tab card. Applications include retail credit card charges, hospital patient charges, and such industrial uses as inventory control, materials requisition, and parts identification. Price for the standard Templapunch is $350. THE ENTWISTLE CO., Providence, R.I. For information:

CIRCLE 174 ON READER CARD

laser graphics

An on-line plotter employs a laser optics system to produce high-resolution drawings (black and white with 14 intermediate greys) at computer speeds. The plotter secures information from memory and by use of laser light as its graphic source, or stylus, is able to accept data at a rate comparable to most computers. It uses roll film 100' long and 40" wide as a print surface. Large continuous tone or line cartographic displays with words, letters or numerals can be plotted in any dimension or slant, top to bottom, with 5-mil resolution. DRESSER SIE, Houston, Texas. For information:

CIRCLE 175 ON READER CARD

estimating service

A program estimating service PROGRESS is designed to aid management in manpower decisions with information based on surveys of computer operation and development in industrial environments over the past 10 years. The company analyzes the data supplied by a client, the same data the client would give his own analysts or programmers regarding a new system or program to be implemented, and furnishes an appraisal of the magnitude of the task stated in manmonths, weeks or days of a "competent, experienced programmer." The estimate can also indicate a performance standard for the client's employee goals and development and, incidentally, serve as a double check on the client's own programmer. Fee for one program analysis is $27.50. MECHANICAL ENGINEERING ASSOCIATES, INC., Dallas, Texas. For information:

CIRCLE 176 ON READER CARD

hard copy generator

RAPCOR System Series 725, produces hard copy prints of computer and video outputs, including alpha-numeric, graphic, and continuous tone imagery. It features fully automatic operation, instant recording of internally displayed information, continuous or intermittent delivery of hard copy within seconds, multistation control and video inputs from remote locations, and plug-in operation. OPTO-MECHANISMS, INC., Plainview, N.Y. For information:

CIRCLE 177 ON READER CARD

transmission test set

A compact transmission test set weighing 8 lbs., the Model 110 evaluates data transmission systems using synchronous modems that are equipped for RS232B/CCITT V.24 interface and that supply their own transmit and receive clock signals. The unit can test modems operating at any speed from 10 to 10K bps, and provides a 2047-bit pseudo-random pattern for transmission and receive checking for the proper binary sequence. Although its most suitable application seems to be in testing prior to peak load, the Model 110 connects directly to the data modem and allows data processing equipment to operate normally during the testing. MILGO ELECTRONIC CORP., Miami, Fla. For information:

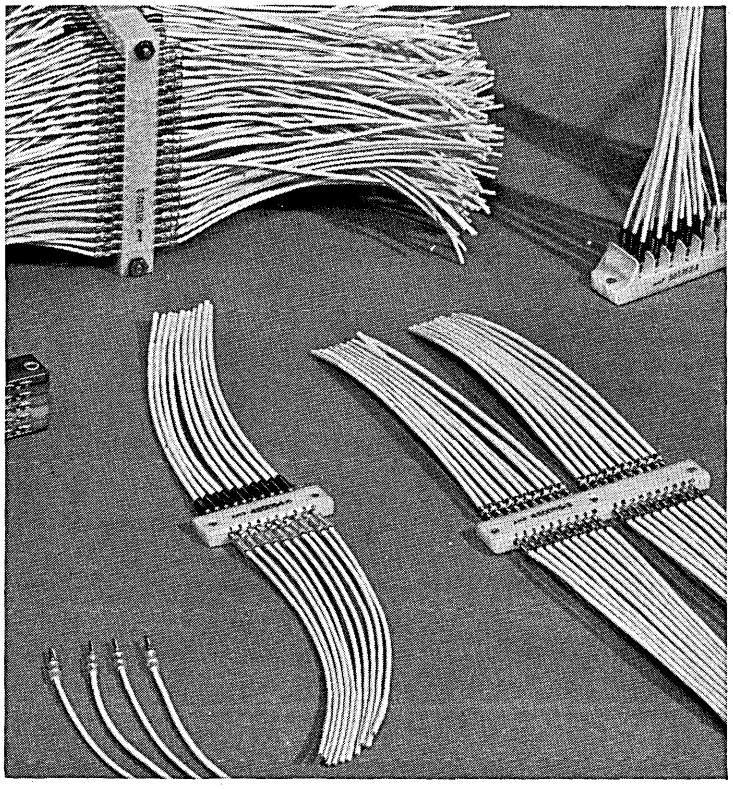
CIRCLE 178 ON READER CARD

general purpose computer

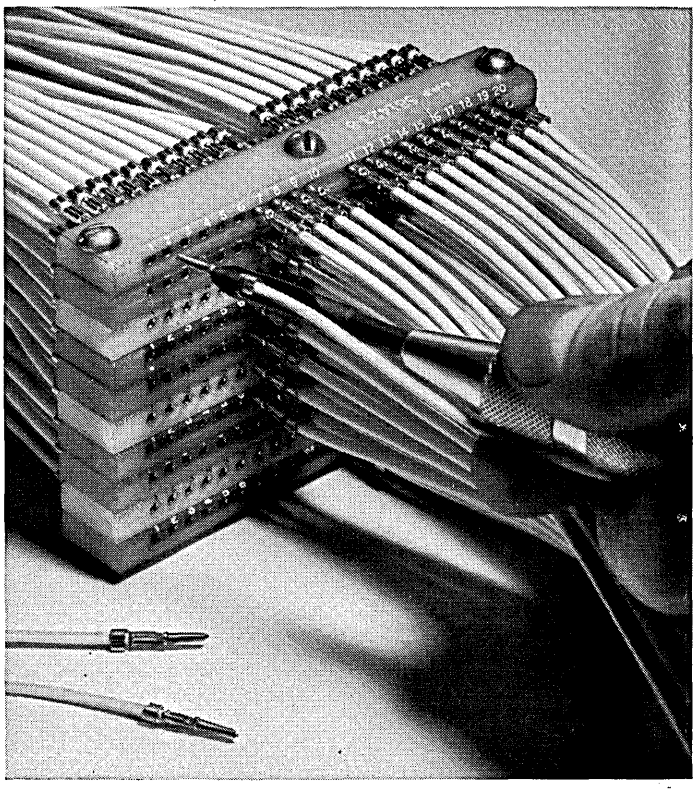
The DT-1600 is a small (28 lbs.), general purpose digital computer intended for real-time control functions such as data acquisition, process control, automatic test and inspection, and medical data monitoring and processing. It also seems suitable as a remote terminal. It features all integrated circuitry, 17K hour mtbf, 8-bit word size with the majority of the 73 instructions in that size, 4K memory (expandable to 16K) with random access 3D core, and costs $6,600 (small quantity). It

Economation: AMP's taper pin interface wiring technique

AMP offers the broadest line of taper pin products in the world.



Taper pins are quickly inserted using a precision spring-loaded A-MP* tool.



Taper technique is an excellent example of Economation by AMP—cost reduction through automation. Based on the wedge principle, the connection is self-cleaning and self-locking when the pin contact is inserted into a matching taper receptacle.

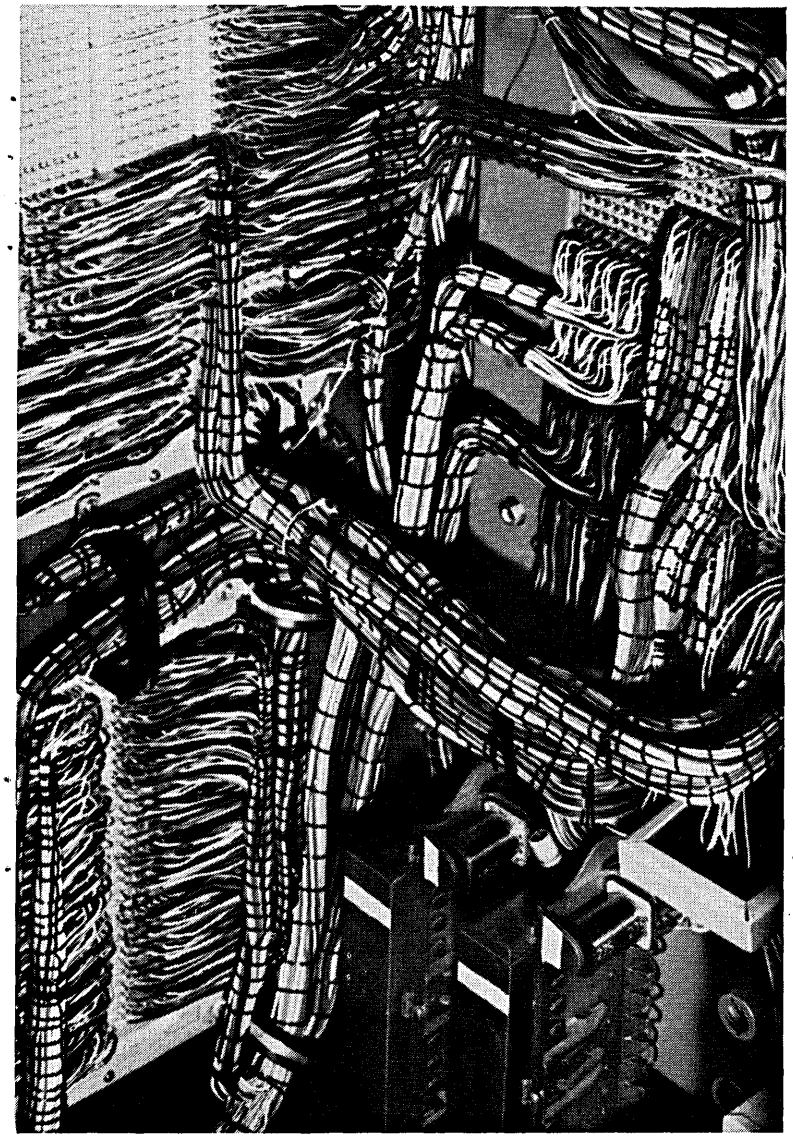
The pin has only a slightly larger diameter than the wire itself, which allows very high density connection packaging. Yet any contact may be individually replaced without interference with other contacts. This, plus small size and weight and proven reliability, makes it perfect for interface connections between main frame and peripheral computer units, and in a host of wiring applications throughout the Electronics Industry.

AMP's taper pin product line—the world's most complete—is also the most automated and economical. For example, one automated A-MP* machine can cut leads to size and apply over 10,000 taper pins an hour. And each termination is uniformly reliable because AMP engineers design a tool to match every product. This means fewer rejects, faster production, and applied cost savings.

Get the facts on taper technique and AMP's lower applied cost now. Write AMP Incorporated, Harrisburg, Pa. 17105.

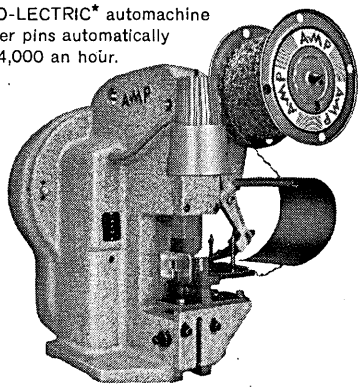
*Trademark of AMP Incorporated

High-density interface wiring with A-MP* taper pin blocks.

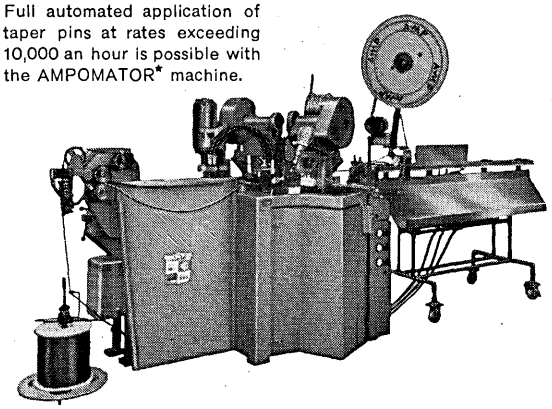


AMP

The AMP-O-LECTRIC* automachine applies taper pins automatically at rates of 4,000 an hour.



Full automated application of taper pins at rates exceeding 10,000 an hour is possible with the AMPOMATOR* machine.



CIRCLE 58 ON READER CARD

is available off-the-shelf and in production quantities.

The DT-1600's memory cycle time was designed at 8 usec to eliminate pulse timing problems, and the machine's circuit design allows user replacement of any card, including the memory stack, without special circuit tuning. It interfaces with a wide range of peripherals, including mag tape, reader and punch, ASR-33 Teletype, disc memories, A/D and D/A converters, multiplexers, and digital logic cards. DATA TECHNOLOGY CORP., Mountain View, Calif. For information:

CIRCLE 179 ON READER CARD

voice memory

The Digitalk 36W is a random access voice memory that translates a 6-bit buffered binary input into any of 36 audible words of up to one second duration each. The system permits a computer to emit language sounds directly to personnel or user through an audio channel. The unit is compatible with all current logic levels and features mag drum memory, integrated circuitry, fixed airgap, fixed mag pickups, and power supply. The price is $3,900. METROLAB, San Diego, Calif. For information:

CIRCLE 180 ON READER CARD

graphic display terminal

ARDS (Advanced Remote Display Station) is a desktop graphic display terminal designed to communicate with computers over a standard telephone line. It consists of a keyboard, a display unit, and a controller, which contains both a symbol and a vector generator. All 94 ASCII symbols can be printed on the 6½" by 8¼" screen, which can display over 4K characters. The unit operates at a speed of 1,200 bps. Text and graphic drawings can be displayed simultaneously, with an erase time of .5 sec., and may be generated either by the computer in response to a data request or by the terminal user. Price of the unit is around $13K. COMPUTER DISPLAYS, INC., Waltham, Mass. For information:

CIRCLE 181 ON READER CARD

time-sharing computers

Deliverable in nine months, the GE-430 and GE-440 time-sharing systems are the latest developments in the GE-400 series. The company reportedly has improved user response time at a lower cost per line through better software and extensive use of faster, removable disc file systems.

The GE-430 will serve up to 30 users concurrently. It consists of a central processor with 32K words of memory, floating point hardware, a 16K word communications processor, and four DSU-160 removable disc storage units providing over 30 million characters of storage. The system leases for $15,421 a month.

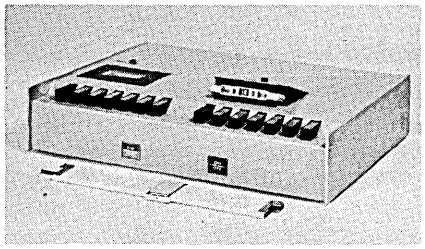
The GE-440 is a larger, faster system that will serve up to 50 users at the same time, with a monthly lease price of $22,187. The central processor provides 64K words of memory.

Both systems use an extended form of the BASIC computer language, and offer FORTRAN IV. GENERAL ELECTRIC INFORMATION SYSTEMS GROUP, Phoenix, Ariz. For information:

CIRCLE 182 ON READER CARD

mag tape unit

The ICP Model 200 DigiCoder is a mag tape unit aimed at the small, general purpose computer OEM market. A double tape deck permits tape duplication or modification and concurrent read/write operation. The tape size is



0.15" width, 60' length, the Philips standard. Tape capacity is up to 180K bytes each side, with a read/write rate of 500 bytes/sec. maximum, and a rewind of less than 30 sec. The unit features integrated circuitry and operates on 115V 60 cps 50 watts. Priced at $1,200 in quantities of 100. INTERNATIONAL COMPUTER PRODUCTS, Garland, Texas. For information:

CIRCLE 183 ON READER CARD

flowchart documentation

FLOWGEN/F is a software program to produce automatic ink-on-paper flowchart documentation of FORTRAN source programs. It allows all basic FORTRAN statements to be processed without source deck modification, and the source deck can be as free-form as the compiler will permit. The result is a standardized flowchart for debugging or modification of the source program. It can also be used as a check on an absent programmer's documentation. CALIFORNIA COMPUTER PRODUCTS, INC., Anaheim, Calif. For information:

CIRCLE 184 ON READER CARD

data simulator

A compact digital data simulator, Model 912, clocks out 960 serial bits of binary information at rates to 10 MHz. In the parallel mode, up to eighty 12-bit words can be outputed at clock rates to 5 MHz. To simulate larger parallel words, additional simulators can be synchronized in a master-slave configuration. Model 912 applications include: error checking in telephone data transmission equipment; checking and/or programming 7 and 9 track magnetic tape units; programming punched tape perforators and automatic test systems; checking IC shift registers. The unit is priced at $4K; delivery is 45-60 days. SRC DIV., MOXON ELECTRONICS CORP., Los Angeles, Calif. For information:

CIRCLE 185 ON READER CARD

data concentrator

The model 8900 data concentrator uses type 4 unconditioned voice-grade transmission lines (no data set or modems required), and accepts data rates of up to 110 baud from 12 input terminals or up to 150 baud from eight terminals, with no restriction in code format. Stations can be operated point-to-point, in a network configuration with drops and pickups, or polled operation. The unit interfaces all teleprinters, paper tape stations, visual displays and similar terminal devices. DACOM DIV., COMPUTER TEST CORP., Cherry Hill, N.J. For information:

CIRCLE 186 ON READER CARD

tape recorders

The PEC series of incremental and synchronous digital magnetic tape recorders are available with 8½" or 10½" reels and are intended for use with data acquisition systems, integrated circuit testers, digital plotters, line printers, pulse height analyzers, and as computer input-output devices. A hybrid incremental write/synchronous read model can accept random data from keyboards, transmission lines, digital voltmeters, counters, converters, and automatic test systems and can then read the prepared tape at speeds up to 25 ips into a digital computer. The data format is IBM compatible, including the requirements for 360, 9 channel, 800 bpi operation. The incremental tape units operate at rates of 1,000, 700, 500 and 350 cps at densities of 800, 556 and 200 bpi. Synchronous models operate

Look.
To build a file management system you could dedicate half a million. Or more.
5 PhDs, 2 VPs, 25 programmers. A soupçon of genius. Shoot 24 months. Maybe 36. And what would you have?

CSC Cogent II

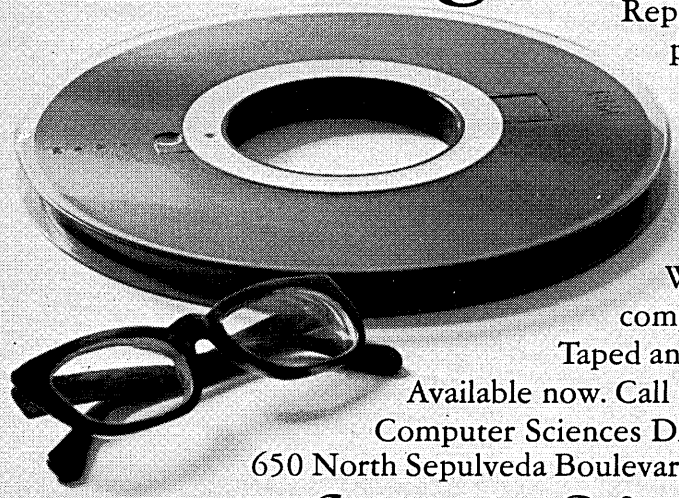
A file management system. Report generator. High-level program language.

Generates source programs in COBOL. Has cut time and cost 75% for file maintenance, reports, and programming.

Works with 3rd generation computers like 360.

Taped and ready to install.

Available now. Call Charles Sullivan: (213) 678-0592.



Computer Sciences Division,
650 North Sepulveda Boulevard, El Segundo, California 90245.

Computer Sciences Corporation

CIRCLE 59 ON READER CARD

Problem:

PASSENGER TRAVEL PATTERNS

Solution:

In order for a domestic airline to schedule flights more efficiently, a method of spotting trends in passenger travel patterns became necessary. In the planning stages of the survey, C-E-I-R was called in as a consultant to lay out the questionnaire and to pre-code it. Because accuracy is a prime requirement of any market survey, all steps in the data collection process are carefully supervised and continually checked by C-E-I-R: collection of booklets, numbering, coding, and keypunching the data. All input documents and data are stored systematically for easy retrieval in case the client wishes to check back over past questionnaires.

Results:

The airline runs the data through the computer on a quarterly basis to *accurately* spot trends in passenger travel patterns. They have been able to efficiently plan their flight schedules to take care of peak passenger requirements, based on C-E-I-R survey data.

YOUR PROBLEMS ARE OUR BUSINESS! This problem was solved by our Market Research Staff. Contact us for complete information on all areas of problem solving.

C-E-I-R INC.
THE PROFESSIONAL SERVICES SUBSIDIARY OF CONTROL DATA CORPORATION

5272 River Rd., Washington, D.C. 20016
Phone: (301) 652-2268

CIRCLE 60 ON READER CARD

new products

at any single speed from one to 25 ips at densities of 800, 556 and 200 bpi. PERIPHERAL EQUIPMENT CORP., Chatsworth, Calif. For information:

CIRCLE 187 ON READER CARD

management control software

PROMPT (PROgram Monitoring and Planning Techniques) is described by the company as a "finely-tuned PERT." It provides computerized reports, oriented to multiple levels of management, detailing each phase of a program cycle down to basic tasks performed by each individual during every working hour. The COBOL package comes with a program deck, three instruction manuals, a usage indoctrination course, and technical assistance in setting it up on the user's computer. The company states that PROMPT is adaptable to any computer operation. ARIES CORP., McLean, Va. For information:

CIRCLE 188 ON READER CARD

cobol aid

MAGIC is a program to aid the COBOL programmer in decreasing debugging time, minimizing source programming time and improving documentation. It runs on 360 computers under DOS or OS on as little as a 32K-byte configuration. It produces full formatted COBOL source programs from user defined abbreviations, and provides fixed format data description, relaxed rules for punctuation and reserved words, and implied PICTURE clauses. INFORMATION MANAGEMENT INCORPORATED, San Francisco, Calif. For information:

CIRCLE 190 ON READER CARD

mag tape series

The 870 Series magnetic computer tape series is IBM-compatible and features an "improved" binder formula with longer tape life and reduced headwear than the 830 Series, which it replaces. The polyester base tape is available in the following configurations: 871 tape records 556 cpi on a 7-track format; 872 records 800 cpi on 7-track; 873 records 800 cpi on complete area tested tape (CATT); and 874 records 1600 cpi/3200 flux changes per inch on CATT. The company guarantees 870 Series tape to be 100% free from original permanent errors. It is available now. AMPEX CORP., Redwood City, Calif. For information:

CIRCLE 191 ON READER CARD

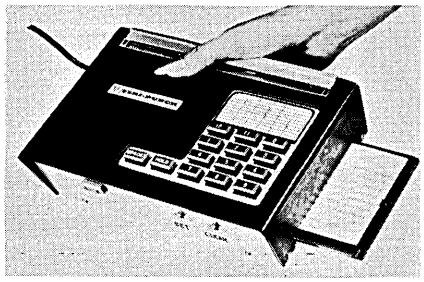
simulation software

Simul8s is a simulation software package developed for use with small, general purpose computers such as the PDP-8 series, the CDC 3600 or comparable 360's. It enables the user to obtain diagnostics, assemble, debug, prepare a binary tape, and execute a PAL III source program, thus eliminating the size and input-output constraints during the development of a computer program. DECISION SCIENCE, INC., San Diego, Calif. For information:

CIRCLE 192 ON READER CARD

portable key punch

An electric portable key punch machine, the Model 400 Vari-Punch, enters information on machine-readable records that are immediately ready for computer processing, eliminating written or typed information. The Vari-Punch punches any standard 80-



column card and can be operated remotely. It operates on 115-volt A.C. or 12-volt D.C., and is available in a choice of 12-key adding machine or tab keyboard with space and tab buttons. A column indicator provides a visual check of the column punched. Price is $450. VARIFAB, INC., High Falls, N.Y. For information:

CIRCLE 193 ON READER CARD

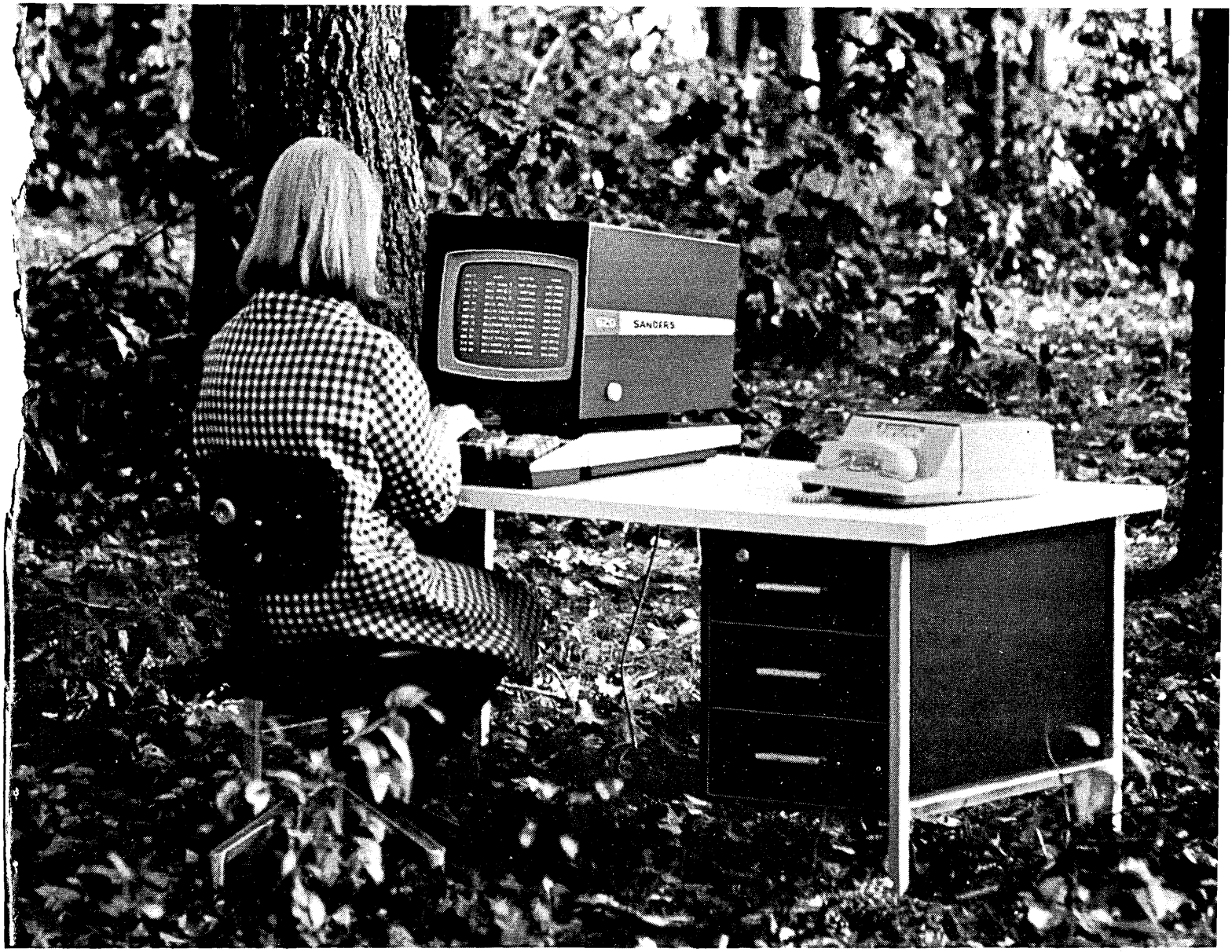
flowchart generator

ComChart is a flowchart generator written in assembly language and operative on all models of the 360. The program, priced at $195, eliminates the need for hand-drawing of flowcharts for finished programs. De facto documentation is useful in cases where the originator of the program has left the company, or for program audits. COMPRESS, INC., Washington, D.C. For information:

CIRCLE 194 ON READER CARD

sales prediction program

ISIS (Instant Sales Indicator System) is a proprietary program that will, according to the company, forecast the cumulative volume of sales that will occur at any given date. Written in FORTRAN and operative on "any" third-



the remote possibility

If you have remote facilities of any kind — branch offices, warehouses, retail outlets, or service centers — the Sanders 620* Data Display System is more than a remote possibility.

This completely self-contained, desk top, visual display system handles routine retrieval and update of computer-stored data in remote locations as efficiently as other cathode ray tube displays do in local environments.

The 620 System features compatibility with all major computers, synchronous/asynchronous operation, exclusive full screen utilization, easy-to-read characters, and a wide range of options, such as format mode and hard copy output, to satisfy individual requirements.

The standard 620 Stand Alone Display System is priced at only $5400. Monthly rental is $180, maintenance included.

For more information, contact your nearest Sanders Data Systems office or Data Systems Division, Sanders Associates, Inc., Nashua, New Hampshire, (603) 883-3321, Extension 6985.

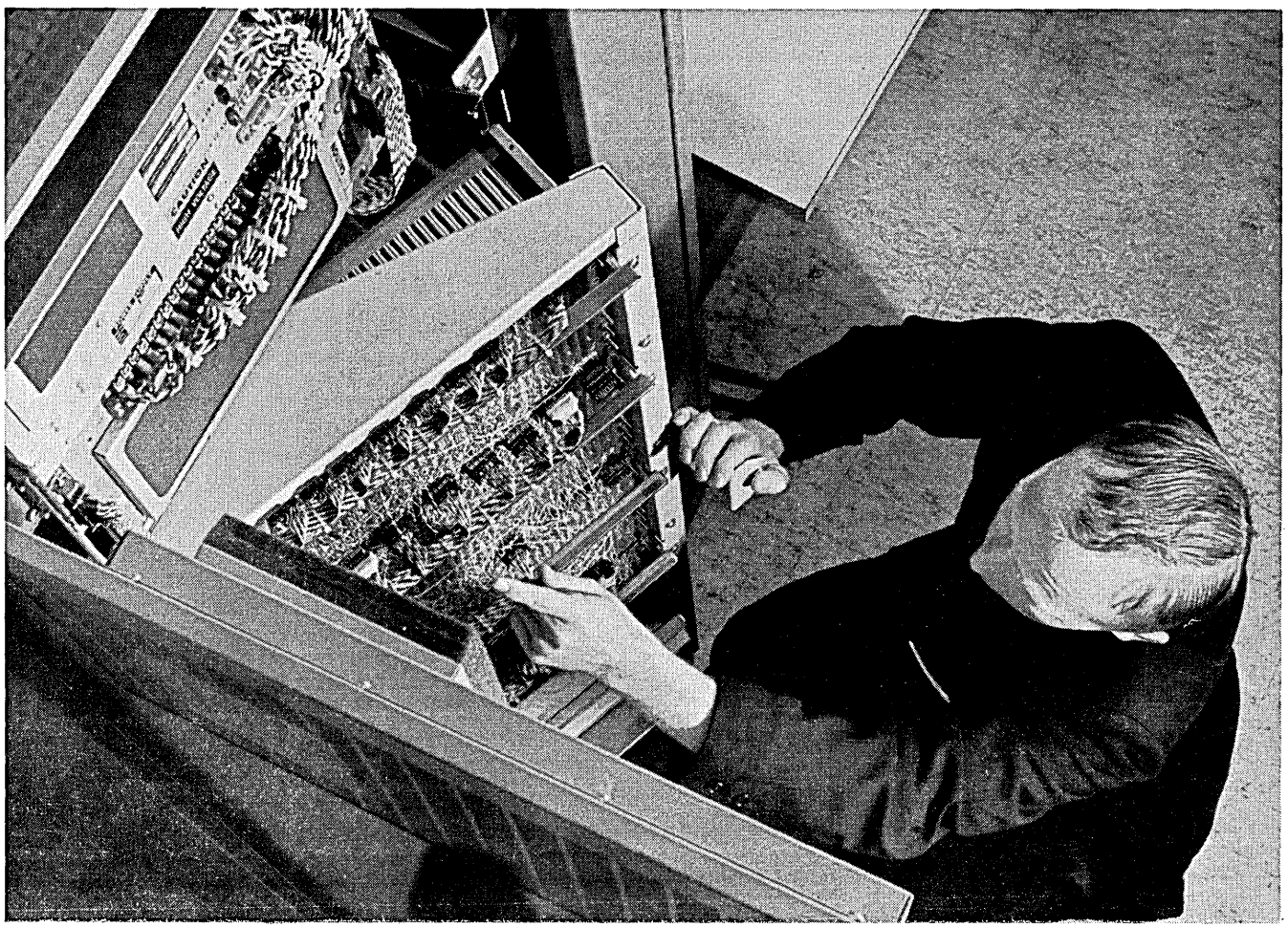
SA SANDERS ASSOCIATES, INC.
DATA SYSTEMS DIVISION

*T.M. Sanders Associates, Inc.

SALES OFFICES: NASHUA, N.H., NEW YORK, N.Y., WASHINGTON, D.C., CHICAGO, ILL., LOS ANGELES, CALIF., HOUSTON, TEX., ATLANTA, GA., TORONTO, ONT., CAN., PHILADELPHIA, PA., DETROIT, MICH., MIAMI, FLA., NEW ORLEANS, LA., MINNEAPOLIS, MINN., DALLAS, TEX., SAN FRANCISCO, CALIF.

CIRCLE 61 ON READER CARD

Who buys EMR?



The kind of man who looks at more than the name of the system before he buys.

Anyone can call up and order a system by brand name. After all, that's the "safe" way. Frankly, he's not our man. We're after the buyer who does his homework. He's the kind of person who looks hard at competitive comparisons, cost/performance ratios, and the like.

Why? Because our processors are second to none. We know. We've tested our systems against the best of our competitors and we've got them beat. Take I/O, for example. Our ADVANCE 6130 system has a full 16-bit word I/O transfer rate of better than 5 megacycles when using 4 asynchronous memory control buses. Our multiple memory bus control feature is completely modular from 1 to 4, and with the addition of each bus control the I/O transfer rate is increased by 1.29 megawords.

Be honest. Can you afford not to compare before you buy? Write or call our manager of marketing for more information. We invite your comparison.

EMR COMPUTER

EMR DIVISION OF WESTON INSTRUMENTS, INC • A SCHLUMBERGER COMPANY
8001 Bloomington Freeway, Minneapolis, Minnesota 55420 • Phone (612) 888-9581

CIRCLE 62 ON READER CARD

new products

generation computer, the program determines the correlation between the cumulative volume of sales for a future period and the volume of sales to date. It also establishes confidence limits within which the projected sales amount will occur, based on intricacies of past sales patterns. The $3,600 program includes FORTRAN deck, user's manual and a demonstration operation. Preliminary correlation analysis is priced separately. ECONOMATICS, Pasadena, Calif. For information:

CIRCLE 195 ON READER CARD

accounts receivable software

An accounts receivable package, operative on any 360 configuration using mag tape or disc, provides detailed reports on invoicing, sales analysis, cost analysis, inventory control and operating statements. The package includes disc layouts, program narratives, assembly listing, card formats, printer formats, operating instructions, keypunch instructions and clerical procedures. MASTECH, INC., Chicago, Ill. For information:

CIRCLE 196 ON READER CARD

time recorder

The 500 Calculagraph Elapsed Time Recorder calculates and prints mainframe and peripheral equipment elapsed time on an 80-column card. It can also be used to capture keypunch time. CALCULAGRAPH CO., Hanover, N.J. For information:

CIRCLE 197 ON READER CARD

core memory

VersaSTORE III coincident-current memory has storage capacities from 256 to 4,096 (36-bit) words or 8,192 (18-bit) words, and operates asynchronously at a cycle time of 1 usec. Access time is 450 nsec. VARIAN DATA MACHINES, Irvine, Calif. For information:

CIRCLE 198 ON READER CARD

punched-card sorter

The 408 punched-card sorter handles 550 cards a minute and has 13 pockets. Designed for low-volume applications, the unit offers card counting and sort suppression (combinations of categories can be closed to the sort, and the desired mix sent to a single pocket). Delivery of the $4,330 device is immediate. NCR CO., Dayton, O. For information:

CIRCLE 199 ON READER CARD

serial printer

A multicopy business-oriented serial printer prints out computer or communications data at rates up to 60 cps or 600 words a minute. Imprinting is achieved by a 64-character font cylinder; a line is standard 120-character width. The printer uses regular fanfold, pin feed paper in sizes up to 15" wide, and is priced from $4K-6K depending on the model. It will be available for delivery at the end of the year. TALLY CORP., Seattle, Wash. For information:

CIRCLE 200 ON READER CARD

mag tape cleaner

The E-24 is an automatic mag tape cleaner that offers two cleaning cycles: one for old tapes, one for new. The unit, meeting all rehabilitation requirements for 9-channel and full-width tapes, features a single capstan to eliminate tape cinching, creasing, and deformation from excess tension. CYBETRONICS, INC., Waltham, Mass. For information:

CIRCLE 201 ON READER CARD

New programming aids cut non-productive time.

HEX-DEC ADDER for both hexadecimal and decimal-hexadecimal addition without conversion.

HEXAVERTER tables for easy, accurate conversions and dump analysis.

HEXADUMP OVERLAYS for fast location of data on dumps.

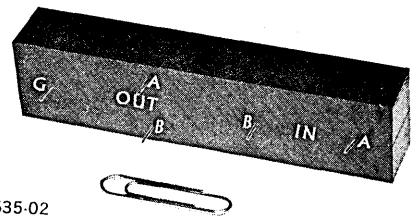
Programming tools from —

CC SYSTEMS, Inc.

P.O. Box 522 • Elmhurst, Ill. 60126

CIRCLE 63 ON READER CARD

PROTECT DATA INPUT LINES FROM TRANSIENTS



1635-02

Use Joslyn Communications Protectors. Choose from many models. Each designed to be connected in series with the data input line to provide positive protection for virtually the life of the products they protect.

NEW **Model 1635-02**—employs a tri-guard spark gap with common hermetically sealed gas chamber. Max. signal peak — 10 v; insertion loss at max. signal — <0.5 db; discharge rating — 10 ka at 10 x 20μs; transient into protector — 10 kv peak, 5 ka peak at 10 x 20μs; max. output volts — <120 at <0.2μs.

Series 1600 includes models featuring a maximum current surge rating of 40 ka at 10 x 20μs; also super precision, very low dc voltage breakdown, and wide band pass. Available in balanced-pair or coaxial single-ended configuration.

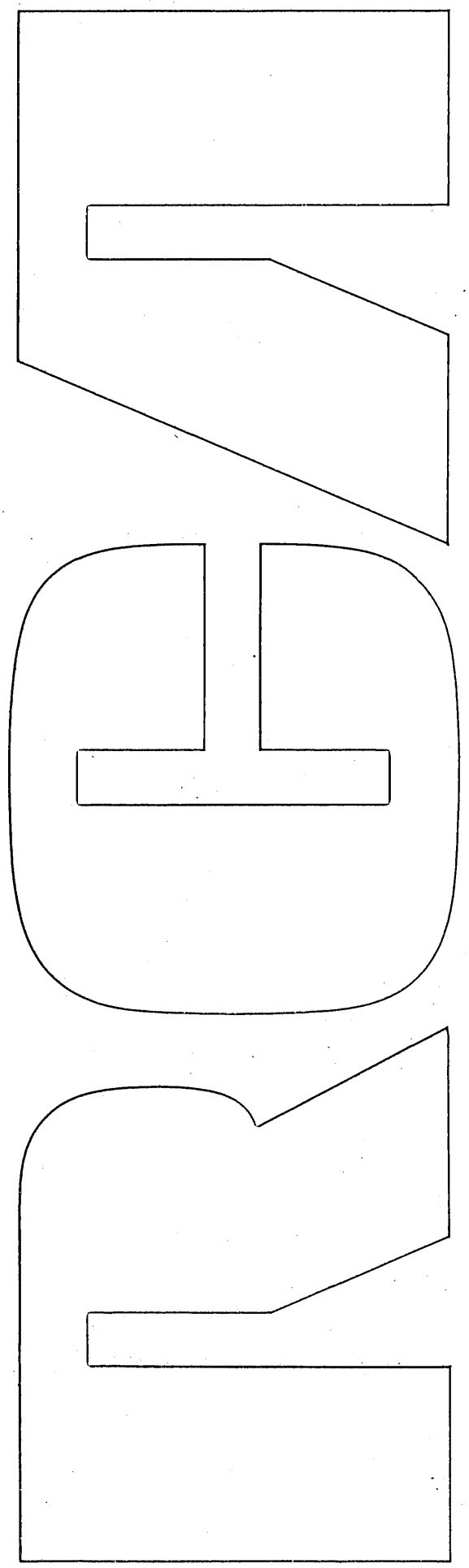
Series 1620 Balanced Pair Protectors feature low dc breakdown voltage from 2 v to 100 v, depending upon model.

Write or call today for full information. Joslyn Electronic Systems, Santa Barbara Research Park, P.O. Box 817, Goleta, California 93017. Tel. (805) 968-3551.

JOSLYN ELECTRONIC SYSTEMS

307

CIRCLE 64 ON READER CARD



If your programmers are waiting more and producing less talk to RCA

RCA's Spectra 70/46
Time Sharing Computer
gives them results in seconds.

Computers are in their third generation, but program preparation hasn't kept pace. Programmers still write, compile, test, modify, maintain and document programs on production-oriented batch processors.

It all gets done. Eventually. But each step means delay... hours, days, or even longer. Keypunching alone takes long enough. And programmers still have to wait their turns for the computer. *Again and again.* The process is frustrating, expensive and demoralizing.

RCA has a simpler way. The third-generation way . . . on-line program preparation and maintenance with the RCA Spectra 70/46 Time Sharing Computer. With Spectra 70/46, programmers working at remote video displays or teleprinters interact with the computer . . . at their convenience . . . any time, all the time . . . concurrently . . . step by step. And they get results in seconds or minutes.

Spectra 70/46 software has a lot to do with it. It provides programmers with the tools they need to perform professionally:

Command Language — for communication between the user and the system.

Data Management System — for cataloging and processing program files.

File Editor — for creating and modifying program files.

Interactive Debugging Aids — for monitoring program execution.

Desk Calculator — for calculating and checking intermediate arithmetic results.

COBOL Syntax Checker/Compilers for preparation of COBOL programs.

Conversational FORTRAN compatible with ASA FORTRAN IV Compiler.

Macro Assemblers, Assembly Diagnostics, RPG and utility programs.

Batch processing and problem solving are concurrent with program preparation. Based on equipment resources, you can run multi-programmed background tasks along with 48 interactive tasks from remote terminals. For high-powered computation by engineers, scientists, financial analysts, etc., Spectra 70/46 provides Basic Language and Conversational FORTRAN.

Save time and money. If programming preparation is cutting into the productivity of your high-rental computer system, equip your programming staff with the moderately priced Spectra 70/46. You'll be way ahead with faster programming preparation, faster turn-around time, earlier implementation of applications and happier programmers.

Let us show you this remarkable system in action. Write E. S. McCollister, RCA Information Systems, Camden, New Jersey 08101. Or phone (609) 424-2385.

RCA
Information Systems

CIRCLE 65 ON READER CARD

THE SPC-12 CONTROL COMPUTER NOW

and that's a mighty important difference

But it's not the only one. Start with a low price—$6400, and that includes a teletype interface, real time clock, control panel, priority interrupt and integral plug-in memory expansion.

With the software library and documentation, SPC-12 is a general purpose digital computer but with the complete line of functional modules, it can be tailored to dedicated applications.

Then, check these specifications: 4096 words of memory (8-bit bytes) expandable to 16K, with 2.2μ sec. cycle time; seven 12-bit registers, six addressing modes and over 400 powerful commands; plus a remarkable new *shared command* concept that increases memory efficiency by up to 35%.

Over 30 SPC-12's are already in the field being used for communication concentration and distribution, source data collection, computer peripheral device control, scientific instrument control, information processing, formatting and communication. If you act now, you can probably have an SPC-12 in your own system within 30 days.

the AUTOMATION PRODUCTS division of GENERAL AUTOMATION, INC.

706 West Katella, Orange, California 92667 (714) 633-1091

CIRCLE 66 ON READER CARD

new literature

EVALUATE T-S SYSTEM USAGE: 151-page report discusses a methodology—based on a study of the characteristics and design of present and proposed computer systems, as well as relevant behavioral theory and research—through which time-shared computer system usage can be evaluated. The categories of variables included in the methodology are measures of: 1) the cost of using the system; 2) the performance produced through use of the computer system; 3) the speed with which results could be produced; 4) the amount of learning resulting from the use of the system; and 5) the attitudes of the users of the system. AD-668 084. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

PORTABLE TERMINALS: Four-page brochure describes the company's two portable teleprinter data terminals, each including a teleprinter, an electronic control module, and a telephone coupler in two luggage-type cases. The terminals can be carried on trips, then acoustically or magnetically coupled to an ordinary telephone. The user can send typed input data to a computer and receive printouts. VERNITRON CORP., Farmingdale, N.Y. For copy:

CIRCLE 210 ON READER CARD

PLOTTER SOFTWARE: 12-page brochure describes SCOPLT (Scope Plot), a program designed for use with the IBM 2250 display unit and any CalComp digital plotting system, on-line or off-line, to automatically obtain a hard copy of any image which is displayed on the screen. CALIFORNIA COMPUTER PRODUCTS, Anaheim, Calif. For copy:

CIRCLE 211 ON READER CARD

OPTICAL SCANNING SYSTEM: Four-page brochure describes automatic input device which can read four machine codes in a single pass. No character recognition is involved, reportedly rendering higher accuracy and requiring less circuitry than character recognition equipment. Cost is less than $1,000/month for a programmable, off-line scanner. Sorting capability and listing and totaling accumulator are optional. CUMMINS-CHICAGO CORP., Chicago, Ill. For copy:

CIRCLE 212 ON READER CARD

INVENTORY CONTROL: Abbott Laboratories case history shows how the company has experienced a 7% reduction in inventory and realized "considerable" savings in labor costs due to timely, useful labor reporting using I-D-S (Integrated Data Store) file organization and maintenance technique and GEPEXS parts explosion system. GENERAL ELECTRIC CO., Phoenix, Ariz. For copy:

CIRCLE 213 ON READER CARD

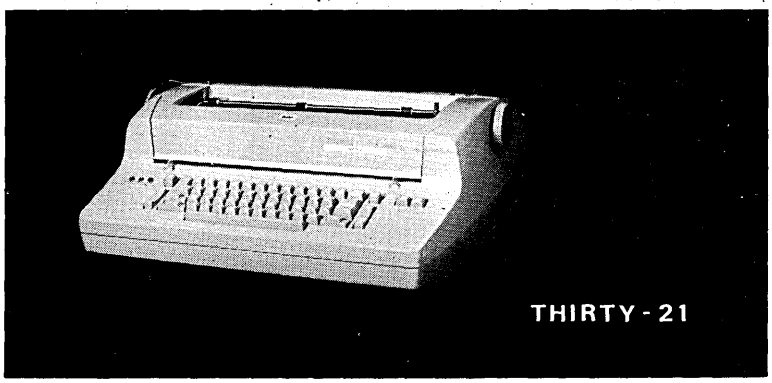
SYSTEM SELECTION: 60-page report develops a conceptual approach for evaluating and selecting among alternative edp systems proposed to meet a set of user needs by applying cost-effectiveness methods and techniques to the source selection problem. AD-667 522. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

ACM SEMINARS: Catalog describes the ten different tutorial and state-of-the-art seminars offered by the ACM's Professional Development Committee. These seminars will be held in 28 cities from August through December. ASSOCIATION FOR COMPUTING MACHINERY, New York, N.Y. For copy:

CIRCLE 214 ON READER CARD

N/C SYSTEM: Six-page brochure explains the Campoint system for computer-aided preparation of tapes for N/C machines. The system is said to make operation of tape-controlled, two-axis, point-to-point N/C machines 40-60% more profitable by cutting tape preparation time, providing more accurate tapes, and reducing manufacturing time. The brochure explains the step-by-step procedure for using the system to produce tapes with the aid of a remote terminal and special programming features. The service will eventually be available in all areas

See Datel . . . If your needs are immediate and your system requires an executive terminal . . . .



Brings the convenience of a sophisticated and advanced time sharing computer into any office or business.

As a conversational Data Terminal the THIRTY–21 offers the highest speed I/O rates in the lowest cost unit of its type on the market . . . ideally suited for applications requiring a conversational mode of operation such as text editing, on-line inquiry and response, scientific computation, program writing and many other uses.

As an Executive Typewriter the THIRTY–21 provides quality hard copy and complete type face selection in a compact 50 pound portable package. It does not require a special desk or console mounting. IBM 2700 Series compatible.

Datel CORPORATION
457 FORBES BLVD.
SO. SAN FRANCISCO, CALIF. 94080

FOR ADDITIONAL INFORMATION CALL OR WRITE:
CARL A. PENNING, Director of Sales
TEL. (415) 589-6913

CIRCLE 27 ON READER CARD

new literature

of the country. WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa. For copy:

CIRCLE 215 ON READER CARD

COBOL NEWSLETTER: The ACM's Special Interest Groups on Programming Languages and Business Data Processing have issued a joint newsletter containing the report of the COBOL Committee of CODASYL, "COBOL Extensions to Handle Data Bases." Cost: $2 ($1 in quantities over 50). ACM, 211 E. 43 St., New York, N.Y. 10017.

URBAN MANAGEMENT PROBLEMS: 51-page report, "Using Advanced Management Techniques," is a collection of three articles, written by city government people and staff members of Arthur D. Little, showing how scientific management techniques have already been applied to improve the efficiency of urban services and probing what may be done to broaden their use in the future. Cost: $3. COMMUNICATIONS SERVICE CORP., 1629 K St., N.W., Washington, D.C. 20006.

T-S SYSTEM: Eight-page brochure describes the 945 time-sharing system, which leases for less than $15K/month and features interactive, conversational service for up to 24 simultaneous users. Required peripherals are listed, and software is described. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For copy:

CIRCLE 216 ON READER CARD

UNIONS & TECHNOLOGY: 440-page study on the interrelationships between industrial cooperation and adjustment to technological change concentrates on these interrelationships as they are embodied in joint management-union committees (JMUC) and seeks to evaluate the potential and prospects of the JMUC's in the process of adjustment to technological change. PB-177 565. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

GP COMPUTER: Eight-page brochure describes system organization, hardware, software and peripherals for the H632 medium-scale system for real-time scientific and control applications. First in a family of IC computer systems, the 632 is a 32-bit machine with a memory expandable from 8,192 to 131,072 words and an 850-nsec cycle time. HONEYWELL COMPUTER CONTROL DIV., Framingham, Mass. For copy:

CIRCLE 217 ON READER CARD

MICROFILM INFORMATION SYSTEMS: Four-page bulletin describes family of microfilm information systems which can store 200,000 documents in a modular file requiring only 10 sq. feet of floor space, provide a look at any document in 6.5 seconds from either local or remote stations, provide hard or microfilm copies, and interface with a computer. MOSLER, Hamilton, Ohio. For copy:

CIRCLE 218 ON READER CARD

CORE MEMORIES: Four-page bulletin describes TB 402B, first in a new series memory systems featuring expandable capacities from 1,024 to 16,384 words of up to 36 bits each. Also detailed are complete specifications, I/O interface circuits, timing charts, and connector pin assignments. Delivery time of the "instant memories" is said to be less than three weeks from receipt of order. STANDARD MEMORIES, Sherman Oaks, Calif. For copy:

CIRCLE 219 ON READER CARD

INSTRUMENT COMPUTERS: 28-page brochure describes 1060 series of wired program instrument computers and their associated plug-in modules. Capabilities include signal averaging, time and amplitude distributions, pulse height analysis, and multi-channel scaling. FABRI-TEK INSTRUMENTS, INC., Madison, Wis. For copy:

CIRCLE 220 ON READER CARD

APPLICATION NOTE CATALOG: 16-page brochure gives title and a brief summary of more than 130 available papers describing circuit and system application designs. MOTOROLA SEMICONDUCTOR PRODUCTS, Phoenix, Ariz. For copy:

CIRCLE 221 ON READER CARD

PROCESS CONTROL INSTRUMENTATION: 20-page brochure describes the company's line of process control instruments, including strip chart recorders, solid-state digital indicator printers, and digital weight and force indicators. Application information, operating procedures, readout methods, power requirements, and accuracies are included. REVERE ELECTRONIC DIV., Wallingford, Conn. For copy:

CIRCLE 222 ON READER CARD

This is not an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

June 21, 1968

259,793 Shares

University Computing Company

Common Stock
(Without Par Value)

Price $120 per Share

Copies of the Prospectus may be obtained in any State in which this announcement is circulated from only such of the underwriters, including the undersigned, as may lawfully offer these securities in such State.

Kidder, Peabody & Co.
Incorporated

Blyth & Co., Inc. — Eastman Dillon, Union Securities & Co.

Lehman Brothers — Smith, Barney & Co. Incorporated — White, Weld & Co.

Bear, Stearns & Co. — Dominick & Dominick, Incorporated — Equitable Securities, Morton & Co. Incorporated

Goodbody & Co. — E. F. Hutton & Company Inc. — W. E. Hutton & Co.

F. S. Moseley & Co. — Shearson, Hammill & Co. Incorporated — Shields & Company Incorporated

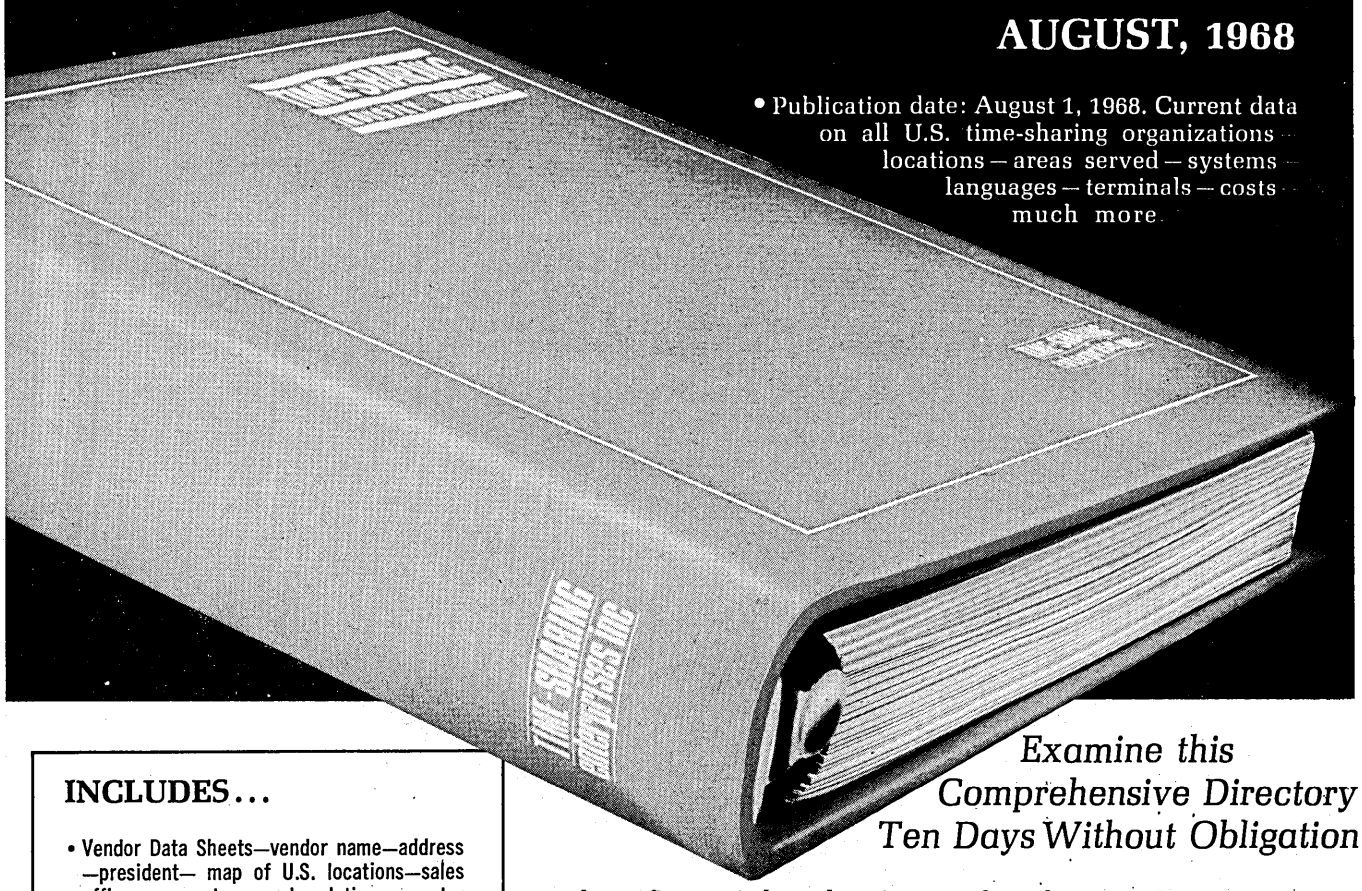
CIRCLE 77 ON READER CARD

First complete

Time-Sharing Industry Directory

AUGUST, 1968

• Publication date: August 1, 1968. Current data on all U.S. time-sharing organizations – locations – areas served – systems – languages – terminals – costs – much more.



INCLUDES...

- Vendor Data Sheets—vendor name—address—president— map of U.S. locations—sales offices—computers used—relative computer size and capability—terminals—languages—detailed cost of service—time-sharing or remote batch—calculation or business oriented—number of simultaneous users—communication lines available—core size— disc size and speeds—drum size and speeds—special features—special packages/applications—portable terminal rental or sales—front end computer....
- Fold-out charts of vendors by cities—fingertip reference showing cities where vendors offer their services—geographical concentration of vendor service—phone line capabilities....
- Fold-out charts of vendors by area codes—how phone charges can be reduced by use of local lines....
- Vendors by type of computer—time-sharing and remote batch equipment used....
- Time-sharing vendor selection—points to consider for both potential and experienced time-sharing vendors—how to rate a vendor—vendor rating forms—negotiating for a trial period—what to look for AFTER you have selected a vendor....

TIME-SHARING ENTERPRISES, INC.
151 W. 51st Street, New York, N.Y. 10019

Examine this Comprehensive Directory Ten Days Without Obligation

Industry first—an independent time-sharing consulting organization which neither sells computer time nor represents any vendor has *finally* published the first full scale, complete survey and analysis of the U. S. computer time-sharing industry.

The purpose of this DIRECTORY is to present each vendor service in as objective and complete a manner as possible and make it possible for you to • have all the information on the time-sharing industry at your fingertips • keep you updated on all new developments and changes as they occur through the updates • select the computer system most suitable to your organization and applications • identify the most suitable vendor with the system selected • compare the vendor's capabilities and performance with other candidates • compare vendor costs and fees • judge the vendor's capability of solving your problem.

The TIME-SHARING INDUSTRY DIRECTORY—1968 is presented as a deluxe volume of over 130 pages in a ring binder. Updated six times per year, with special sections to come. Now coming off the press, send for your copy without obligation by using the coupon below.

TIME-SHARING ENTERPRISES, INC. D1
151 W. 51st Street, New York, N.Y. 10019

Please mail to me as soon as it comes off the press (August 1, 1968), the TIME-SHARING INDUSTRY DIRECTORY–1968, under the following plan:

A _____copies of the DIRECTORY @ $75 ea. $_____. Includes all updates (total six) for 1 yr.

B _____copies of the DIRECTORY @ $50 ea. $_____. Updates NOT INCLUDED.

I understand that if I am not completely satisfied, I may return the DIRECTORY, within 10 days, without obligation and you will return my remittance.

☐ Check enclosed ☐ Bill me ☐ Bill my company

Name .....Title .....

Company .....

City .....State .....Zip .....

CIRCLE 69 ON READER CARD

EMR wanted a high-speed printer that their customers could forget!

...so they chose the data products LINE/PRINTER*

■ The Computer Division of EMR wanted a high-speed printer that would complement their exceptional 6000 and 6130 Computer Systems . . . a printer that would operate day after day without downtime and without stopping for periodic adjustments. They wanted *proven* reliability, the finest print quality available, and ease of maintenance.

Mission impossible? Not at all! The LINE/PRINTER is famous for providing these features to meet the rigid requirements of OEManufacturers . . . and more.

Data Products' exclusive one-piece print hammer is virtually friction-free, and requires no periodic adjustments. Freedom from wear reduces maintenance and downtime to a bare minimum. Controlled hammer flight time, short dwell time, and clutchless paper feed contribute to the sharp, non-smear print out that our customers' customers love to see.

Keep *your* customers printing . . . not adjusting. Write Data Products, 8535 Warner Drive, Culver City, Calif. 90230, for our latest LINE/PRINTER literature.

Data Products manufactures **LINE/PRINTER™, DISCfILE® , Core Memories, Tape Cleaners, Off-Line Printer Systems, Card Readers & Punches**

data products

"the peripheralists"

*Trademark of *data products corporation*

CIRCLE 70 ON READER CARD

people

Computer Usage Development Corp. has split its western region, formerly managed by **Bob Glaser,** into two regions, southwest and northwest, headed by **Elbert "Matt" Matthews** and **Ross Gwinner,** respectively. Both are vp's. Other new vp/regional managers are **George Tolis,** southeast; **Kevin Rogan,** midwest; and **Irving Kay,** N.Y. metro. . . . **Leonard J. Palmer,** president of Computer Servicenters, Inc., Greenville, S.C., has been elected president of ADAPSO for the 1968-69 association year. . . . **Ronald Kushner** has been appointed technical director, eastern region, for Information Management Inc. At IMI San Francisco headquarters, **Harry Hicks,** former director of applications services, is now director of consulting services. . . . **Dr. Jerre D. Noe,** exec director of computer planning and operations at Stanford Research Institute, has resigned to accept the posts of professor of computer science and electrical engineering and chairman of the computer science group at the Univ. of Washington. . . . **Lew Dumbauld,** Wabash Magnetics vp, has been elected vp of the company's Phoenix subsidiary, Peripherals Inc. . . . **James A. McCullough,** in charge of product management for edp systems at Burroughs, has been named vp, product management, and will assume the additional responsibility of product management for electronic and electro-mechanical accounting machines and systems and small applications machines. . . . **James E. Feely,** former director of corporate dp for Martin Marietta's Aerospace Group, has been named director of product marketing for the CDC 6000 series. . . . **Thomas R. Mulcahy,** former assistant director, is now director of Honeywell International Operations, EDP Div. . . . **Jerry L. Koory,** manager of systems programming for Programmatics, Los Angeles, has been named a company vp. . . . New director of the Computer Services Div. of Stadtler Research Laboratories is **William F. Schwartz,** former research chemist with Pennsauh Chemicals Corp. . . . **Robert Benjamin,** National Dairy Products Corp., is chairman of the steering committee formed to prepare operating rules and standards for The IV League, users group for Informatics' Mark IV file management system. . . .

Allan Rudell, ex-vp of administration for Honeywell's EDP Div., has been promoted to division vp and assistant gm. . . . **Donald A. Jackson** has been named assistant to the president of CSC's Computer Sciences Div. . . . **Charles R. Cole, Jr.,** has been promoted from director of sales to vp-sales at Scientific Data Systems, Santa Monica, Calif. **James Y. Payton** has been named

head of the company's new peripheral products div. . . . **Robert N. Verville,** formerly with Auerbach, has joined Philco-Ford's communications and electronics div. as marketing manager for the Computer Services Network, a new post. . . . **Ronald C. Mrachek** has been named vp of corporate development at Computer Planning Corp., Los Angeles. Prior to joining the six-month-old firm, he was with Control Data. . . . **E.G. (Bud) Shuster,** former vp, government marketing, for RCA EDP, Washington, D.C., is now president and chairman of the board for Datel Corp., South San Francisco.

manager's hint

System 360 users who don't work closely enough with OS/360 to keep up on current terminology can ask their friendly local IBM salesman for a copy of a document called "OS/360 Master Index." It's also called SRL C28-6644, and will allow you to quickly and easily look up terms you'd like to use intelligently with systems programmers who use the terms regularly. ■

IF YOU'RE BLOCKED IN YOUR CAREER

COBOL

CAREER OPPORTUNITIES BEYOND OLD LIMITS

Albert, Nellissen's language to get you further faster through the logical application of our in-depth knowledge of the computer marketplace. Not just a job! But a challenging rewarding opportunity for creative personal progress.

CAREER OPENINGS EUROPEAN AND NATION WIDE $10,000—$40,000

- ☐ Software Development
- ☐ Time Sharing Systems
- ☐ Logic/Digital Design
- ☐ Management Sciences
- ☐ Real Time Systems
- ☐ Sales and Marketing
- ☐ Scientific Computation

Unique opportunities exist in the $9000-25,000 class for Managers and Men who can accept management responsibility and professional growth.

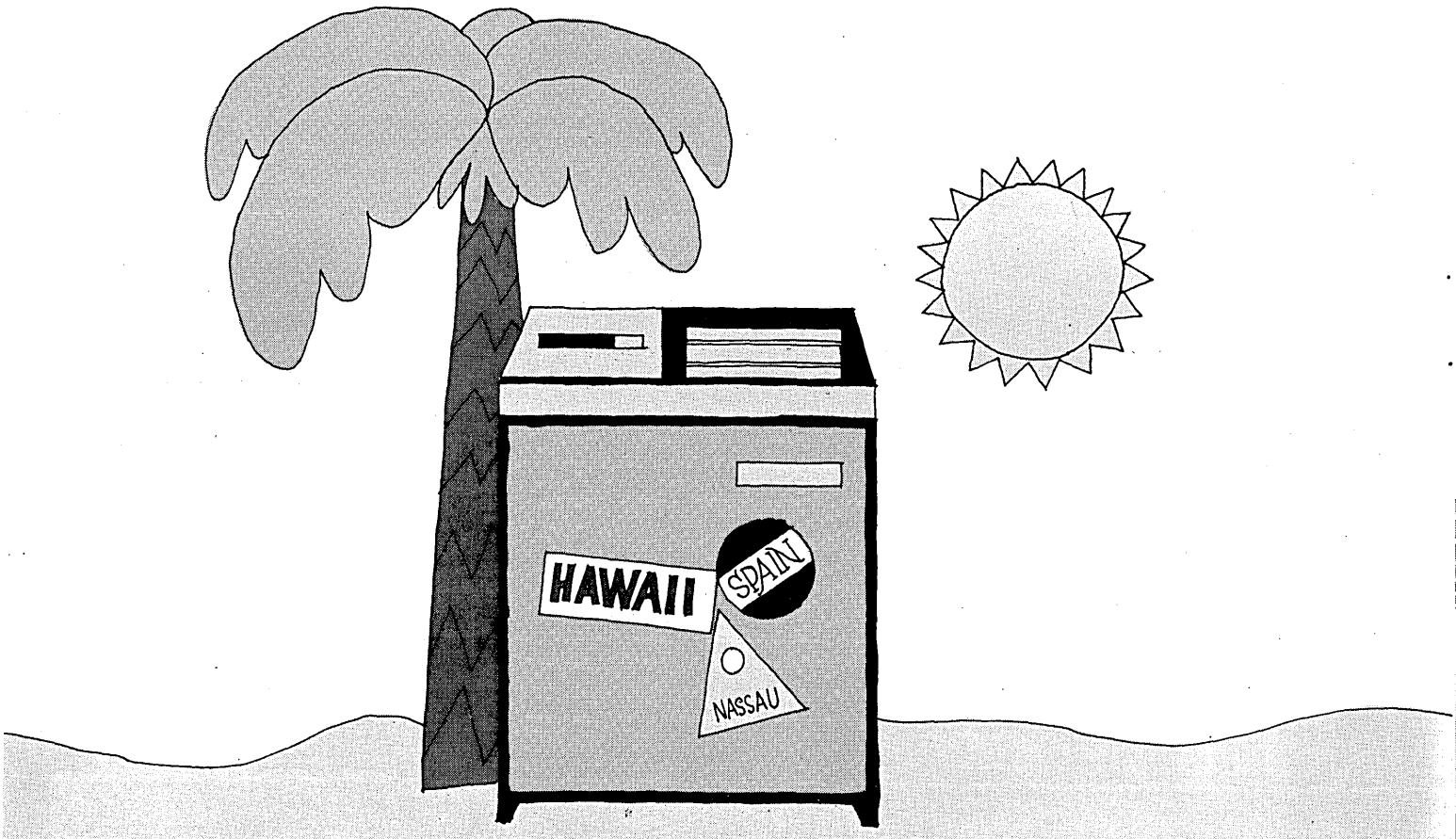
DIRECT SALES/MKTG
Hardware & Services
TO $30,000

All expenses are assumed by our client companies

Write in confidence, including present salary, acceptable locations or call (Collect) Mr. Nellissen (Area Code 212) PLaza 9-1720

a&n
ALBERT, NELLISSEN, INC.
Leading Consultants to Management in the Data Processing Field
510 MADISON AVE., N.Y., N.Y. 10022

CIRCLE 300 ON READER CARD



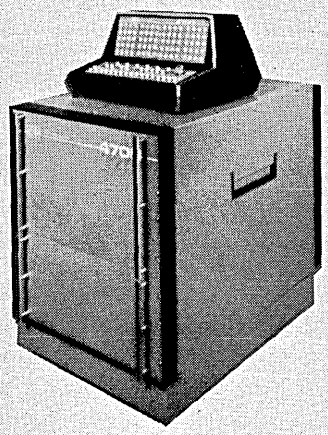
Why settle for a computer that spends most of its time on vacation?

SCC's 4700 is the first SMALL machine you can multiprogram around the clock!

When you pay good money for a computer, you're entitled to full utilization. That's what you get with SCC's optional memory mapping and protection features in the **NEW** SCC 4700 IC Computer. This **16-BIT** machine has the best environment yet designed for a **background/foreground** situation. You can control processes in a large industrial plant, for example, while your engineers use this machine at the same time to check out programs.

CHECK THESE OPERATIONAL CHARACTERISTICS:

- Cycle Time ..... 920 Nanoseconds
- Add/Subtract ..... 1.84 Microseconds
- Multiply ..... 6.67 Microseconds
- Divide ..... 6.90 Microseconds
- Double Precision Multiply ..... 15.64 Microseconds
- Double Precision Divide ..... 15.64 Microseconds
- Floating Point Multiply ..... 19.00 Microseconds
- Floating Point Divide ..... 19.00 Microseconds



CHECK THESE DESIGN FEATURES:

- Microprogrammed — implements use of optional instructions and simplifies maintenance.
- Multiplexer Channels — up to 2 channels that will handle 64 devices per channel operating simultaneously in block transfer mode.
- Selector Channels — up to 2 high speed channels that will handle 64 devices per channel.
- Double precision and floating point arithmetic packages.
- Hardware Multiply/Divide.
- Bit Slice Arrangement — simplifies maintenance.
- Fast Memory — 4K 16-bit word expandable to 65K 16-bit words.
- ASR 33 Teletype with pin-feed platen.
- Real Time Monitor. • FORTRAN IV.
- Flexible Communications Capability . . .
  - — 32 full duplex lines per channel
  - — Handles wide variety of speed dependent and user oriented remote devices
  - — ASCII Compatible
  - — Modular construction permitting system tailoring to specific user needs.

CHECK THIS PRICE — BASIC SYSTEM UNDER $15,000

Whatever your computer application — be sure you talk with SCC before you buy.

Scientific Control Corporation

P.O. Box 34529 • Dallas, Texas 75234 • 214 — 241-2111 • TWX 910-860-5509

EASTERN REGION
7100 Baltimore Ave., Suite 105
College Park, Maryland 20748
301 - 779-2510

Holiday Office Center, Suite 96
Huntsville, Alabama 35801
205 - 881-8805

1222 Route 46, Suite 217
Parsippany, New Jersey 07054
201 - 335-3001

2024 Riverdale Street
West Springfield, Massachusetts
01089
413 - 781-0063

CENTRAL REGION
612 Exchange Bank Building
Dallas, Texas 75235
214 - 358-1331

International Trades Building
400 Brookes Drive, Room 125
Hazelwood, Missouri 63042
314 - 864-6291

WESTERN REGION
780 Welch Road, Suite 208
Palo Alto, California 94304
415 - 328-8980

306 Hirschmann Building
9550 Flair Drive
El Monte, California 91731
213 - 443-0143

CIRCLE 71 ON READER CARD

books

The Art of Computer Programming. Volume I: Fundamental Algorithms, Donald E. Knuth, Addison Wesley Publishing Company, 1968. $19.50.

This book's content and intent are best summarized by the following extracts from the preface.

"This book is the first volume of a seven-volume set of books that has been designed to train the reader in the various skills which go into a programmer's craft . . . I have tried to write this set of books in such a way that it will fill several needs. In the first place, these books are reference books which summarize the knowledge which has been acquired in several important fields. They can also be used as text books for self-study or for college courses in the computer and information sciences . . . This set of books is intended for people who will be more than just casually interested in computers, yet it is by no means only for the computer specialist. Indeed, one of the main goals has been to make these programming techniques more accessible to the many people working in other fields who can make fruitful use of computers, yet who cannot afford the time to locate all of the necessary information which is buried in the technical journals . . . The subject of these books might be called 'nonnumerical analysis.' . ... The results of the recent research in nonnumerical analysis are scattered throughout numerous technical journals, and at the time of writing they are in a somewhat chaotic and disorganized state. The approach used here has been to study those techniques which are most basic, in the sense that they can be applied to many types of programming situations; I have attempted to coordinate these into more or less of a 'theory,' and to bring the reader up to the present frontiers of knowledge in these areas. Applications of these basic techniques to the design of software programs are also given . . . The following chapters are *not* meant to serve as an introduction to computer programming; the reader is supposed to have had some previous experience. . . . The reader should have already written and tested at least, say, four programs for at least one computer."

Professor Knuth has undertaken a monumental task. And in this first volume he has set a high standard for the entire set. One cannot really be sure of a textbook until it has been tested in the classroom situation. Nor can one be sure of the set's usefulness as a reference book for nonspecialists until the material covering other than the fundamentals becomes available. But my extrapolation of Volume I suggests that the set will meet these needs, and the reference needs of the computer specialist, not only in a way that is satisfying compared to other available sources of information but satisfying in some absolute sense as well. Within the intended scope of the first volume, the material is well organized, the coverage relatively complete, and the writing of such style and clarity that it becomes a pleasure to read.

Again, quoting from the preface,

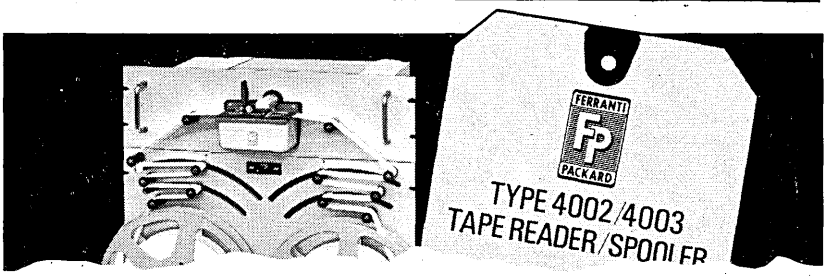
"The present volume may be considered as the 'intersection' of the entire set of books, in the sense that it contains the basic material that is used in all the other volumes . . . Volume I is not only a reference book to be used in connection with Volumes II through VII; it may also be used in college courses or for self study as a text on the subject of *data structures* . . . or as a text on the subject of *discrete mathematics* . . . or as a text on the subject of *machine language programming*."

(These suggested topics correspond rather directly to three courses in the proposed ACM undergraduate curriculum in computer science.[1] Although additional readings would in general be used, this volume does supply much of the material suggested for each of those courses.)

Chapter 1—Basic Concepts includes sections on algorithms, mathematical preliminaries (covering such topics as mathematical induction, integer functions, permutations and factorials, generating functions, asymptotic representations, among others), an "ideal" computer and its assembly language, and some fundamental programming techniques (such as sub-routine, coroutines, interpretive routines, input and output).

Chapter II—Information Structures includes sections on linear lists, trees, multi-link structures, and dynamic storage allocation. Interspersed in this material are exercises, graded as to relative difficulty and mathematical sophistication required, and historical-bibliographical notes on the development of the various ideas and tech-

[1] ACM Curriculum Committee on Computer Science, "Curriculum 68, Recommendations for Academic Programs in Computer Science," CACM, vol. 11, no. 3, March 1968.



We've taken our 1000 C.P.S. Paper Tape Reader/Spooler, slowed it down to 300 C.P.S., halved the price...

...and come up with a dependable unit that can't be matched in terms of quality, economy and delivery.

Medium speed range — up to 300 characters/second — photoelectric sensing — stops on character at 300 characters/second — bidirectional — silicon logic — tried and tested design concept and components — off the shelf delivery from mid 1968 — low unit price of $1,200.00. For complete details, write, wire or phone.

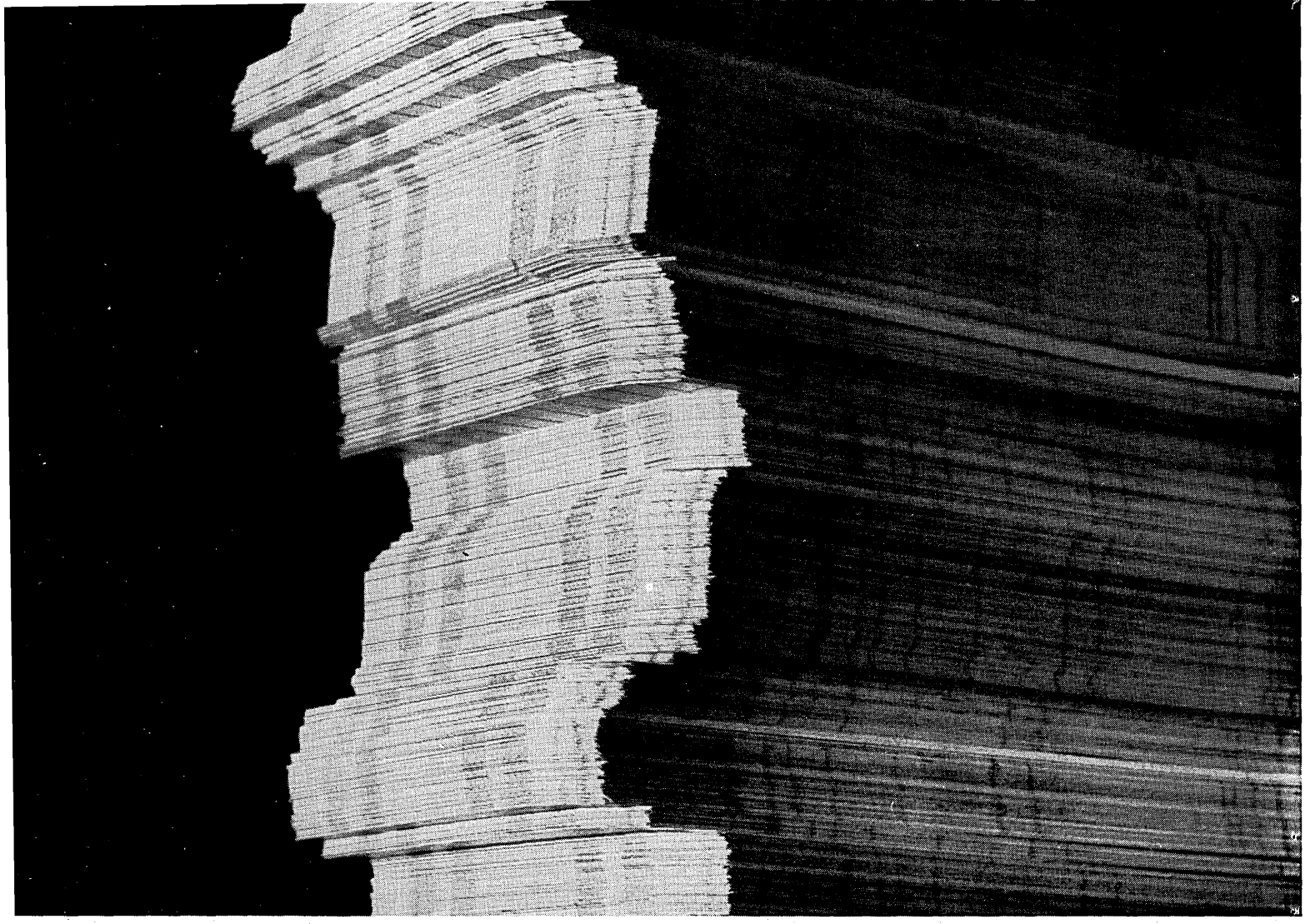
FERRANTI PACKARD

FERRANTI-PACKARD ELECTRIC LIMITED

ELECTRONICS DIVISION • TORONTO 15 • ONTARIO • CANADA

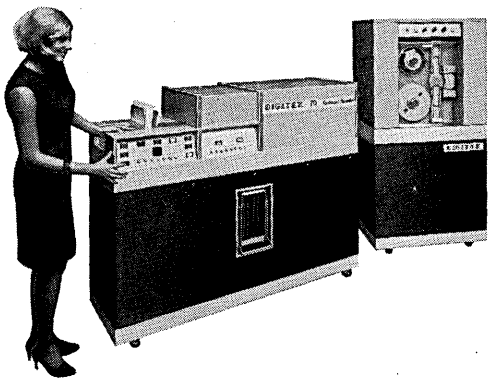
AREA CODE (416) 762-3661 TWX (610) 491-1434 6712

CIRCLE 28 ON READER CARD



Each of these 2500 keypunch cards is a thing of beauty.

Also time-consuming, costly, unnecessary.



We suggest you eliminate them once and for all time. You can because there is a better, faster, more accurate and economical way to feed your computer: the Digitek 70 optical scanning system.

This versatile system thrives on input volume. It reads pencil marked (original) documents at the rate of 2500 per hour and transfers information directly to magnetic tape—ready for your computer. The Digitek 70 not only eliminates intermediate steps of keypunching and key-verifying, it also reduces errors and speeds up computer scheduling for greater utilization.

When you give up the card idea you gain ground on a function that accounts for as much as 35% of the total cost of your computer operation and up to 90% of time delays. Give up?

Write today for information on this and other Optical Scanning systems that read a variety of hand- or machine-printed source documents.

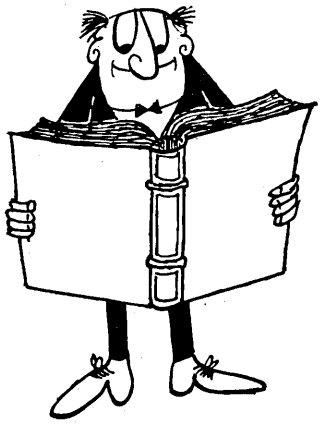
OPTICAL SCANNING CORPORATION

Newtown, Pennsylvania 18940 Phone (215) 968-4611

CIRCLE 72 ON READER CARD

niques presented in the preceding sections.

Two themes run through these sections. One is an emphasis on analysis, on the careful examination of an algorithm to study its properties and to compare it with other possible algorithms for accomplishing the same task. The material is arranged in such a way that the need for mathematical sophistication increases as one continues in a section; the reader interested in pro-



gramming and not wanting to be "bothered" with the mathematics will be able to read for a while and then skip to the next section. However, I suspect that he will find it difficult to skip in this way continually, but rather will be caught up in the business of seriously analyzing algorithms to see what it is that they do indeed do. For this aspect of the presentation, many teachers will be grateful. Too often we have postponed the emphasis on the analysis of algorithms and programs, despite feeling that it must be an important part of any computer scientist's development, on the grounds that we must first present all sorts of techniques and tools, *after which* we can perhaps suggest how these techniques and tools might be used *sensibly*. "Afterwards" often turns out to be too late. Knuth shows us how it should be done.

The second theme is the use of machine language programming as a means of presenting the algorithms to be studied, using an "ideal" machine developed specifically for this purpose. Knuth justifies the choice of a machine language, rather than higher-level language, presentation on the grounds that:

- Algebraic languages are more suitable to numerical problems than those considered here;
- By writing in machine language, the programmer will tend to use a more suitable method;
- The programs required here are all rather short and so will be rela-

Pick your spot at McDonnell Douglas:

East, Midwest, or West.

We have immediate openings for data processing professionals in St. Louis, Southern California, New York, and Washington, D.C. Just indicate your location preference on the coupon, and we'll do the rest.

We're looking for systems analysts, programmers, math modelers, information system specialists, computing engineers, engineering and business consultants, accountants, sales engineers, computer-oriented marketing representatives, and other experienced data professionals.

You'll find what you're looking for at McDonnell Douglas: R & D programs; real-time, on-line systems; business, scientific and software programming; and management information systems – to name just a few activities.

You'll find opportunities in commercial data service at our McDonnell Automation Company Datadromes and in engineering, scientific and business computing and data processing at Douglas Aircraft Company, and in our Information Systems Subdivision.

To arrange an interview, mail the coupon today; please attach your current resume, if available.

Mail to: Mr. W. R. Wardle, Professional Employment, Box 14308, St. Louis, Mo., 63178
or: Mr. M. M. Kilgore, Professional Employment, 3000 Ocean Park Blvd., Santa Monica, Calif. 90406

Name_____

Home address_____

City & State_____ Zip Code_____ Phone_____

Education: BS_____ (date) MS_____ (date) PhD_____ (date) Major Field_____

Primary experience area_____

Present position_____

Location: East ☐ Midwest ☐ West ☐ Best Opportunity ☐

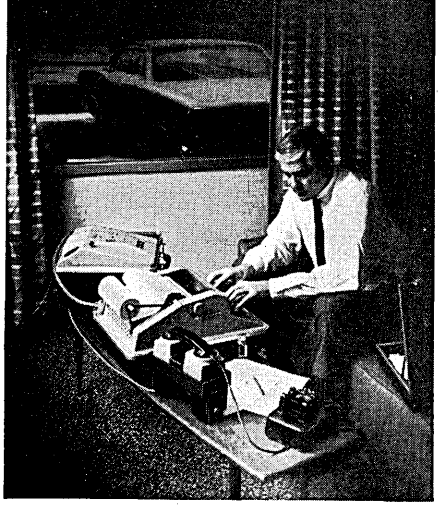
D-8

MCDONNELL DOUGLAS

An equal opportunity employer

CIRCLE 302 ON READER CARD

TAKE YOUR COMPUTER WITH YOU!



Model VDT-2 DATAPORT Portable Terminals

- ☐ complete with teleprinter
- ☐ luggage cased, under 40 lbs/case
- ☐ full TTY 33-type terminal functions
- ☐ half/full duplex modes

Model VDT-2 is a complete time-sharing terminal including teleprinter, data set and coupler. All model TTY-33 teleprinter features are included for compatibility with almost all known time-sharing offerings.

Packaged in two sturdy luggage type cases, the entire terminal is safely transportable and relatively light weight. An exclusive magnetic/acoustical telephone coupler allows clear transmission and reception of data even under poor telephone line characteristics.

Write for Brochure

VERNITRON CORPORATION
50 Gazza Blvd.
Farmingdale, N.Y. 11735
Call (East Coast) 516-694-5002
(West Coast) 213-328-2504

CIRCLE 22 ON READER CARD

books

tively easily understood;

Any person more than casually interested in computers should be familiar with machine language; and

Some of the exercises and topics considered require the use of machine language, if not for programming the exercise, then as the output of the exercise.

While my personal preference would be to base the exposition on a higher level language, it is very difficult to argue with a good job well done. Knuth has capitalized well on the use of a machine-level language in the various analyses of algorithms and their timing considerations, perhaps far beyond what could be done with a higher level language. Given the overall value of the presentation, I am certainly willing to devote some of my time to understanding this ideal computer. (However, Knuth suggests that one hour is a sufficient time to become familiar with his machine. My experience indicates that this is an underestimate by a factor of three or four.)

There are aspects of the presentation to which one might object, of course. Consider the following property of the ideal computer (MIX).

"Each byte holds an *unspecified* amount of information, but it must be capable of at least 64 distinct values . . . Furthermore, each byte contains *at most* 100 distinct values . . . MIX has a peculiar property in that it is both binary and decimal at the same time. *The programmer doesn't actually know whether he is programming a machine with base 2 or base 10 arithmetic.*"

(On the other hand, it is quite possible to use most of the text, and to follow the algorithms presented, without understanding MIX at all. Most algorithms are presented in an English language format and/or flow charts in addition to the MIX program.)

And I feel a useful distinction can be made between data structures, representing logical relationships among problem elements, and storage structures as the embodiment in computer storage of these data structures (a notion developed, for example, by M. E. D'Imperio[2]). No such distinction is made in the chapter on information structures, with the result that the grounds of discussion sometimes shift back and forth between notions of required logical relationships and particular ways of implementing those relationships in storage, without the shift being clear.

But over-all this is an excellent volume. It will influence how many courses are taught and how many programs are constructed. It should be in the personal library of any serious practitioner or student of computer science.

What about the price ($19.50)? (The preface to Volume I suggests that a shorter version of this set of books will soon be published, intended to serve as a more general textbook for undergraduate computer courses.) Lacking some classroom evaluation, I chose to make the book a recommended (but not required) text for a course on information structures. The library placed enough copies on reserve to provide one for every three to four students in the course. The local bookstore has followed their ordering heuristics for recommended books; they have not been able to keep any in stock. At least locally (University of California at Irvine), the evidence is that even at $19.50 book is well worth the price. —FRED TONGE

book briefs

(For further information on the books listed below, please write directly to the publishing company.)

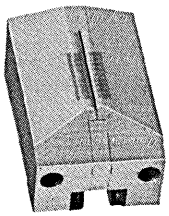
***Elements of IBM 1130 Programming*, by Wilson T. Price. Holt, Rinehart and Winston, Inc., New York, N.Y. 1968. 484 pp. $9.95.**

The fundamental concepts of stored programs computers—including a history of data processing—are presented and explained via a thorough examination of the IBM 1130. Although primarily an introductory text, discussions on the use of IBM-supplied subroutines and the principles of employing 1130 hardware interrupt features may interest advanced students.

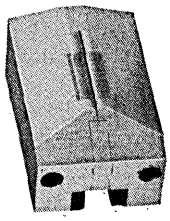
***An Introduction to ADP for Wholesalers*, by George C. Webster. National Assn. of Wholesalers, Washington, D.C. 1966. $10.**

A loose-leaf book in eight chapters, this guide is intended to orient wholesalers to the data processing field. Topics include: selecting the right adp system, analyzing your adp needs, installing the system, making effective use of the system, adp and management information.

[2] D'Imperio, M. E., "Data Structures and Their Representation in Storage," in *Annual Review of Automatic Programming 5*, Pergamon Press, 1968.

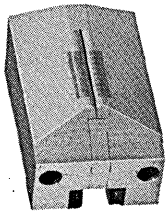


CEC digital recording heads don't exactly live up to their guarantee.



It's a matter of recorded history that they live far beyond it. Case on record: the *first* magnetic tape head replaced in a certain military data-processing installation in Germany logged more than 10,000 hours—or *five times the guaranteed life.*

An atypical performance perhaps? Yes. It was *subpar.* Unit records show an *average* utilization in excess of 12,000 tape passing hours. And a peak head life of 16,000 hours. The system operates around the clock at 120 ips.



CEC has conquered the tape head aging process through use of advanced materials developed by Bell & Howell's Research Center. The upshot has been outstanding magnetic properties, an extremely low wear rate...and Methuselahian life-span.

You're assured that, whatever make or model recorder you're using, we've got the head for it. Regardless of interface parameters. And, although we're alone in guaranteeing our heads for 2000 hours, you're assured we try never to live down to it.

That's why we're known as the old heads in the business. For all the facts on the complete line, call your nearest CEC Field Office. Or write Consolidated Electrodynamics, Pasadena, California 91109. A subsidiary of Bell & Howell. Bulletin Kit 1711-X1.

CEC/DATA INSTRUMENTS DIVISION

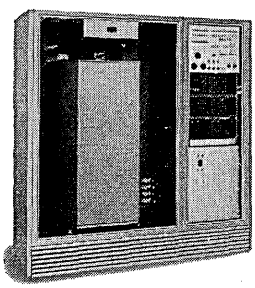
BELL & HOWELL

CIRCLE 73 ON READER CARD

Buy as much of our plug-in mass storage system as you need at 27¢ a thousand characters.

You can start with one Bryant memory drum or disc file and end up with as many as eight. Increasing your system's capacity from 8 million to 5 billion characters. All at 27¢ a thousand characters anywhere along the line.
And there's plenty to offer for the money.

For example, the universal controller system interfaces to just about any computer made with the push of a plug. It can operate in several different modes, both serial and parallel. It features word transfer rates from 50 microseconds to 900 nanoseconds per word—to and from two computer central processors. And it comes with a software package, complete with handler and maintenance routines (if specified).



XLO-1000 Controller plug-in Auto-Lift Drum System

Skeptics beware. We're out to make Bryant Believers out of you. Write and see. Ex-Cell-O Corporation, Bryant Computer Products, 850 Ladd Rd., Walled Lake, Michigan 48088.

BRYANT COMPUTER PRODUCTS

XLO®

EX-CELL-O CORPORATION

CIRCLE 74 ON READER CARD

world report

BRITISH GOVERNMENT HITS IBM PRICE HIKE

IBM has emerged badly mauled from an investigation by the British government into its pricing structure. The Prices and Incomes Board, a department set up to monitor inflationary rises in prices, incomes and dividends, opened an inquiry in April following an appeal from the IBM users association. An inquiry was called for because IBM hiked all its prices by 10%. Rents went up by the same proportion for obsolescent machinery as for new contracts. Viewing this as highhanded, the users club unanimously decided to appeal to the board. Club secretary David Gourlay forwarded the request.

Ironically for IBM, David Gourlay is an ex-IBM-er with nine years of computer selling behind him, three of them managing one of IBM's sales territories. Pleading that earlier devaluation of the pound had affected trading balance, IBM said the rises were justified. In reply the board accepted increases for new business, but proposed a 7% hike for pre-'68 contracts and 5% on anything more than four years old. The government report acknowledged increases in IBM costs in continued software and service maintenance. But in so doing it made the best case yet for splitting hardware and software. What has shaken IBM right back to its suburban foundations in Armonk was the Prices and Incomes Board attack on its inflexible standard contract. The report says, "In our investigation we have been impressed by a certain amount of frustration evinced by customers in the face of inflexibility displayed by IBM over the financial arrangements they offer. The rental contract, with all the services it offers, cannot readily be varied, and in the normal course of events the customer accepts all these events or none. The company's position is made so clear that customers do not perhaps go to very great lengths to change that attitude; the result is that the company are under the impression, which they conveyed to us, that there is little or no demand for variation."

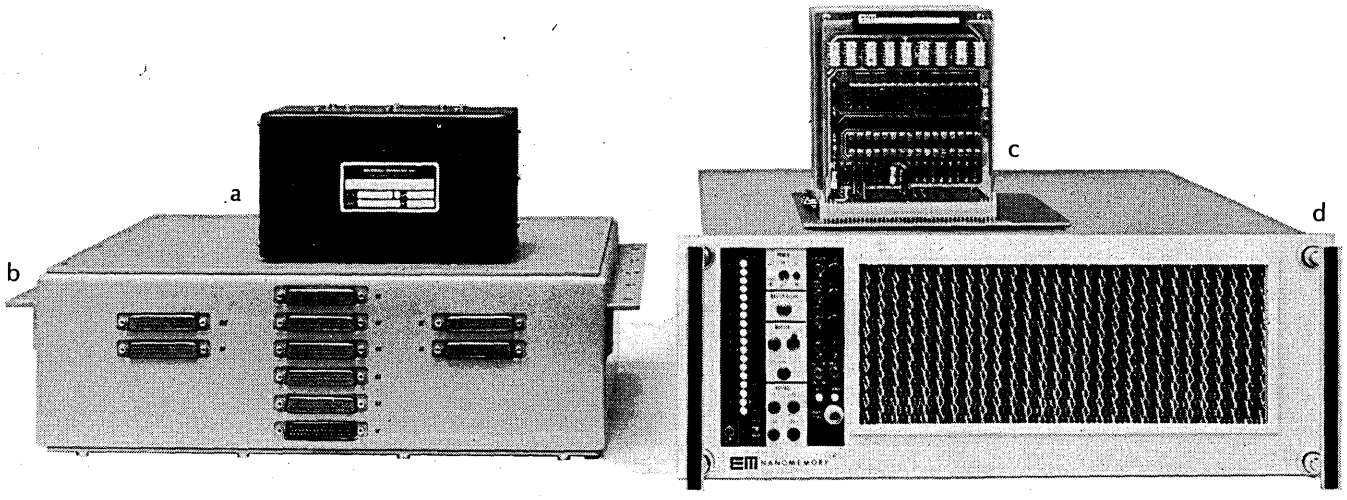
The board recommends an increase in rentals from 12-month to 24-month agreements with six months' notice on either side -- and a sliding scale rental for long-term customers. Report: National Board for Prices and Incomes. Report No. 76. Increase in Rental Charges for Equipment Hired IBM United Kingdom Ltd. Price two shillings (25 cents) from Her Majesty's Stationery Office.

PHILIPS' COMPUTER LINE NOW OFFICIAL

After the years of speculation, the Dutch Philips group has formally announced its production plant at Apeldoorn and unveiled its series of machines. The P1000 series now gives the Dutch giant a spread from programmable desk calculators through accounting machines to the big stuff. Marketed as Philips Data Systems, the computer range is made by NV Philips-Electrologica, with software from Computer Systems International in which the manufacturer has a big stake. The initial series consists of three machine

two hawks

two doves



These two military and two commercial memories round out the broadest system line in the industry. Whatever your environmental requirement, we have a system to meet it. And we have it available right now.

There are other advantages in letting us build your system. The design techniques we've mastered for our military memories have been adapted for our commercial devices. You get the benefit of features like pluggable stacks and electronics for easier maintenance, integrated circuits for increased reliability, and space-saving design concepts.

Brief specs are listed below, but for the full story write to Electronic Memories, Inc., 12621 Chadron Avenue, Hawthorne, California 90250.

(a) SEMS 5—Designed for airborne applications, the SEMS 5 has a 2 microsecond cycle time, packs 131,062 bits into only 132 cubic inches and meets applicable portions of MIL-E-5400, MIL-E-4158, and MIL-E-16400.

(b) SEMS 7—Developed for ground based applications, this rugged memory has a 2 microsecond cycle time, a 327,680 bit storage capacity and meets applicable portions of MIL-E-4158, MIL-E-16400 and SCL-6200.

(c) MICROMEMORY™ 1000—Taking up only 400 cubic inches, the 1000 features a 32,768 bit capacity and a 2.5 microsecond cycle time. It uses a unique 3D drive configuration permitting a particularly low component count, with correspondingly high MTBF, and a price less than 10 cents per bit in small quantities.

(d) NANOMEMORY™ 2000 SERIES—Combining integrated circuit electronics and a unique 2½D drive system, the 2000 Series has a 294,902 bit capacity, cycle times of either 650 or 900 nanoseconds, and a configuration measuring only 21.5 inches deep by 19 inches wide by 7 inches high, including power supply and optional tester.

EM electronic memories

CIRCLE 75 ON READER CARD

groups with three models in each group. Group one is 14K-64K store, group two 64K-256K, and group three 128K-512K. The memories are 0.96 usecs with effective access time of 0.25 usec. These can be complemented by auxiliary (and cheaper) memories of a basic 2.5 usec cycle time with 1.25 usec effective working. Really a 32-bit-word machine, the designers bow to convention in packing it as 4 x 8 bits -- but refuse to be swallowed by the byte and steadfastly call them octads. A 200-instruction set is split into basic, decimal, floating point and stack operations. Software packages fall back on Philips' own in-house developments, and a language mix of Algol, Fortran and Cobol shows strong European connections. The bulk of software for operating systems up to the size of big time-sharers reflects Computer Sciences' experience.

First orders have already rolled in from the Dutch government and more are promised. The first is a $1.3 million contract for the Dutch Post Office.

To back Philips' crash programme on leasings, the biggest Euroloan yet achieved on the European money market has been raised. The $100 million is in process of underwriting by N M Rothschild and Sons, London, the Amsterdam-Rotterdam Bank, and Heldring and Pierson, New York.

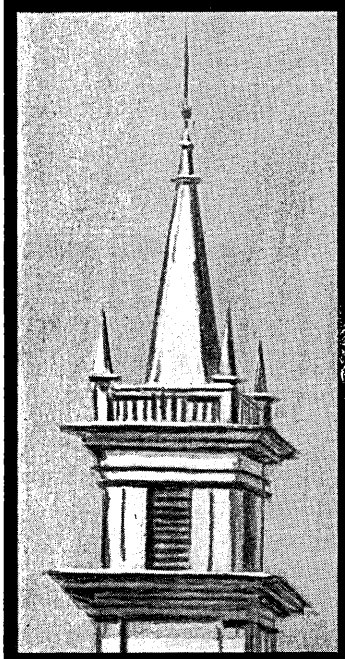
U. K. TIME-SHARERS DEMAND BETTER LINKS

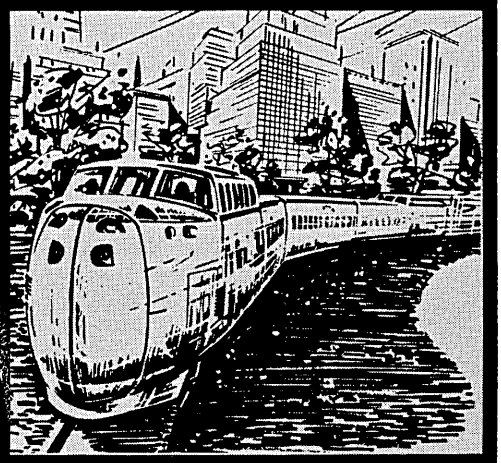
The British Post Office came under heavy fire in July from major time-sharing users demanding a better and guaranteed service for communications links. At a meeting convened for government departments, Members of Parliament and big users, the case for a serious independent capital programme to upgrade the data communications service -- available only from the Post Office -- was put.

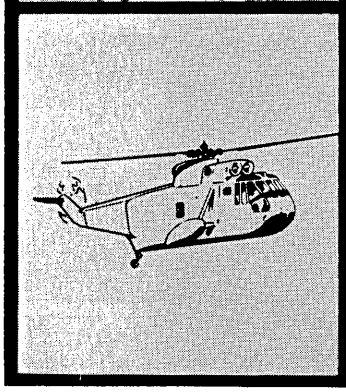
The Post Office is resisting pressure, but it may now accept for trial an idea that has emerged from another government research group at the National Physical Laboratory -- a body similar to the U.S. Bureau of Standards. A scheme there has completed a year-long test for building a dedicated data communications network within the public switched telephone system. (IBM has apparently looked at the project and AT&T has a beady eye on its potential.) The principle is straightforward and has been used in miniature to tie all NPL's laboratories into its time-shared centre. It divides data calls into two groups. The short-haul ones of 25 miles or less can be made without excessive cost over the existing public switched network. But a change is made for the long-distance traffic. Instead of establishing a dedicated line between transmitter and receiver for each call, the practice is to feed all users into a special editing and concentrator unit at the nearest trunk exchange.

The data is packaged in a standard length with a source and destination address and sent over high-speed lines along major trunk routes and unpacked for distribution at the other end. This project has been directed by D. W. Davies. If it gains acceptance it could appeal to machine makers because it would cut out some of the additional hardware for communications that is added to the modem end of the system.

• PROGRAMMERS AND ANALYSTS •







. . . in our

SCIENTIFIC & COMMERCIAL COMPUTER-BASED ANALYSIS & DESIGN SYSTEMS

You can. You'll like what you see at Sikorksy Aircraft—a company dedicated to producing the most advanced VTOL airborne and surfaceborne transportation systems.

And you'll like working with a select group of stimulating, top-talent people . . . on abundant and provocative challenges. You would be applying your professional talents to specifying, designing and implementing advanced computer-based technical and commercial systems.

Our current equipment includes Univac 1108's and IBM 360's with Graphics and Teleprocessing.

Current and planned applications include—

Scientific: Man/Machine Interactive Graphics in Engineering Analysis and Design.

Development of Batch Programs and Systems in all engineering disciplines.

Commercial: Data Base and Real Time applications in Accounting, Manufacturing, Purchasing, Inventory Control and other related areas.

We have exceptional assignments at all levels of experience for:

COMPUTER SYSTEMS PROGRAMMERS AND ANALYSTS FOR BOTH COMMERCIAL AND SCIENTIFIC FIELDS

You and your family will find the unique cultural and recreational advantages of pleasant Connecticut to be abundantly satisfying. And our interest in your continuing professional development is exemplified by our corporation-financed Graduate Education Programs. They are available at these fully accredited schools: Bridgeport • Brooklyn Poly • CCNY • Columbia • Connecticut • NYU • Rensselaer (Hartford Grad. Center) • Stevens • Trinity • Yale.

Send your resume in confidence, stating salary requirements, to Mr. Leo J. Shalvoy, Professional Employment.

Sikorsky Aircraft

U
A

DIVISION OF UNITED AIRCRAFT CORPORATION

STRATFORD, CONNECTICUT

An Equal Opportunity Employer

CIRCLE 332 ON READER CARD

EDP MANAGERS
SENIOR ANALYSTS
SOFTWARE SALESMEN

One of our clients is interested in providing initial financing for the establishment of a new 'software' organization to render complete range of computer based services.

If you are stymied, unhappy with your present position, and have the desire, stamina and courage —together with original constructive ideas—to go into business as executive and one of the principal stockholders of a new company, this is your opportunity to participate in the present software business boom.

Persons with long and outstanding record of achievement in business or scientific computer software developments/applications or sales are invited to write for an appointment to:

Mr. Herbert Paley

RANN & PALEY, CPA's

103 Park Ave., New York, N. Y. 10017

Strict confidence guaranteed

CIRCLE 301 ON READER CARD

The Hexadder

is better than sixteen fingers

The Hexadder is an all-aluminum, pocket-sized, precision calculator for adding and subtracting six-digit hexadecimals in seconds with 100% accuracy.

HEX adder®

$15 each, prepaid; or write for more information from:

HEXCO, INC. P.O. BOX 55588
HOUSTON, TEXAS 77055

CIRCLE 67 ON READER CARD

NCR

PROFESSIONAL PROGRAMMER/ANALYST

How Is Your Journey Progressing?

Has your road to success been a smooth one? Or, have you had a few detours along the way? If you find you are among the group that is by-passed when promotion time rolls around, then perhaps a change in route is in order.

Why Not Give NCR An Opportunity To Discuss Your Career Path!

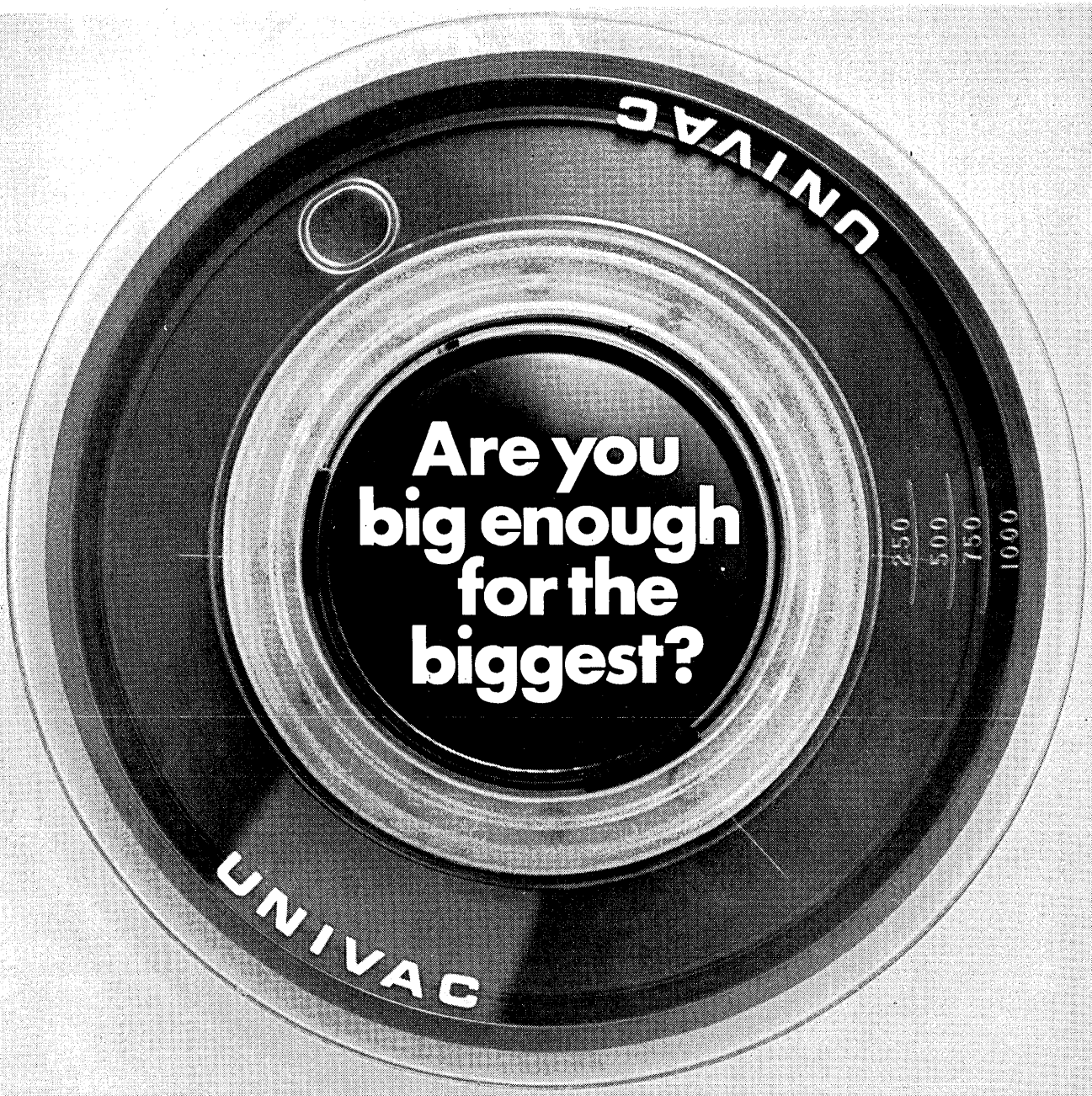
Attractive starting salaries and a professional atmosphere in which to continue, to develop and advance your career will be offered to all applicants who qualify for current openings in our EDP Division. In addition to OPPORTUNITIES a full range of benefits are offered.

For confidential consideration, send letter or resume to:

Robert L. Creviston
Executive & Professional Placement
The National Cash Register Company
Main & K Streets
Dayton, Ohio 45409

AN EQUAL OPPORTUNITY EMPLOYER

CIRCLE 303 ON READER CARD



Unimatic is the largest computer system in the business world. We need systems analysts with programming experience to help us tap its full potential.

With United Air Lines, you'll have the largest real-time computerized information system at your disposal. It's a multi-processing system controlled by three UNIVAC 1108 central processors and it incorporates real-time control of more than 3,000 remote input/output terminals, 262K (word) core storage, and 2 billion-plus characters of random access storage.

The new system is designed to give our management all the data necessary to operating the world's largest airline efficiently. We especially need experienced inventory control analysts to develop a real-time material control and information system and to integrate it into our total management information system.

United Air Lines' employee benefit program includes free air travel for you and your family, (plus substantially reduced rates on international airlines), employee stock purchase plan, paid insurance and many more.

If you have two to five years' business or scientific experience, and a college degree, or its equivalent, please send your resumé to: **Mr. H. K. Schlinker, Management Employment, United Air Lines, Box 66100, O'Hare International Airport, Chicago, Illinois 60666.**

An Equal Opportunity Employer

UNITED AIR LINES

CIRCLE 304 ON READER CARD

washington report

FCC CHANGES RATE DATE, HEARS BELL PLEA

FCC commissioners attached an accounting order last month to two pending rate increases -- one involving private line teletypewriter service, the other Telpak C and D.

At about the same time, AT&T asked the commission to delay its decision in the Carterphone case, rendered a short time earlier. Apparently, Ma Bell is preparing to go to court in an effort to maintain its near-total ban on the connection of foreign attachments to the telephone system.

The tty rate hike had been scheduled to begin the first of this month. In its recent order, the commission delayed the starting date until Nov. 1. The Telpak increase becomes effective next Sept. 1. (For a description of the new rates, see May '68 Datamation, p. 94.)

The chief effect of the July FCC ruling is to impose higher charges on Telpak and other private line users while the commission examines the related rate-making principles. That examination also embraces phase 1B of the general rate case and Telpak sharing; it will not end for quite a while. But the commission's July order also will entitle users to rebates -- if they can prove the present private line rate-making principles are unfair.

CIVIL SERVICE SOFTENS OUTSIDE CONTRACT RULING

Last fall, the Civil Service Commission forced NASA to cancel two personnel service contracts at Goddard because they violated the civil service laws (see June '68, News Briefs, p. 92). Last month, the commission added a clarifying "supplement"; it says the amount of federal supervision is the key element determining whether flesh contracts can legally be contracted out.

The National Council of Technical Service Industries -- which had loudly protested the earlier decision -- applauded the supplement. NCTSI believes agencies now have more discretion in contracting for outside service support. Commission sources indirectly confirmed this interpretation when they reported the agency doesn't plan to make an intensive search for nonconforming contracts; the federal personnel cutback, it was explained, will require some work to be done outside that would ordinarily be performed in-house.

DATA BANK DORMANT; FEDS SEEK OTHER MEANS

The Budget Bureau was directed last month to report to the House GovOps Committee by year's end on how BOB could gather, store, and utilize federal statistics more effectively without a central data bank. The data bank idea is apparently dead for this session.

Even the Federal Statistics User's Conference, a staunch data bank supporter, seems to have lost hope. The GovOps Committee, in its pending report, cited an ongoing FSUC study which suggests that improved data-collection methods may make the national data bank unnecessary.

BOB was also asked to answer several dozen questions on how privacy could be assured, particularly in OLRT systems, before submitting any new legislation.

CAPITOL BRIEFS

A.R. Fredericksen of 3M recently told a Senate subcommittee investigating trade with Eastern Europe that his company lost mag tape contracts in Czechoslovakia and Rumania last year because of Commerce Dept. foot-dragging in granting an export license...EDP Technology has added ex-Administration celebrity Bill Moyers as a board member.

SPERRY RAND

Systems analysts...

If your career has run into one of these...

Think about this:

At Univac, your career never has to yield to that of someone with more seniority, because we don't care about seniority. In fact, the average age of our systems supervisors is just 34.

Univac computer systems are being used by agencies of the Federal Government, such as NASA, Bureau of Census, Department of Defense, Federal Aviation Agency and by prime contractors for use in scientific applications.

We have developed dozens of advanced products for national defense and space programs... ranging from room-sized computers to micro-miniature aerospace computers ruggedized to meet extreme environmental conditions.

Today, we are looking for talented engineers and scientists to help lengthen our lead in computer technology. Openings now available include:

- **Computer Systems Design and Analysis**
- **Computer Graphics and Displays**
- **Electronic Packaging and Thermo Analysis**
- **Magnetic Memories (Thin Film and Ferrite Core)**

For more information, write: R. K. Patterson, Employment Manager, Dept. 115, address below.

UNIVAC
FEDERAL SYSTEMS DIVISION
2750 WEST SEVENTH BLVD.
ST. PAUL, MINNESOTA 55116
AN EQUAL OPPORTUNITY EMPLOYER M/F

CIRCLE 306 ON READER CARD

SYSTEMATIØN CONSULTANTS, INC.
Houston-New York

Process Control

Noted international management consulting firm seeks ambitious engineer (preferably ChE) with computer process control applications experience in chemical/oil industries (DDC or Supervisory). To work in liaison capacity with consulting firm's technical staff and client companies in developing real-time monitoring/control systems for multiprocess product lines. Excellent opportunity with starting salary to $18,000 range — Southwest.

Software Development

Aggressively expanding company having doubled earnings in the last two years and working in the forefront of computer software technology with offices in Houston and Dallas seeks professionals with experience in the design and implementation of large and multi-computer systems software, Operating Systems, and real time executive and message switching systems. Company developing a complete software system for a large scale, multiprocessor, time-shared fourth generation computer with on-line graphics terminals. Excellent growth opportunity with starting salary to $16,000 range.

Management Consultant

Highly respected consulting firm seeks systems professional with creative and meaningful technical experience with 3rd generation equipment applied to either various commercial applications or software development/systems programming. Require above average industrial achievements and capability to project proper professional consulting image in communicating with client company management to market Firm's services in above functional areas. Houston base location with some travel. Starting salary $18,000 range.

NO FEE

The above positions are only a small sampling of the exceptional hardware and software opportunities within the activities of systems design/programming, process control, scientific/commercial applications, etc. as well as marketing, Operations Research, and other associated activities of our client companies in various domestic and international locations—both jr. and sr. positions available. Your current employer will not be contacted without your permission. Send resume in confidence or request our resume form. A call to our Houston Director—J. L. Gresham, BChE, MBA—for further information is also invited.

1616 West Loop South
Houston, Texas 77027 (713) NA 2-1370

CIRCLE 307 ON READER CARD

Senior Hybrid Programmers

Math modeling of physical systems. Simulation modeling of analog, digital and hybrid computers. Analysis and documentation of results.

For more information please call R. D. Dunkel (205) 837-1800 collect, or write

P.O. Box 1103 West Station, Huntsville, Alabama 35807.

Lockheed is an equal opportunity employer.

LOCKHEED
MISSILES & SPACE COMPANY
A Group Division of Lockheed Aircraft Corporation

CIRCLE 305 ON READER CARD

decided to join several different companies under his control, which include Economy Plating, Associated Baked Enameling Co., Memory Magnetic Int'l and Athana, under the Comstock-Keystone umbrella. Linnell Electronics of Phila. also was involved. This firm will manufacture disc drives for Athana beginning shortly. 5 million shares of C-K were authorized, of which Powers owns 3.5 million; 1.1 million are publicly owned and a few hundred thousand are scattered around. All of this, apparently, was done under SEC regulations -- C-K insists everything was quite open.

The same, however, can't quite be said for Athana's manufacturing facilities, which exist "somewhere in Torrance," unmarked, tightly guarded, the number of employees unknown. Athana intends to keep its good thing to itself as long as possible.

But is it a good thing? Reactions to the price cut ranged from "utterly ridiculous" to "they must know something we don't," with guarded "no comment" and "studying the situation carefully" the usual response. The general feeling is wait and see and no company has announced plans to follow suit on the cut, although it is doubtful that any of them will just sit by. A C-K spokesman said the cut was long overdue, that all discs have been overpriced. He said orders are piling up and reports from the field indicate enthusiasm. Meanwhile, there's the stock thing and camouflaged factories and sudden conglomerates and it all must be making someone think.

"PROGRAMS...GET YOUR PROGRAMS HERE...$2"

The first encouraging word of deflation in the price of proprietary programs comes from the small (19-man) software house of United Computing in Redondo Beach, Calif. United's Uni-Try sells for a sensible $2; rental rates have not yet been announced.

It's a real program, available for "most popular computers," such as the 360's and Spectra 70's. It uses about 300 Cobol source statements and vp Ted Shepherd says it's "fully documented" with user's instructions on data format and operating procedures. The program is for use at the system design stage to generate sample reports before complete programming has been done. It's also useful, Shepherd says, "for faking it when the boss wants to see quick results."

NATIONAL PAYROLL STARTS OWN EQUIPMENT DEVELOPMENT

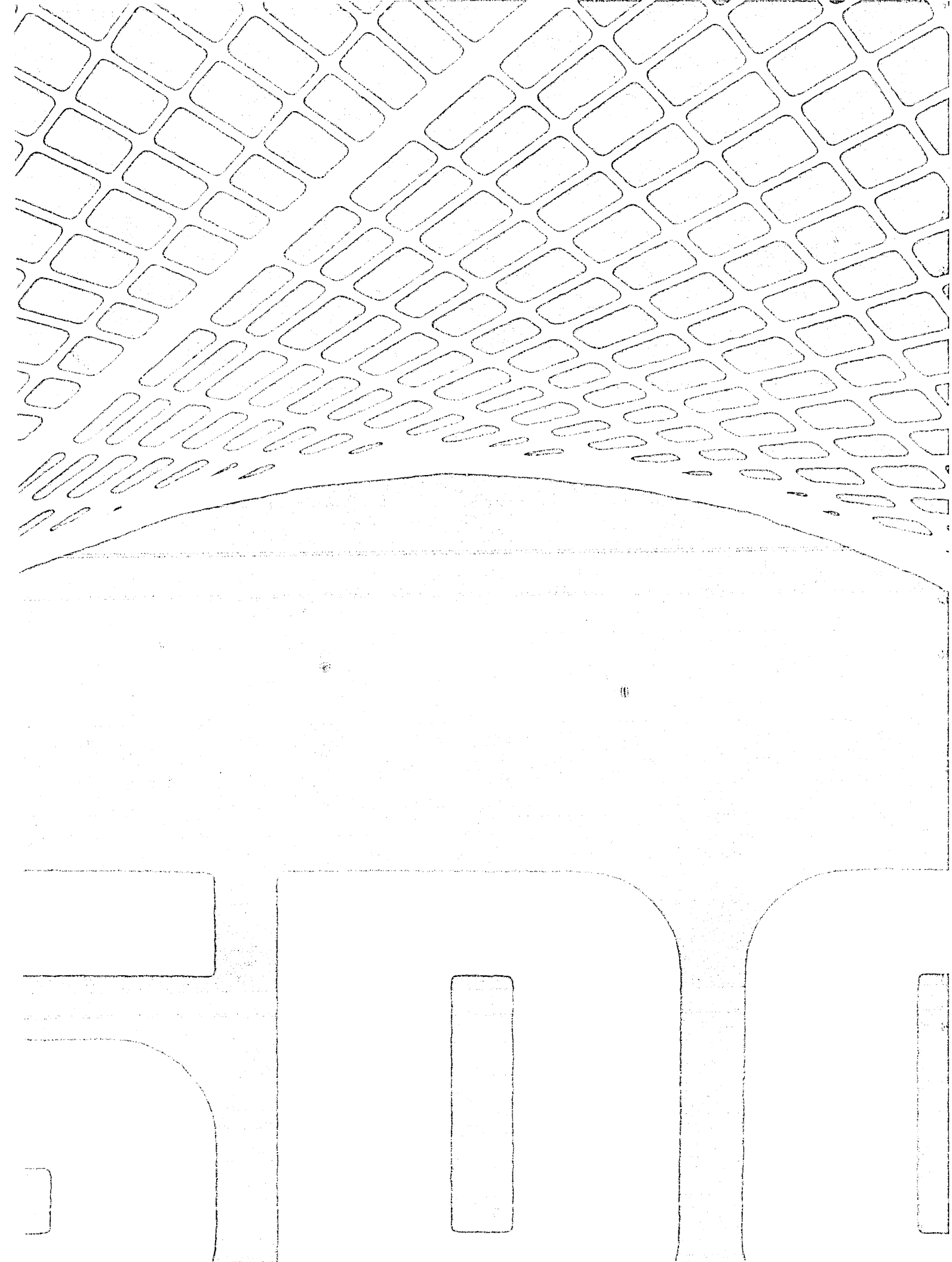
The aggressive little firm of Soliman & Associates, which has spawned National Payroll, Inc. (July News Briefs, p. 93), is already moving to get equipment built for its special needs.

A modified Teletype for National Payroll is the first project. It will have 10 keys added for calculation functions and a mag tape unit will be fitted. The idea is to get time-sharing prices down by using slack hours and letting the computer decide when it hasn't anything more pressing to do. Input information is recorded by the terminal operator. When she leaves at the end of the day, she dials the t-s computer and signals it to pick up the tape data when it gets around to it. Next morning, if all went well, she has a hard copy of the output.

Engineering and production is to be done by American Communications, Inc., in Los Angeles, with a prototype scheduled for December and, Soliman says, 1000 units turned out by June of next year.

The next project, further away, is a new, small t-s computer with a big disc storage. Electronic Arrays, Inc., of Mountain View, Calif., is working on it and aiming for a June '69 prototype.

(Continued on page 155)



Have you looked into the newest software company around?

So you think you know all about good old us. Maybe you even worked here once. Well, take another look.

We're a new company in a lot of ways. Expanding our horizons and taking on a lot of new challenges. What's happening around here lately could affect your career.

For instance, SDC's new Commercial Systems Division is applying its know-how in large-scale systems and software to the urgent needs of today's business and industry. It's a new set of customers for us. But not a new set of problems. And we've taken the lead in work on problems that affect our whole society. Urban planning, educational aid, law enforcement, health problems, solving transportation clog-ups.

Interesting? It is if you want to be where the action is. In general purpose systems. In 360 systems. In work that means career growth that pays off next year and keeps paying off.

And we're working on the frontiers of defense technology. You can be working in satellite control. New languages for space-borne computers and telemetry. New advances in defense and tactical systems using time sharing, data management. Systems integration. Command and control.

We need competitive, professional programmers and systems analysts for these jobs in our new-looking company. Professionals who'd rather not spend their careers living out of a suitcase or tied to one computer company's hardware. Who want to be where tomorrow's software is, and maybe even managing it. Who get impatient with routine.

We offer what a programmer like this expects: the unlimited opportunities, turned-on atmosphere, and untapped future of the newest software company around! SDC!

System Development Corporation

SDC

CIRCLE 309 ON READER CARD

Send your resume to Fred Aaron, 2400 Colorado Avenue, Santa Monica, Calif. 90406
Or see Bill Partridge at the Frontier Hotel, Las Vegas, during the ACM conference.

PROFESSIONAL

COMPUTER PERSONNEL

Washington, D.C.

$7,000 to $20,000

- SCIENTIFIC PROGRAMMING
- SYSTEMS PROGRAMMING
- SYSTEMS ANALYSIS
- BUSINESS PROGRAMMING

ALLOW US TO ARRANGE A PERSONAL INTERVIEW WITH THE WASHINGTON AREA'S MOST DESIRABLE EMPLOYERS.

Our service is confidential and personal. We are one of the oldest and most effective E.D.P. placement specialists in the East.

All fees and expenses paid by employer

SYSTEMAT

We Unscramble Computer Careers

9525 Georgia Ave.
Silver Spring, Md. 20910
301-587-3650

CIRCLE 313 ON READER CARD

PROGRAMMERS ENGINEERS

Washington, D.C. • New York • New Jersey • New England • Philadelphia • Chicago • Minnesota • Texas • Ohio • Florida • Arizona • California • Southeast Asia

If you have a B.S., M.S. or Ph.D. and you are experienced or interested in any of the following, contact us immediately for free career counseling and an objective analysis of your position in today's market.

PROGRAMMERS
- Management Info Systems
- Information Retrieval
- Command & Control
- Aerospace Applications
- Real Time/On Line
- Systems Simulation
- Software Development
- Communications

SYSTEMS ENGINEERS
- Reliability Analysis
- Digital Computer Systems
- Digital Logic Design
- Digital Circuit Design
- Digital Communications
- Systems Integration
- Soft Ware Analysis
- Oceanography

Salaries range from $8,200 to $25,000.
Our client companies assume all fees.

Forward resume in confidence, or call (collect):

Mr. Martin E. Sheridan
Area Code 703) 524-7660

SHERIDAN ASSOCIATES INC.
1901 North Fort Myer Drive
Suite 614
Arlington, Virginia 22209

(Just over the Potomac from Washington, D.C.)

Personnel Consultants to the Computer Industry

CIRCLE 311 ON READER CARD

It's free. The new 1968 Edition.

Our National Computer Salary Survey and Opportunities Analysis.

This is it. The all-new 1968 edition of Source Edp's FREE 20-page Computer Salary Survey and Opportunities Analysis. It's a summary of computer salaries by 24 separate levels of professional and managerial experience ranging up to $75,000. Plus a comprehensive analysis of current trends in computer employment.

All of this information has been compiled, analyzed and put together by some of the most knowledgeable people in the business. The people at Source Edp. Source Edp is the only placement firm staffed by computer professionals for computer professionals. It's their business to know the data processing field.

To get your free copy of the 1968 Edition of Source Edp's Computer Salary Survey and Opportunities Analysis just circle the reader inquiry card. To speed delivery write directly to:

source edp

Where computer professionals place computer professionals

Chicago – David D. Grimes, 100 S. Wacker Drive (312) 782-0857
Detroit – Charles T. Walther, 2990 West Grand Blvd. (313) 871-5210
Los Angeles – Robert A. Davis, 3470 Wilshire Blvd. (213) 386-5500
Minneapolis – Fred N. Anderson, 507 Marquette (602) 332-8735
New York – Edward T. Golden, 1414 Ave. of the Americas (212) 752-8260
San Francisco – Richard M. Clark, 111 Pine Street (415) 434-2410

Client companies assume our charges.

CIRCLE 312 ON READER CARD

EDP PERSONNEL SPECIALISTS FOR ELEVEN YEARS

DATA PROCESSING PERSONNEL

We have a wide choice of EDP positions available in degree and non-degree skills in salary ranges from $7,000 to $25,000 including:

Communication Analysis	System Designers
EDP Systems Analysis	Analyst/Programmers
Programmers, Jr. & Sr.	Programming Services
Systems Planning & Research	Software Specialists
Mgrs. EDP Systems	Computer Operators
Operations Research	Data Processing Sales

Computer Technicians

In all cases, Interview, relocation, and our search fees are all paid by client firms. You will have several choices of companies or industries to select for your specific job interest. Because we operate a network of offices. positions are located in many areas of the country.

Our Automatic Data Processing Personnel Manager, Mr. Robert J. Averell, welcomes your inquiry and/or resume. Or you may call him collect.

For full information—Write, Phone or Wire Today

SCHNEIDER, HILL & SPANGLER, INC.
"The People Placers"
Suite 331—121 S. Broad St., Phila., Pa. 19107
Telephone: 215-KI-6-2804

CIRCLE 310 ON READER CARD

look ahead

SOFTWARE PACKAGE MARKETING FIRM ACQUIRED

Proprietary software marketing pioneer Software Resources Corp. went up for grabs last month, and it was Programming Sciences Corp., NYC, which beat out the bids of firms like CAI and Aries. We hear PSC aims to capture this market and has approached several more firms, but is silent at writing because of SEC registration. PSC was founded as a programming and system analysis firm in Feb., 1967, by ex-IBM and CUC managers. Last Nov. PSC had listed 39 people and an unimpressive $126K income, a $125K loss. PSC now has six offices with 130 people involved in programming, seminars, facilities management, and edp schools (one acquired, more to come), service bureaus (one bought in L.A., another to be set up in New York), and direct mail operation.

T-S SERVICE BUREAU BETS ON MICROPROGRAMMING

Pillsbury Occidental Co.'s Call-a-Computer Division, which operates six time-shared service centers, will replace its GE-265's with new microprogrammed "file-oriented" systems to be designed jointly by CAC and Standard Computer Corp., Santa Ana, Calif.

Standard will build the hardware, CAC the software with a new group in Corona del Mar, Calif., headed by Dick Quillin. The Standard "inner computer" concept (see p. 89) will play a key role in CAC's plans, allowing them to build special sets of microprogrammed "superinstructions" specifically designed for greater time-sharing efficiency. File protection is said to be another benefit of the Standard hardware.

The computer order is conditional on performance of the first machine, scheduled for delivery to its seventh site in L.A. in December. Size of the ultimate order was not revealed (we've heard 11 machines), but CAC plans to use Standard hardware in all of its centers, including any new ones.

CAC will also market the new Standard T-5 system to customers ready for an in-house facility.

HOUSE HITS BANK ROLE

Wright Patman, Chairman of the House Banking and Currency Committee, says that last April State Street Bank of Boston controlled 10.3% of the common stock of Scientific Data Systems and 5.8% of Control Data Corp., and the National Shawmut Bank of Boston held 50.1% of the voting shares in Optical Scanning Corp. In a recent study by the staff of the House Banking and Currency Committee, Patman also pointed to director interlocks between leading banks in New York, Boston, and Detroit and the managements of IBM, NCR, and Burroughs.

Patman assailed the "snowballing economic power" of the banks, saying that bank trust accounts effectively control many companies, and the presence of bank officers in corporate boardrooms gives such companies an inside track to bank credit. He urged the Justice Department to investigate possible "anti-competitive implications" of these practices.

Though no legislation is contemplated this year, the study may generate Congressional review of "non-banking" activities at commercial banks -- including the growing practice of banks providing dp services.

CAI's EXECUTIVE CHAIRS SPIN AGAIN &...AGAIN

The epidemic of resignations that took much of CAI's top-level management in the Northeast Region and NY offices early this year has now spread to management ranks below. William Lucas, director of commercial

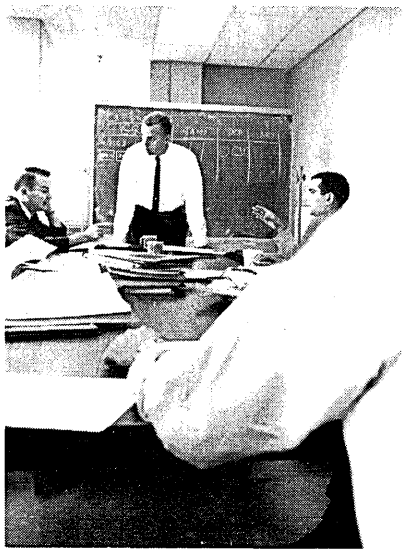
PROGRAMMER'S PROGRESS AT XEROX:

From system to system, with your career in view.

At Xerox, programmers are involved in virtually every phase of business operations. As the need arises, depending upon your background and career goals, you'll be concerned with programs that may range from marketing research to business modeling to manufacturing to accounting to engineering.

Providing people with this kind of varied exposure helps develop a strong, innovative staff for us, and helps you to develop broad experience...which is the best preparation for better things to follow. As a point in fact, that's one reason why most of our programmers are called programmer/analysts.

Since our most important product is better customer service, we are looking for talent that can utilize EDP and systems thinking in their broadest sense to provide practical, business-like solutions to multi-faceted problems. It's the kind of talent that is going to help direct our operations in the future.



If you have a Bachelor's degree and/or experience with an IBM 360 or 7000 system, or a Univac 1108, using COBOL or AUTOCODER, there could be a future management opportunity waiting for you at Xerox. To find out more about the opportunities on all levels, send your resume, including salary, history and requirements, to M. H. Hartigan, Dept. MZ-27-H1, Xerox Corporation, P.O. Box 1995, Rochester, New York 14603.

An Equal Opportunity Employer (m/f).

XEROX

systems for CAI-NY, moved out in May to form Wellington Systems Inc. Four directors reporting to him also left, William Kuehsel and Ted Rosenberg going to vp positions at WSI. Then at least two of the four assistant directors were moved up...and moved out too, and that's the last we heard.

Lucas also garnered two executive vp's for WSI from CAI: Jerry Mellinger, NE marketing director, and Leonard Elfenbein, head of the Chicago office. Wellington Systems, New York, is in software and applications programming, concentrating on real-time systems in areas like airlines, banking, and petrochemicals. The 27-man firm hopes to grow to 70 by year's end, has formed a Canadian subsidiary -- Wellington Systems, Ltd. -- and may go into facilities management and leasing.

ADDITIONAL IBM COBOL SUPPORT

Even though IBM has thrown full development support to PL/I, it looks like the firm will fulfill promises to make demanded additions at least to COBOL. At the June SHARE/GUIDE COBOL meeting, IBM announced it will provide USAS COBOL, as expected, plus compatible extensions from COBOL F and 12 of the 16 items the committee had long requested (some are in the standard). No delivery dates were given. Teleprocessing was not among the promises, and the committee has proposed a limited teleprocessing capability involving only message processing (no message control, few new words).

In the meantime, more extensive teleprocessing proposals for COBOL are being made to USASI, but one user says IBM's not likely to go for them since they mean too many language additions.

RUMORS AND RAW RANDOM DATA

Burroughs is evidently readying a new version of the 8500 supercomputer (see p. 85), but it's at least a couple of years away. Features will include 200-nsec thin film memory, parallel-processing of multiple cpu's a la Iliac IV and Star. Its current designation: 8502. ... AFIPS president Paul Armer is leaving RAND next month. ... Some 30 firms have approached SDS to discuss their role in SDC's plans to turn profit-oriented. But the 3000-man, $52-million/year firm is too big for half of them to swallow. ... Computer Methods, NYC software house, is acquiring L.A.'s Time Sharing Services, Inc. (see Feb. '68, p. 17). Founded in '61, 100-man CM is a subsidiary of Coburn Corp., offers programming, educational film services, time-sharing for stock-brokers. ... IBM's software development costs for CALL 360 is said to be about 6 megabucks. ... Informatics has set up a 360/40 service bureau in L.A., will add other cities soon. The bureaus will offer Mark IV. ... Remote Computing Corp. fires up its 32K B 5500 in L.A. next month. System features 100-million-character disc with 40 msec access and automatic dial-out. Another 5500 is slated for action in the Bay Area soon after.

Mobil

International Computer Technology Consultant

Due to our expansion and the increasing sophistication of third-generation equipment, our International Division is offering a unique New York-based position in its Field Systems Support Department.

Our new consultant will have broad-scope advisory responsibilities to international management. Specifically, these are: to provide guidance on the latest developments in hardware, software, communications and operations for our worldwide affiliates; to participate in formulation, specification and evaluation of hardware and software for both commercial and technical/scientific use; to assist in implementation of upgraded equipment and new versions of operating systems and high level languages. Finally, he must be attuned to the concept of the computer as a decision-making tool for management.

The qualified candidate should have a Master's degree in computer science, engineering, mathematics, science or a related discipline. His experience should include 3 or more years in hardware/software, encompassing System 360, OS/DOS and COBOL/FORTRAN. He should be capable of making oral or written presentations to management. The international character of this work demands an ability to work independently with groups of various nationalities and a willingness to travel abroad on short assignments. Fluency in at least one foreign language is highly desirable.

This position affords advancement to other areas of International Systems, to line management with possible relocation abroad, or to assignments in other divisions. To explore this opportunity, send your detailed resume and salary requirement, in confidence, to Mr. Paul J. Harbaugh, Department 3483, 150 East 42nd Street, New York, New York 10017.

Mobil Oil Corporation

An equal opportunity employer

CIRCLE 314 ON READER CARD

SYSTEM ANALYSTS, PROGRAMMERS

Ohio University has opening in Administrative Data Processing for System Analysts and Programmers who are interested in a wide variety of experiences. The University has an IBM System/360 Model 40 with disks and tapes which is used for financial, business and student record applications.

Ohio University, located in Southeastern Ohio, is a rapidily growing state university offering its employees the advantages of an academic environment, small town atmosphere, and liberal benefits. Send resume in confidence to Alden R. Dalzell, Director of Systems and Procedures, Ohio University, Athens, Ohio 45701.

CIRCLE 316 ON READER CARD

what's so good about our

"TIME SHARING" SYSTEM?

we'll tell you!

When you're looking for a career challenge, you don't care to be a *remote* station. You want to come up with the right answer as quickly as the computer does when you feed it a problem. But you also wish to feel there is a human element involved.

That's where we come in. At MANAGEMENT SCIENTISTS we are on line at all times. As consultants to prestige firms here and abroad, we know WHERE the action is—WHERE your career future lies. And after evaluation of your background, we waste no time in directing you to the most rewarding job opportunities.

At present we are recruiting for talented professionals in

- **TIME SHARING/REAL TIME**
- **SOFTWARE DEVELOPMENT**
- **OPERATIONS RESEARCH**
- **SYSTEMS DESIGN**
- **BUSINESS/SCIENTIFIC PROGRAMMING**

For details, send us your resume, in confidence, including salary history and geographical preference.

Management Scientists, Inc.

101 Park Avenue—Dept. DM 8-68
New York, N.Y. 10017
(212) 532-7710

Exclusively: DATA PROCESSING & MANAGEMENT SCIENCES
Career Planners—Recruitment Specialists

CIRCLE 315 ON READER CARD

Don't let your boss catch you reading this ad.

He might get edgy if he thought you were interested in working with Lockheed at NASA's Manned Spacecraft Center in Houston.

And you should be interested. For you'll be responsible for developing programming systems and advanced techniques that integrate digital, analog or hybrid computers into the overall functions of scientific computation, data acquisition, transmission and processing.

You might perform analysis and programming on IBM, UNIVAC or CDC equipment, using COBOL and FORTRAN IV and V. Or you might analyze equipment configurations and data processing requirements for instrumentation engineering of telemetry communications systems. Or you might develop electrical and numerical models of scientific and engineering problems for solution on high speed computers.

You'll be working at the very frontiers of the state of the art. And you'll get all the responsibility you can handle in helping us develop tomorrow's aerospace technology.

Whatever your assignment, you'll be expected to innovate. To improve. To make as large a contribution as you can.

We'll encourage you to continue your education. At company sponsored courses. At any of the colleges and universities in the Houston area. We have regular management training programs in which we enroll key management and potential management people.

Your kids will have the advantage of attending exceptional schools with the children of our space pioneers. In 1966, nearly 10% of the high school seniors in the local school district were semi-finalists in the National Merit Scholarship Tests. Compare that record with a national average of ½ of 1% and you'll see why Houston is such a wonderful place for your family.

A thriving community with attractive homes, sailing, golf and other recreation has grown up right around the Manned Spacecraft Center. And theatres, museums, concerts and fine shopping are just a few minutes away from home or work in the metropolitan center of Houston.

So look into this opportunity to move up in your own field now. Send a resume of your experience and qualifications to Mr. Dean Pearson, Employment Manager.

Break the news to your boss. Gently.

LEC LOCKHEED ELECTRONICS COMPANY

A Division of Lockheed Aircraft Corporation
16811 El Camino Real, Houston, Texas
An Equal Opportunity Employer

CIRCLE 317 ON READER CARD

"...provide systems programming/ software support..."

You'll work with our customers and sales engineers as regional software expert for the PDP-10, Digital's new and phenomenally successful, 36-bit. time-sharing computer system. The PDP-10 is primarily used as a remote multi-user computation system and for real-time applications in scientific environments.

You'll provide post-sale software support, insuring customer ability to use our PDP-10 software, develop it and maintain it. You will also provide PDP-10 pre-sales support, including software systems design, presentation of Digital software capabilities and giving training in our software systems.

These responsibilities demand a degree in engineering, mathematics or science, and at least three years' experience with software systems and assembly level programming. You'll use all your knowledge of computers, assemblers, loaders, operating systems and more, lots more. How much more depends on you.

Field software support provides the opportunity to contribute creatively to our rapidly expanding organization and to move into sales and management. Field assignment follows a training period of 3-6 months at our Maynard plant.

At Digital, we define half the job. You define the other half.

For more information about opportunities with Digital in software support for the PDP-10 and our other computer systems, write to Mr. P. T. Koch, Professional Personnel, Digital Equipment Corporation, 164 Main Street, Maynard, Massachusetts 01754. Digital is an equal opportunity employer.

digital

any given time, what the entire configuration of that universe will have to be at some subsequent time. Rather than prove this contention, which would be tedious but not difficult, I will offer a simple example which should inspire any interested reader to figure it out for himself.

Suppose the universe consisted of a switch (On/Off), a relay and a computer. The computer is assumed to possess, at some arbitrary zero time, all the details of the state of this universe, and the ability to predict its state at some future time, T. It is also presumed that the computer can complete this prediction by the time T/R, where R is greater than 1. Suppose now that the computer is programmed to perform its calculations, print the result (On or Off), and then energize the relay so that if the result is "On," it sets the switch at "Off" and vice-versa.

Pondering on this awhile should lead the astute analyst to the conclusion that the configuration of a deterministic system at a given time, T, could positively be described at some earlier time only within a second system which would not convey energy to the first system prior to time T. Or, the more use that's made of a prediction, the more uncertainty there is of its accuracy. This last can be pragmatically verified at any race track. Also note, the conclusion that the state of the universe is unpredictable follows not from the assumption that it doesn't obey direct physical laws, but from the assumption that it does.

ROBERT GELMAN
Lafayette Hill, Pennsylvania

social science computing

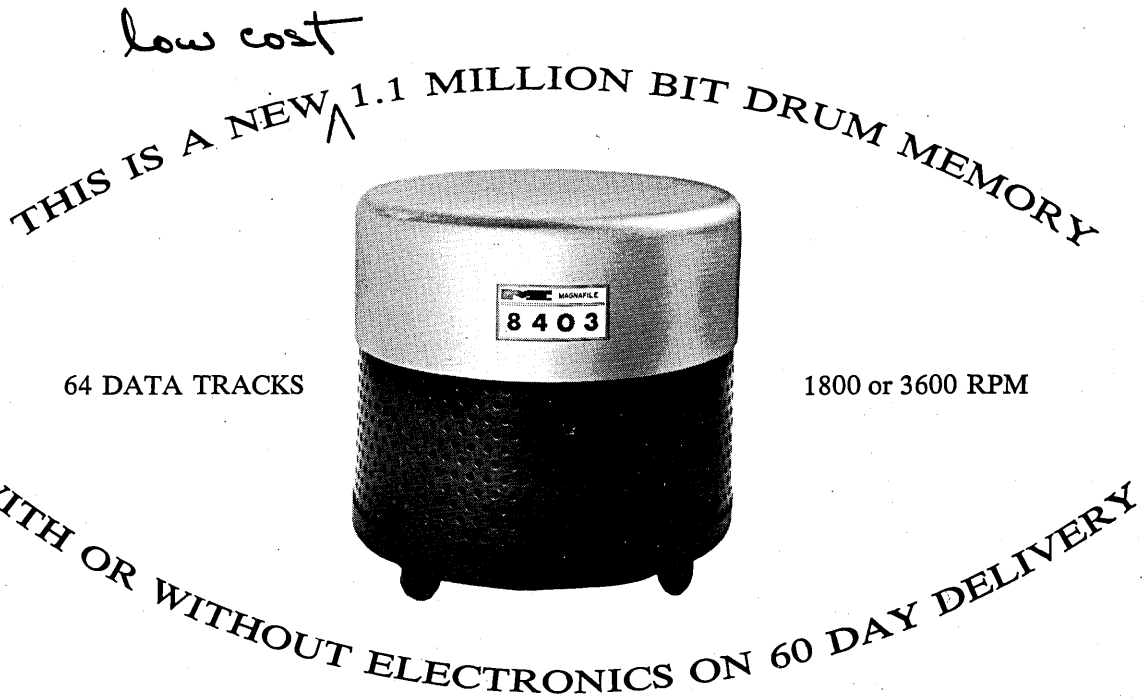
Sir:

On behalf of a group of members of the Association for Computing Machinery, I am submitting a petition to the Council of the Association to consider the establishment of a Special Interest Committee for Social Science Computing (SICSOC).

The use of computers by social scientists is rapidly increasing in universities, government and business, yet there does not now exist an organization whose scope is sufficiently broad to appeal to a substantial number of these individuals. We propose SICSOC as an organization that would attempt to focus upon our common interest of the use of computers in the social sciences. Examples of areas the committee might concern itself with are (1) statistical programming, (2) statistical systems, (3) social science procedural languages, (4) information retrieval in the social sciences, (5) simulation of social models and social systems, and (6) the application of computers to public policy formation. These examples indicate some topics of current interest, and are not intended to exhaust areas of potential committee activity.

Our present conception of the committee's functions is that it serve as an exploratory device to ascertain the most appropriate domain of interest for such a group and to determine the viability of the group as a productive association of individuals. As an initial action, we anticipate holding an organizational meeting at the forthcoming ACM Conference in Las Vegas. Two immediate purposes of this meeting would be (1) to begin a search for a qualified, well-known social scientist who would be interested in heading a more formalized group, and (2) establishing informal channels of communication (probably a newsletter) between interested individuals. In this way, we hope to be able to explore our potential for various kinds of activities informally throughout the year.

Readers who are interested in participating in the committee's activities are encouraged to write me, outlining



MAGNAFILE INC.

2987 W. FAIRMONT • PHOENIX, ARIZONA • 85017 • (602) 266-4416

CIRCLE 78 ON READER CARD

CAR
EERS

COAST TO COAST
EUROPE

TOP
20%

EXCLUSIVE!

The unique personal and confidential relationship we establish with you and our clients permits us to offer you outstanding job opportunities, many not found anywhere else. If your potential or abilities are above average and you are looking for a challenge, our unique service provides 49 state and international coverage.

PARTIAL LIST COMPUTER CAREERS
SALARIES $10,000 — $35,000

- Marketing/Sales
- Management or Computer Consulting
- Operations Research/ Management Science
- Time Sharing/Real Time Systems
- Computerized Process Control
- Management Information Systems
- Systems Planning/Development
- Business Systems, Programming
- Applied Mathematics
- Scientific Computation
- Logic/Digital and/ or Circuit Design
- Software/Applications Packages

(From Junior to V.P. and Director Levels)

Our clients assume all expenses
Write in full confidence to
Joseph Albert or phone 212/679-5688
Indicate salary and geographic requirements.
Member ACM
Career Consultants in the Data Processing Field

ALBERT A ASSOCIATES

210 Fifth Ave., New York, N.Y. 10010
CIRCLE 318 ON READER CARD

letters

the nature of their interest and their ideas concerning the committee's future.

GEORGE SADOWSKY
Director, Computer Center
The Brookings Institution
1775 Massachusetts Avenue, N.W.
Washington, D.C. 20036

microfiche users

Sir:

There has been a growing tendency for Federal agencies to encourage, usually through differential pricing, the distribution of microfiche instead of full size copies of reports. The economic advantages of microfiche are obvious to the issuing agencies (and to the General Accounting Office); agency distribution lists show that some libraries actually prefer to receive microfiche. We have little information, however, on the acceptance and use of microfiche by individual scientists and engineers.

I have been asked by COSATI (the Committee on Scientific and Technical Information of the Federal Council for Science and Technology) to look into this matter. Readers who have actually been offered the opportunity of using microfiche and have strong opinions on such subjects as legibility, convenience, availability and quality of readers and reader-printers and kindred topics are encouraged to write to me at: AFOSR/SRI, 1400 Wilson Blvd., Arlington, Virginia 22209. I am especially interested in hearing from those who have found it possible, or even preferable, to use microfiche in maintaining their personal report collections. I cannot guarantee to answer individual letters, but all respondents will receive copies of a summary report —in full-size hard copy!

HAROLD WOOSTER
Director of Information Sciences
Air Force Office of Scientific Research
Arlington, Virginia

employment considerations

Sir:

On and off it becomes fashionable for our profession, through some of its organizations, publications, and conventions, to debate the social implications of our contribution to life today. All too often this turns out to be a debate about how large, all encompassing, and big-brother-like central government computers and data bases shall

E. B. Schultz has the audacity

He came into EDP with a silver spoon in his mouth. One of the Big Four discovered him right out of college. He returned the compliment by becoming one of their best Employment Managers.

"E. B." was always a little stuffy about finding the precise corporate place for every individual set of abilities and personality kinks. Since joining DMS as VP of our Career Development Division, he's become downright audacious.

It's a necessary part of his new job. Personnel placement is a secondary function at DMS, where we offer our company clients the whole ball of wax of Research and Planning, Educational Programs, Programming Services, and Equipment Acquisition. Mr. Schultz doesn't depend on quantitative quotas to earn his keep. On the contrary. Our clients depend on him to fill those few prime spots that never get out on the street.

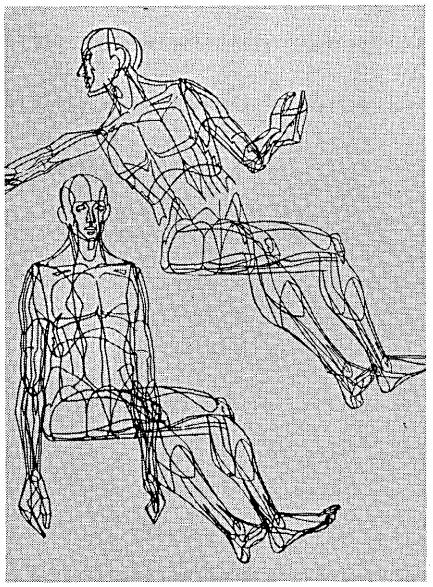
A recommendation from E. B. Schultz can open all kinds of doors. Professionally he might be audacious. Personally, you'll find that he's something else again in the employment field. If you're a better-than-average applications or systems programmer, systems analyst, product planner or salesman, give your own sense of audacity a breath of fresh air. Send him your resume. Or call collect. (215) KI 6-0901.

DMS

DATA MANAGEMENT SERVICES, INC.

CORPORATE OFFICE: 1515 LOCUST STREET, PHILADELPHIA, PENNSYLVANIA 19102
NORTHEAST REGIONAL OFFICE: 31 LEWIS STREET, HARTFORD CONNECTICUT 06103

CIRCLE 319 ON READER CARD



Computer-drawn figures assist in cockpit design engineering at Boeing. The company is one of the pioneers in computer graphics technology.

Computer Specialists:

Help apply computer technology to advanced jetliner development.

The Boeing Company's deep involvement in applying computer techniques to all phases of advanced jet transportation offers experienced computer specialists exceptional career opportunities with the company's Computing Staff in Seattle.

The Computing Staff plays a major role in the design, development, test, manufacture and marketing of all Boeing jetliners.

A wide array of equipment is available to the Staff, including analog computers, a hybrid computer, advanced "real-world" pictorial displays, and IBM 7094, 360, and CDC 6600 computers.

Immediate openings exist in these functional areas: Manufacturing and Management Support Systems; Simulation, Design and Test Data Systems; and Methods. Minimum qualifications include three years' experience and a Bachelor's degree, or a Data Processing Management Association certificate.

Please write today to Mr. William Denman, The Boeing Company, Commercial Airplane Division, P.O. Box 707-BBY, Renton, Washington 98055. If convenient, include a resume. Boeing is an equal opportunity employer.

BOEING
Commercial Airplane Division

Other Divisions: Missile & Information Systems • Space • Vertol • Wichita • Also, Boeing Scientific Research Laboratories

be. I believe there should be more discussion about the social implications of some other facets of technical life.

Relatively little is said about whether raising the requirements for membership in the profession to the minimum of a bachelor's degree is a socially responsible act. Most of us know people without degrees who helped develop the profession when common sense, drive, and the ability to achieve results were recognized as acceptable credentials. Are we to discourage people like this in the future? Relatively little is said about governmental bias in favor of degrees when examining the qualifications of a bidder's staff to do some proposed contractual job. Is it really worthwhile to place an artificial barrier in front of that class of people in the engineering field who for one reason or another have not achieved college degree status?

Relatively little is said about whether pressing for an average 7% raise each year is a responsible act for our profession. Is big annual salary increases a phenomenon because of the shortage of skilled people or is it perhaps a subtle result of modern day union-like activity of our professional associations? Does the steady raising of the minimum starting wage represent an increasing entry barrier to those people less qualified to rise from an already high starting point but still qualified to do useful work at a lower level (forcing these people away from our profession)? Do steadily rising wages chip away at the competitive position of our country as it faces the world of our profession? Does the domino effect of raising minimum wages mean increased standard of living at the expense of increased unemployed because marginal ability people cannot find work as the minimum wage rises?

I believe that as a profession we ought to be concerned enough to continue debate of these issues and bold enough to accept the consequences or, rather, implement the changes which might be the logical result of some of the conclusions we may reach.

JOHN A. KEENAN
Fairfax, Virginia

Sir:

Trade magazines, newspapers, and government-sponsored articles all cry for the need for trained computer personnel. A past issue of one of the trade magazines states: "All colleges should include some computer instruction as part of their normal program." (Of course, most of these students are being trained in non-related fields and will never work with a computer again.) (Continued on p. 168)

What do you want most?

☐ Respect ☐ Title
☐ Money ☐ Location
☐ Challenge ☐ Security
☐ Opportunity ☐ Fringes

Our nationwide survey in the Financial & EDP field revealed that employment desires were in the order listed above.

We can assist in finding exactly what you want in Financial or EDP employment. That's all we handle... we're the largest specialized source.

Fees Paid By Management

MGR. DATA PROCESSING $35,000
Investment banking exp.
MGR. SYSTEM & PROGRAMMING ...$26,000
Major publisher
MGR. MGMT INFO $25,000
Design, install, staff
PROGRAMMER $20,000
FORTRAN, Linear programming
DATA PROCESSING MGR. $20,000
Implement EDP + manual systems
SYSTEMS CONSULTANT $20,000
Lite travel. Expanding dept.
SYSTEMS/PROCEDURES MGR. $18,000
Forms, Paper flow
OPERATIONS RESEARCH ANALYST ...$18,000
Degr. in Math or Engr
SYSTEMS DEVELOPMENT $17,000
Production/inventory controls
DATA PROC. MGR. $16,000
Large bank
SYSTEMS/PROC. MGR. $16,000
Set up new dept.
OPERATIONS MANAGER $16,000
Honeywell 2200 equipment
SYSTEMS ANALYST $16,000
Library experience
SYSTEMS ANALYST $15,000
Teleprocessing BTAM-QTAM
SR. SYSTEMS ANALYST $15,000
Chemical products mfr.
SYSTEMS ANALYST $15,000
Hard goods manufacturer
PROGRAMMER $14,000
1-2 yrs. COBOL or AUTOCODER
PROGRAMMER $14,000
Software or assembly language
PROGRAMMER $13,500
3rd generation equipment
SYSTEMS ANALYST $12,000
Lite experience

Mail resume to your nearest R-H office.

ROBERT HALF PERSONNEL AGENCIES

Atlanta: 235 Peachtree St., NE ..... (404) 688-2300
Baltimore: One Charles Center ..... (301) 837-0313
Boston: 140 Federal St. ..... (617) 423-6440
Chicago: 333 N. Michigan Ave. ..... (312) 782-6930
Cincinnati: 606 Terrace Hilton ..... (513) 621-7711
Cleveland: 1367 East 6th St. ..... (216) 621-0670
Dallas: 1170 Hartford Bldg. ..... (214) 742-9171
Detroit: 1114 Guardian Bldg. ..... (313) 961-5430
Garden City, N.Y. 585 Stewart Ave. ..... (516) 248-1234
Los Angeles: 3600 Wilshire Blvd. ..... (213) 381-7974
Miami: 1107 Northeast Airlines Bldg. (305) 377-8728
New York: 330 Madison Ave. ..... (212) 986-1300
Newark: 570 Broad St. ..... (201) 623-3661
Philadelphia: 2 Penn Center ..... (215) 568-4580
Pittsburgh: 429 Forbes Ave. ..... (412) 471-5946
Portland, Ore: 610 S.W. Alder St. ..... (503) 222-9778
St. Louis: 1015 Locust St. ..... (314) 231-0114
San Francisco: 111 Pine St. ..... (415) 434-1900
Stamford, Conn: One Atlantic St. ..... (203) 325-4158

World's Largest Financial & EDP Personnel Specialists.

CIRCLE 320 ON READER CARD

letters

Put the crying towel away and look at the market that is available to us: the person with a high school diploma or equivalent. As an example: Bill is 23 years old, ex-Army, with plans for marriage. For the past year he has worked as an assembler for $127/week. Realizing his limited future, he decides to find out about computer programming. Scanning the newspaper, he decides to visit a computer school. There he is given an aptitude test which determines he has the potential ability to be a programmer. Keeping his day job in order to pay for the school, Bill goes to night school. He is given instruction that includes writing, testing and debugging of several programs. This includes about 25 hours of hands-on computer time, for an overall total of about 200 hours of instruction. This does not include the amount of time he puts in doing homework.

At the end of the course, Bill is ready for placement. The school's placement director and the want ads are his constant companions. But, interview after interview, it's the same story: "We want a college grad," or "some college." Eventually, someone capitalizes on his potential and hires him as a bursting machine operator (or some other talent-wasting job). When he was hired, he was told "if you've got the stuff, you'll get put into programming" (via a console operator's job at $110/week).

Now, the employer should step back and take a long look at the position he wants filled. Does it actually require the educational background that he's asked for? Has he evaluated the job and placed its components in their proper perspective? Is it necessary for a programmer working at one level of programming to have an education equal to one working at a different level? Does someone with a non-related degree have a better grasp of programming than one without a degree? Would you think that a person who has attended a school that concentrates on programming has an advantage over one who attended a school that "adds it on"?

Why not hire people like Bill and have this group led by a more "sophisticated" person, *if* this is a requirement?

Why should all programmers have the same qualities? They certainly need not perform the same duties. A program may be divided into segments of varying complexities, and then assigned to programmers of different abilities.

It seems that we have the means of alleviating this supposed shortage of programmers if we reevaluate the prevailing employment standards we have established.

EUGENE J. SEEWALD
Larchmont, New York

DATAMATION welcomes correspondence about the computer industry and its effects on society, as well as comments on the contents of this publication. Letters should be typed, double-spaced, and brief. Only those reaching the editors by the 5th can be considered for the next month's issue. We reserve the right to edit or select excerpts from letters submitted to us.

If you're ready to make it in a new small company on the go climb aboard and fasten your seat belt!

Computer utilities! The next arena of explosive growth in the gradually maturing computer industry. If you've proved yourself in any segment of the computer industry, now is the time to capitalize on that experience and participate from the beginning.

SAN FRANCISCO BAY AREA AND/OR LOS ANGELES

Immediate requirements in all levels of staff and operating personnel Technical Staff Operations

Marketing Sales Field Service Office

Excellent compensation and fringe package. Incentives and relocation. Los Angeles and San Francisco interviews.

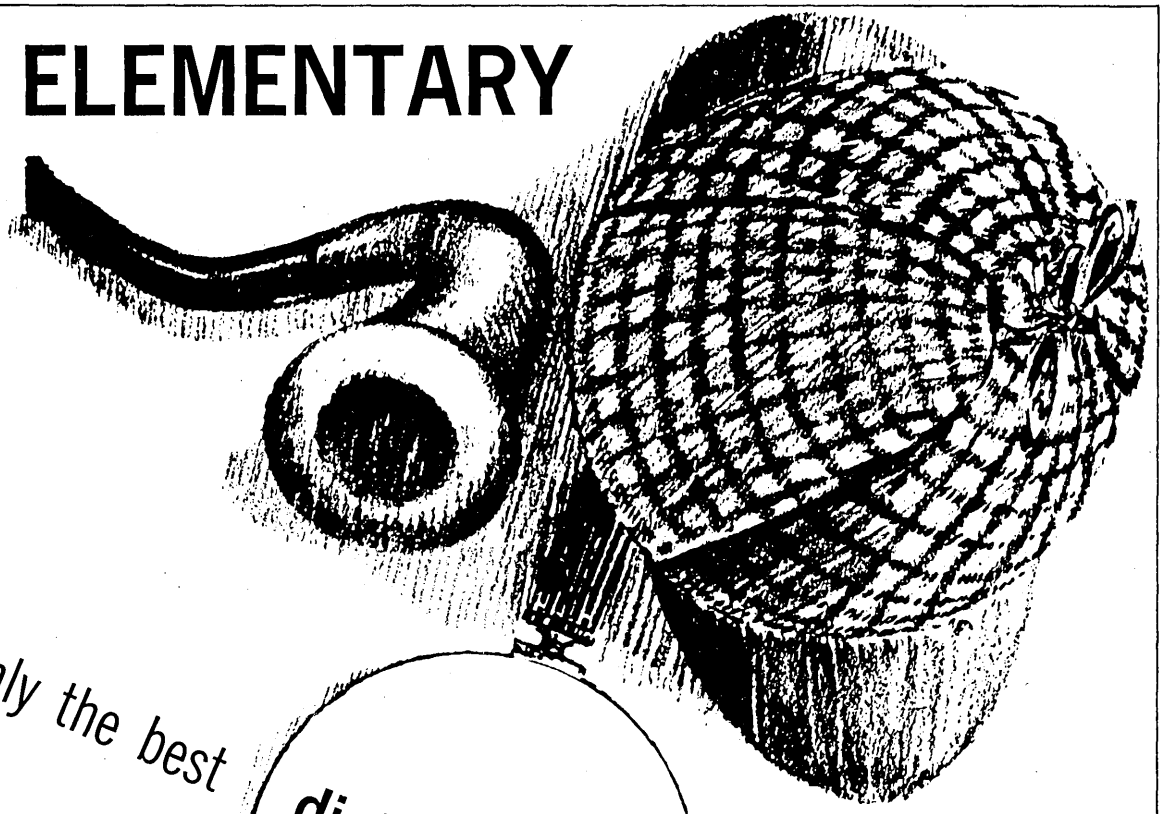
Call or write with enough information so that we'll have an idea of your strengths.

Remote Computing Corporation

One Wilshire, Los Angeles 90017 (213) 629-2532. Address inquiries to A. P. Weeks.

CIRCLE 321 ON READER CARD

ELEMENTARY



only the best **digital careers** are found at Foxboro

Without a doubt, knowledgeable engineers and programmers will find the exceptional opportunities at the Systems Division of the Foxboro Company.

For it is here that computer technology is being constantly advanced and applied to new areas. Exciting new applications such as industrial process control systems, where each presents new challenges and problems. You'll never be bored by routine at Foxboro — when you're the leader in process controls and instrumentation there's no time for boredom. That's elementary, too!

SYSTEMS ENGINEER

Requires degree in engineering (preferably in ChE or EE) with a minimum of five years' experience in instrumentation, process control and on-line computer applications. As the technical design leader of large digital systems projects, the Systems Engineer will utilize his systems skills in both hardware and software, as well as analysis and applications for the process industries. Discharging these responsibilities requires leadership qualities, communication skills, and planning and scheduling capabilities.

STANDARD SYSTEM ENGINEER

Engineering degree with emphasis on advanced work in System Engineering and Digital Technology. Two or more years' experience in digital system equipment design and development, program design and development, customer order engineering or digital system specification writing. Responsible for hardware and software product improvement specification, technical review and coordination; definition and preparation of Standard System Documentation; release of standard Products to Sales; interpretation of the use of Standard Products. Must have good communication skills.

DIGITAL SYSTEMS FIELD SALES ENGINEER

Engineering degree, preferably in the field of ChE, combined with proven Systems Sales experience to the process industries. Must have knowledge in one or more of the following areas: process computers, I/O gear, process control application engineering or instrumentation systems. We have openings available in several locations throughout the country.

DIGITAL SYSTEMS SALES ENGINEER

Engineering degree, preferably ChE. Prime importance is engineering, process design and/or systems instrumentation experience in process industries. Computer experience desirable. Previous selling experience not a prerequisite. Will help promote Foxboro ability in process digital systems and provide support to field sales personnel. Position located in Foxboro, Mass.

SYSTEMS PROGRAMMER

Engineering, scientific, or mathematical degree with experience in the command and control, scientific, or industrial fields. Programming efforts will be in batch control, direct digital control, multilevel programming, supervisory control, and scientific programming.

If you have all your facts ready, match them to one of the positions listed here and present your case to Robert Ash. Call him collect at (617) 543-8750 or write him at the Central Recruiting Office, The Foxboro Company, Dept. D 8 Neponset Avenue, Foxboro, Mass. 02035.

FOXBORO®

Specialists in Process and Energy Control

Look into other career building opportunities with Foxboro, An Equal Opportunity Employer

CIRCLE 322 ON READER CARD

datamart

Address all replies to box number advertisements as follows:

Box.....

DATAMATION

F. D. Thompson Publications, Inc.
35 Mason Street
Greenwich, Conn. 06830
Classified Advertising

EQUIPMENT FOR SALE PURCHASE OR LEASE

OUTSTANDING VALUES IN EDP EQUIPMENT

selling/purchasing/leasing

Computer Sales Inc., Dept. 20, 128 Woodland Ave., Yonkers, N.Y. 10703 914—423-0688

EQUIPMENT FOR SALE PURCHASE OR LEASE

FOR SALE IBM 7094 I AND 4 K 1401 13 TAPE DRIVES (9 729 VI's; 4 729 V's). For full specifications and further information write: Assistant Director, Computer Center, Columbia University, New York, N. Y. 10027

FOR SALE - RCA 501 SYSTEM

49K CPU equipped with Speed-Pak and Hi-Speed storage; 7 - 33KC 581 tapes; tape switching unit; 600 LPM printer; paper tape reader; monitor typewriter. Available October 15. Price negotiable. Box #8-1

FOR SALE: Bell & Howell Phillipsberg 20 Station Collator

Special 20 station selective mastermailer collator with random selection on 20 stations. Special card reading station and sequence check.

Serial Number:	16-229
Power:	220V - three phase - 60 cycle
Size paper:	8½" x 11¼"
Main function:	To put source documents into a designated sequence. A computer punched card controls the collator and pulls only the required documents (papers).
Age:	2½ years old
Price:	$75,000 (Purchase Price $95,000)
Usage:	Was used two periods of three months each for income tax processing. Like-new condition. Inspection can be arranged. Further data regarding how the machine performs its functions; the automatic detection system incorporated in the machine; the control panel; operational controls; general maintenance; and illustrations of the equipment are available upon request.
Reason for Selling:	New production techniques negate need for selective collating.

1401 SYSTEM FOR SALE

Includes 1401 E5, 4K tape-disk processor with many optional devices, 1402 Model 1 (800/250 CPM) card read punch, 1403 Model 2 (600 LPM) printer, and two type 7330 magnetic tape drives. Currently under IBM maintenance contract. Immediate availability. For further details and price information contact A. F. Hill, Raytheon Co. 141 Spring Street, Lexington, Mass. (617) 862-6600.

SCM Model 7816 Desk Computer — For immediate Sale. Three Paper Tape I/O'S, 1 Mag. Tape. Call or Write: Mr. Spencer Gautney A-G FOODS, INC., 215 W. Church Road, King of Prussia, Pa. 19406, (215) 265-6100

LEASING

LIBERAL LEASING

We are looking to finance the average 2, 3, and 5 year leases for the small dealers seeking to sell or the small data processor who wishes to buy anything. 40 West 15th St., NYC 10011. EQUITY LEASING CORP.

SERVICES

ENVIRONMENTAL IMPLEMENTATION
UNINTERRUPTIBLE POWER SUPPLIES
Lighting Air Conditioning Raised Floors
Complete Installations for all DP Centers
AMPELECTRIC COMPANY
17 Amherst Road, Hicksville, N. Y. 11801
516-931-7035

OPTICAL SCANNING

Each month we convert over 1 million records to magnetic tape by typing and scanning. We format your finished tapes per your requirements. High quality work. Write or phone Ken Benson, Input Services, 111 E. 4th Street. Dayton, Ohio 45402 (513) 222-2721.

PAYROLL TAXES. Save on Payroll programming and system studies costs by using the TAXCAL payroll deduction calculation package. Available in PL/I and FORTRAN modules. For details write: TAXCAL, P. O. Box 53264, Houston, Texas 77052.

EDUCATIONAL COURSES

PL/I—COBOL interface education courses "learn-by-doing" the newest programming language at your convenience. Learn More-Earn More. Courses available: PL/1, COBOL DECISION TABLES. Course includes the Directed Instruction Text with tape lecture and instruction by experienced data systems people. The Voice Of Experience lectures are recorded on convenient Cassette Tapes and includes a "named brand" Cassette tape player/recorder. The courses are thoroughly field tested by major corporations and individuals. The courses are designed and produced by a leading EDP Consulting firm. For more information and a brochure outlining the courses write to:

EDP Associates, Inc.
527 Lexington Ave.—New York 10017
Dept. JWI.

*Attention EDP Distributors—some areas still available for exclusive territory. Write on company letterhead for details.

DATAMATION

Classified Advertising

The classified section is open for the following advertising categories: Used equipment; positions wanted; help wanted, educational institutions; maintenance services; professional cards; hobby products; business opportunities and educational courses. Rates are based on total number of insertions used within each contract year.

For further information please contact: DATAMATION Magazine, Classified Advertising Dept., 35 Mason St., Greenwich, Conn. 06830 (203) 661-5400.

POSITIONS WANTED

PhD(1967) in Chem. Eng. seeks to associate with progressive Computer Science Department, Computing Center, or Research Institute to act as science/engineering interface and study applications and numerical methods. Several years background in related areas. No agencies please. Box # 8-2

HELP WANTED NON-PROFIT INSTITUTIONS

DIRECTOR OF COMPUTING CENTER STATE UNIVERSITY OF NEW YORK AT BINGHAMTON BINGHAMTON, NEW YORK

Applications are invited for Director of the University Computer Center. Ph.D. in any discipline required to facilitate joint appointment with relevant academic department, if desired. Salary open and competitive with commensurate experience. University is AAUP rated "A" in compensation levels.

Position involves complete responsibility for directing an expanding computer center with a present staff of 35. The Center currently has an IBM system 360/40 with plans to upgrade to a larger system in the immediate future.

With a faculty of 350, the University is located 180 miles from New York City in a metropolitan area of 300,000. Current undergraduate and graduate enrollment is 4000 scheduled to expand to 10,000 by 1974.

Requests for further information or a formal application consisting of curriculum vitae and names of three references should be submitted to:

DR. RICHARD A. REHBERG

at the above address.

COMPUTER PROGRAMMERS SOCIAL SCIENCE RESEARCH

The Brookings Institution needs experienced, creative applications and systems programmers to contribute to economics and political science research projects. Experience in FORTRAN programming, a working knowledge of quantitative and statistical methods, excellent academic record, and academic or research computing experience are required. Brookings offers an academic environment, liberal fringe benefits, and opportunity to participate in research projects of direct importance in forming social policy. Write to Mr. George Sadowsky, The Brookings Institution, 1775 Massachusetts Avenue, N. W., Washington, D. C. 20036, including resume, professional interests and salary requirement.

If you could see the people CARE feeds...

...you wouldn't need coaxing. Mail a check.

CARE Food Crusade, New York, N.Y. 10016

advertisers' index

Adage, Inc. 8
Albert Associates 166
Albert, Nellissen, Inc. 135
Alphanumeric Incorporated 4
American Technological Institute 162
AMP Incorporated 120, 121
Ampex Corp. 92, 93
Ann Arbor Computer Corporation, A Subsidiary of the Jervis B. Webb Company 15
Applied Data Research, Inc. 5
Athana Corporation 82, 83
Audio Devices, Inc. 118
Automatic Information Management 78
Avco Computer Services 178
Avco Lycoming—Charleston Plant 171

The Boeing Company, Commercial Airplane Division ... 167
The Brookings Institution 175
Bryant Computer Products, A Division of Ex-Cell-O Corporation 142
Burroughs 16

Cadillac Associates, Inc. 171
CC Systems, Inc. 127
C-E-I-R Inc., A Subsidiary of Control Data Corporation 124
Clary Corporation, Data Equipment Division 81
Computer Sciences Corporation 123
Computer Usage Education, Inc. 64
Comress 80
Consolidated Electrodynamics, A Subsidiary of Bell & Howell 141
Control Data Corporation 75
Curtis 1000 Inc. 18

Data Management Services, Inc. 166
Data Packaging Corporation 110
Data Pathing Incorporated 178
Data Products 70, 134
DATAMATION Magazine 159
Datel Corporation 131
Eugene Dietzgen Co. 35, 36
Digital Equipment Corporation 65, 67, 68, 69, 164
Drew Personnel Placement Center 174

Eastman Kodak Company, Business Systems Markets Division 49
Electronic Computer Programming Institute 105
Electronic Memories, Inc. 144
EMR Computer, EMR Division of Weston Instruments, Inc. 126

Fabri-Tek 77
Ferranti-Packard Electric Limited 137
Ferroxcube ..... Cover 4
The Foxboro Company 169
Fujitsu Limited 91

General Automation, Inc. 130
General Electric 62, 63
R. P. Gillotte & Co., Inc. 9
Graphic Systems Division of Computer Industries 102

Robert Half Personnel Agencies 167
Hewlett Packard 6
Hexco, Inc. 147
Honeywell, Computer Control Division 10
Houston Instrument Division of Bausch & Lomb 57

WHAT IS YOUR TRUE WORTH?

FREE Data Processing Opportunities Bulletin

Every month, in the privacy of your own home, you can evaluate the nation's finest openings in the data processing field. Cadillac, the nation's largest executive and professional placement service, represents the majority of the nation's top companies. Their best jobs at salaries from $6,000 to $75,000 appear in our monthly Data Processing Opportunities Bulletin.

Our placements show that the average data processing man is worth 10% to 20% more than his present income. The Bulletin helps you evaluate yourself in today's market. Both the Bulletin and our *confidential* placement service are free. Client companies pay all costs.

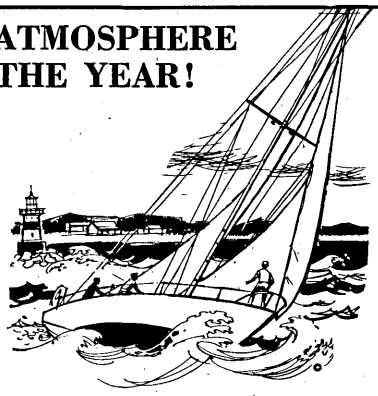
For your free Bulletin, without any obligation circle Subscriber Service Card No. 308. Please use *home address only.*

LON D. BARTON, *President*
Cadillac Associates, Inc.*
29 E. Madison Bldg. Chicago, Ill. 60602
Financial 6-9400

* *"Where More Executives Find Their Positions Than Anywhere Else in the World."*

CIRCLE 308 ON READER CARD

VACATION ATMOSPHERE THRU-OUT THE YEAR!



Sail, hunt or fish just 20 minutes from your own driveway!

Avco Lycoming, world's leading manufacturer of gas turbine engines, has career opportunities open in its Charleston, S.C. plant for the following:

SYSTEMS ANALYSTS
Prefer Management Information Systems background.

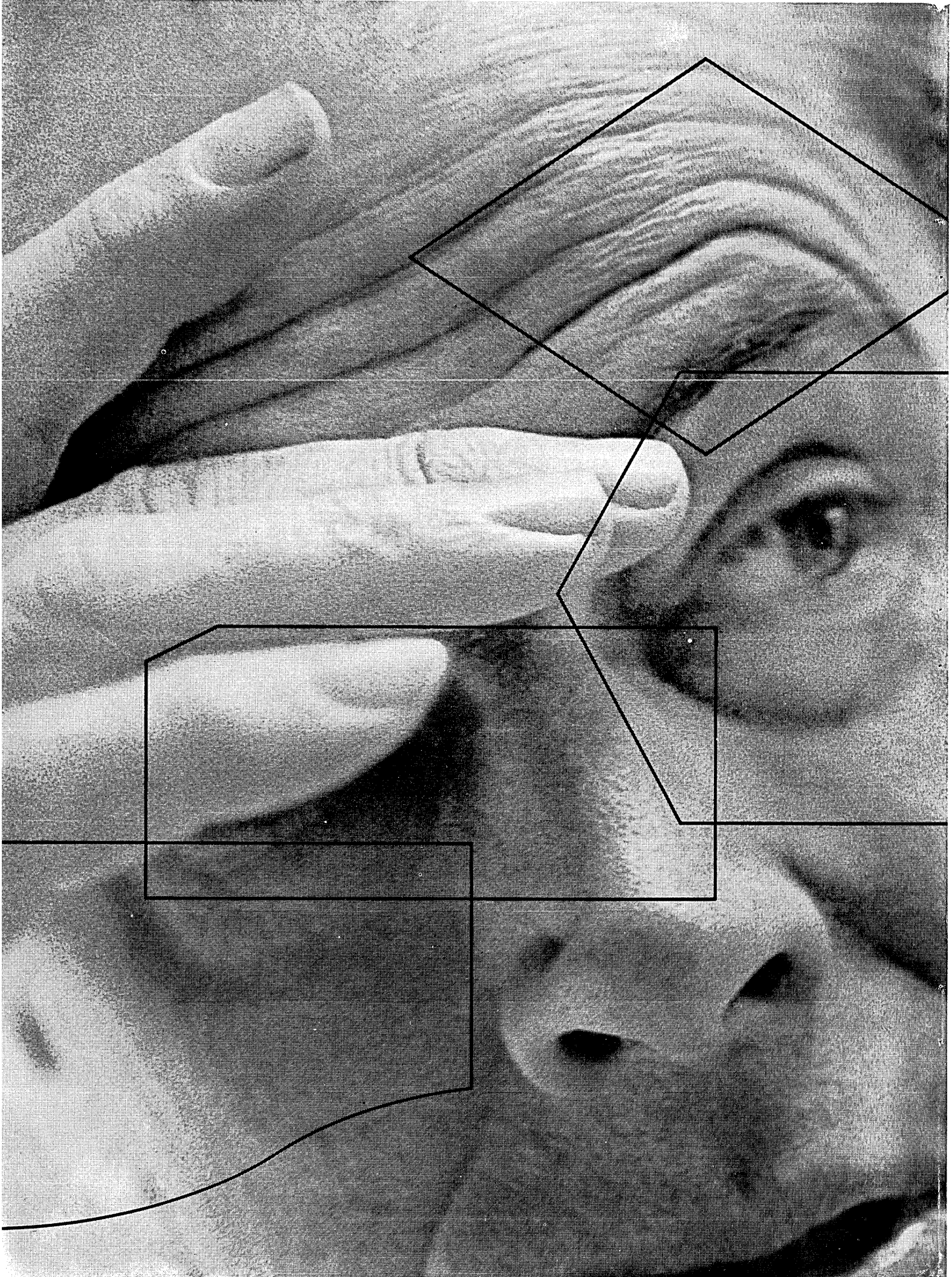
SENIOR PROGRAMMERS
3-5 years experience with some 360 DOS background.

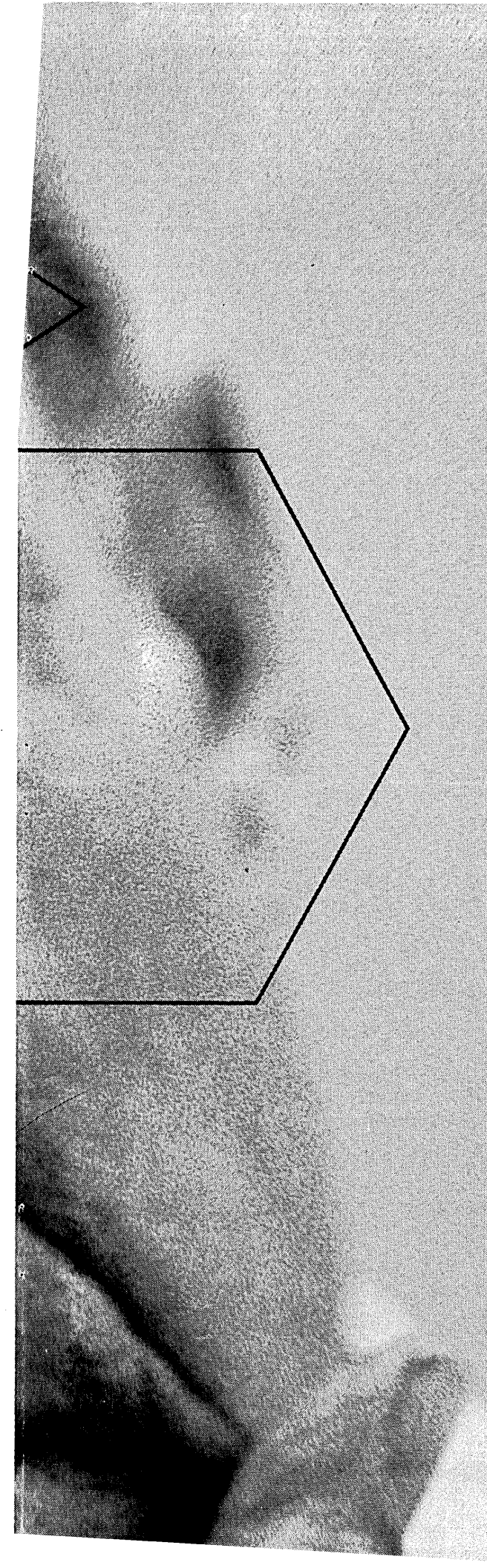
Now is the time to get in on the ground floor in the Charleston, S.C. plant now in operation.

Contact or send resume to:
Ed Blake, Avco Lycoming-Charleston Plant
P.O. Box 10048, Charleston, South Carolina
Tel. (803) 554-1071

An equal opportunity employer

CIRCLE 323 ON READER CARD





You've put a lot into becoming a better programmer.

Are you getting the most out of it?

RCA is as interested in your present progress as you are. It's not altogether an unselfish motive. We want to keep up our record in programming accomplishment much as we have in hardware technology—producing faster higher-capacity machines. You can help our present and future record in the programming area.
For instance, here are two RCA divisions that are leading the way.

RCA Information Systems Division believes that you should get the most out of your potential. You might be in software design or support, marketing support, or product planning, or any of the major fields associated with EDP.

If you are we want to talk with you.

We believe we have the opportunities that will turn your ambitions into reality. You'll have a voice in hardware design. A variety of projects to test your intellectual flexibility. A group of people to work with who speak your language.

We have projects that include time sharing, executive systems, random access, compilers, communications systems, information retrieval and other areas such as management information systems, field systems support, special industry applications, product planning; and if your interest lies in that direction, engineering and EDP sales.

Openings are at all levels. Locations are Cherry Hill, New Jersey and areas throughout the United States.

RCA Graphic Systems Division is busy adding the speed of electronics to typesetting.

At this division we've combined computers with new electronic typesetters that can set the text for an entire newspaper page in less than two minutes. Together, they do the complete job: store and recall manuscripts, size and lay out pages, and set the type.

These assignments require exceptional programmers who combine experience and competence with imagination.

It isn't easy, but it's fascinating; requiring bold creative effort in return for personal recognition and reward.

Openings are at all levels for those with a minimum of 2 years programming experience. Location is Princeton, New Jersey.

To find out more about these major areas of programming at RCA, write to: Mr. T. Beckett, RCA, Dept. SW-8, Bldg. 2-2, Camden, New Jersey 08102. We are an equal opportunity employer.

RCA

LET FDR HELP YOU GET A BETTER JOB IN EDP

A NEW FUTURE FOR 6¢ — Better jobs are looking for you in New York. Right now there are hundreds of openings for EDP personnel in the areas of applications programming, systems programming, systems design, software systems and management information systems. WHY THE JOBS ARE BETTER — New York is where it's happening in EDP. The number of companies using computers in this dynamic business and scientific community is growing at an astonishing rate! Your talents are badly needed and consequently will be much appreciated. Better salaries range from $8,000 to $20,000. The responsibilities and opportunities are greater. You can virtually write your own program for advancement! HERE'S WHAT WE'LL DO —As soon as we receive your resume, we'll start right to work finding the right career opening for your talents. When an opening and your skills match we'll phone you no matter where you live in the continental United States to give you full details about the job. When a client company wants to meet you, our client will fly you to New York for an interview at no cost to you. NOW, ABOUT THAT RESUME — If you have a resume already prepared, fine. Send it to us immediately. If you don't have one, just give us a brief summary of your experience, salary requirements and geographical preference. DREW'S CREDENTIALS — We're the largest EDP personnel placement organization in New York. More than 300 nationally known companies headquartered here rely on us to satisfy their manpower requirements in data processing and systems analysis. That's why, when jobs open up, Drew is the first to know.

DREW

Personnel Placement Center • 160 Broadway, New York, New York 10038 • (212) 964-8150

CIRCLE 324 ON READER CARD

engineers - analysts - programmers GROW

IN THESE NATIONAL POSITIONS FROM 7,000 TO $25,000

■ CIRCUIT DESIGN ■ DIGITAL OR LOGIC DESIGN SWITCHING ■ COMMUNICATIONS ■ MANUFACTURING ■ RELIABILITY ■ SOFTWARE DEVELOPMENT ■ SCIENTIFIC PROGRAMMING ■ REAL TIME SYSTEMS ■ BUSINESS SYSTEMS ■ COMMERCIAL PROGRAMMING ■ OPS RESEARCH

NATIONAL CHOICE: NEW ENGLAND ■ NEW YORK ■ PHILADELPHIA ■ WASHINGTON MIDWEST ■ SOUTH ■ CALIFORNIA ■ TEXAS ■ FLORIDA ■ AND OTHER AREAS

FREE: CAREER OPPORTUNITIES BULLETIN

For a complete listing of outstanding positions with National Companies circle subscriber service card using home address only.

Free custom service. All expenses paid by client companies (fees, interviewing & relocation.) Send resume in confidence with present salary and geographic preference. No obligation.

La Salle Associates

PROFESSIONAL SEARCH DEPT., 2136 LOCUST STREET, PHILA., PA. 19103

CIRCLE 325 ON READER CARD

By this summer the INFORMATION PROCESSING SERVICES CENTER will be running an integrated Attached Support Processor System, with Remote Job Entry from several stations. Our new building, (see sketch) which is near completion, will house this computer complex and its supporting staff.—But to install and maintain the sophisticated time-sharing, batch-processing, conversational and interactive programming systems, which the MIT community expects to use on this computer complex, we need:

SYSTEMS PROGRAMMERS

If you are interested in working with systems concepts that include multi-processing, multi-programming, access to large data bases, graphics and dispersed computing in an integrated system—and have at least two years experience in systems programming (preferably with one year direct contact with OS360 or TSS360), please contact us.

Successful candidates will receive unexcelled career opportunities and salaries based on experience.

If Interested Please Forward Your Resume To

MR. RICHARD G. MILLS

Director of Information Processing Services

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Bldg. 26-269, Cambridge, Mass. 02139

An Equal Opportunity Employer

CIRCLE 326 ON READER CARD

advertisers' index

IBM Corporation 53, 97
IBM Federal Systems Center 176
Information Control Systems, Inc. 13
Information Displays, Inc. 94

Joslyn, Inc. 127

Everett Kelley Associates 175
Kidder, Peabody & Co. Incorporated 132

La Salle Associates 174
Lockheed Electronics Company, A Division of Lockheed Aircraft Corporation 163
Lockheed Missiles & Space Company, A Group Division of Lockheed Aircraft Corporation 150

MAC Panel Company ..... Cover 3
Magnafile, Inc. 168
Management Scientists, Inc. 158
Massachusetts Institute of Technology 174
McDonnell Douglas Corporation 139
Memorex 73
Mobil Oil Corporation 158

The National Cash Register Company 98, 147
National Lead Company, Floating Floors, Inc. 12

Ohio University 158
Optical Scanning Corporation 138

Planning Research Corporation 56

Radio Corporation of America, Staff Employment ..172, 173
Rann & Paley, CPA's 147
Raytheon Computer 20, 95
RCA Information Systems 128, 129
Recognition Equipment Incorporated ..40, 41, 42, 43, 44, 45
Remote Computing Corporation 168

Sanders Associates, Inc. 101, 125
Sangamo Electric Company 116
Schneider, Hill & Spangler, Inc. 154
Scientific Control Corporation 136
Scientific Data Systems 2, 3
Shelby Business Forms, Inc. 103
Sheridan Associates Inc. 154
Sikorsky Aircraft, Division of United Aircraft Corporation .146
Sola Electric Division of Sola Basic Industries 107
Source EDP 154
System Development Corporation 152, 153
Systemat 154
Systemation Consultants, Inc. 150
Systems Engineering Laboratories 58, 59
Systems and Procedures Association 109

Tab Products Co. 88
Tally Corporation 1
Teletype Corporation 112, 113
Texas Instruments Incorporated 84
Thompson Book Company 104
3M Company 54, 55
Time-Sharing Enterprises, Inc. 133
Transistor Electronics Corporation 114

United Air Lines 148
Univac, Federal Systems Division 150

Varian Data Machines, A Varian Subsidiary ..... Cover 2
Vermont Research Corporation 79
Vernitron Corporation, Data Devices Division 140

Wang Laboratories, Inc. 14

Xerox Corporation 156

EDP opportunities in Social Science Research

The BROOKINGS INSTITUTION is a private, independent organization devoted to policy-oriented research and education in the social sciences. The expanded role of computer applications has created these professional positions:

ASSISTANT DIRECTOR, COMPUTER CENTER—

...requires substantial research or academic programming experience, theoretical training and experience in mathematical and statistical techniques, and previous participation in the social sciences, as well as operations management ability. Advanced substantive work in computer or social sciences is highly desirable.

CREATIVE PROGRAMMERS—

...requires interest and background in procedural language design and interactive language design and implementation, as well as numeric informational retrieval systems, for social science research applications. Experience may be in a related field.

APPLICATIONS PROGRAMMERS—

...requires creative persons with substantial experience in FORTRAN programming with applications to basic research studies, a superior academic record and previous academic or research computing experience. A knowledge of mathematical and statistical methods is essential; in economics or political science, it is highly desirable.

Our stimulating academic environment offers growth potential, salaries commensurate with experience and ability, and an exceptional benefit program. For prompt, confidential consideration, send your resume, including requirements and professional interests, to Mr. George Sadowsky.

The Brookings Institution
1775 MASSACHUSETTS AVENUE N.W.
WASHINGTON D.C. 20036
An equal opportunity employer

CIRCLE 327 ON READER CARD

CAREER MEMO

To **PROGRAMMERS/ANALYSTS/ENGINEERS**

From **EVERETT KELLEY ASSOCIATES, INC.**

If your present position lacks professional motivation . . . NOW is the time to let us program your professional future . . .

Consult our staff of experienced specialists who are at your disposal. They will open doors and arrange favorable interviews with selected clients. Utilize your total professional capability in:

- Scientific Programming
- Real Time Systems
- Software Development
- Operations Research
- Applied Systems
- Systems Design
- Consulting
- Digital or Logic Design
- Circuit Design
- Commercial Programming
- Mathematics
- Development Engineering
- Communications
- Sales/Marketing

Salary range: $8,000-$30,000. All expenses paid by client companies (fees, interviewing and relocation).

Submit your resume in strict confidence, including salary requirements and geographic preference, directly to Mr. R. L. Keilholtz or Mr. Donald Wayne or write for our composite resume form A.

NATIONAL EMPLOYMENT ASSOCIATION SERVICE MEMBER

EVERETT KELLEY ASSOCIATES

Consultants to the Computer Industry

121 So. Broad Street (Suite 1300)
Philadelphia, Pa. 19107
Placement of Computer Professionals since Binac.

CIRCLE 328 ON READER CARD

Programmers and systems analysts

Help the air traffic controllers

You can do it with both feet planted firmly on the ground—right next to IBM/Atlantic City's battery of System/360 modified units. Among this system's many peripheral devices are real-time radar inputs, flight strip printers, video and alphanumeric displays. But more important than glamorous hardware is the satisfaction of working on an urgent and important problem—assisting air traffic controllers in keeping airplane traffic running smoothly.

Crowded skies

There are 40,000 more planes in the United States today than there were 10 years ago. And air traffic control specialists are busy around the clock controlling them. Last year, the FAA's 18,000 specialists in flight control guided more than 48 million take-offs and landings, and by sometime in the 1970's it is predicted that number will have more than tripled.

IBM is helping these controllers by computerizing their information input and display systems. The computer also correlates aircraft tracks with flight plan information. (At present, the controllers position markers by hand on the basis of spoken information.)

Immediate openings

This is vital work and IBM/Atlantic City, N.J., needs additional experienced programmers and systems analysts to help us with it.

These jobs take an ability to interface with other people and to draw together insights from far-flung disciplines. You'd be using sophisticated programming tools and techniques to create and test hardware and multi-processing computer programs. SAGE and other similar real-time experience will be helpful.

If you'd like to participate in this work at Atlantic City, N.J., call Jim Dunn at (301) 921-7724 or write him at the IBM Federal Systems Center, Dept. BH1010, 18100 Frederick Pike, Gaithersburg, Maryland 20760.

IBM®

An Equal Opportunity Employer

the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

A PUBLIC EDUCATION PROGRAM

Our younger generations in grammar school and high school are literally growing up with computers. It is highly probable that they will develop a technically correct and responsible attitude towards computer technology, that is, if our student generations learn from good textbooks rather than absorbing what they might read about computers in the popular press of newspapers and magazines. Our concern is with the adult population which is getting its knowledge of information processing technology primarily through the popular press.

I propose an eight-point program to combat the fear of our technology. This program is addressed to the computer users, professionals, management, scientists and academicians who are willing to assume this responsibility.

1. The advertisements in our technical publications as well as those in publications for the general public sponsored by the computer and software industry should be of a responsible nature with emphasis on the fact that their products are products of people, and that the products are to be used by people as tools in their work. Getting the "people" concept into computer advertisements is a very important aspect of responsible advertising.

2. Our technology should be willing to support financially and encourage service and professional organizations to engage in computer education of the public. An example is a project which I am developing for the San Francisco Bay Area Chapter of the Association for Computing Machinery. This project is an exhibit to be placed in public libraries, high school libraries, banks and office building lobbies. Its purpose is to educate the public as to what computers are all about. The exhibit is titled "Make a Computer Work." It consists of three self-standing units subtitled "What Makes It Work," "How We Make It Work," and "Who Makes It Work." Industries in the San Francisco Bay Area will be solicited for the financial support to build this exhibit.

3. We must be ready at every opportunity to support our educational institutions. This can be done through local parent-teacher organizations and by offering direct help to our educators. Computer components can be supplied for educational purposes. Our services can be offered for vocational guidance conferences. We can support high school computer clubs and junior achievement companies organized to produce products related to the computer field.

4. All types of organizations in our technology should be willing to offer tours of their computer installations and advertise and make known to the public their willingness to offer such tours. Speakers bureaus can be organized to offer responsible speakers who can represent our technology appropriately to the public.

5. It is incumbent on us all to influence legislation of our government. We should be writing to our congressmen whenever situations arise that require responsible advice concerning both legislation and the government use of computers. Our computer and software industry and our professional organizations should offer expert testimony when called upon and volunteer to do so before congressional committee hearings.

6. We need better system design at the point of system interface with people. Humanizing attributes should be present in input data forms, output listings and on-line terminal dialogues. The user's, not the system, terminology should be used for naming input and output variables. The programming language limitation of n characters for variable names should not limit the name size on input forms or in output listings. With a little extra effort, individuals' names can be printed first name first and even "Miss," "Mr.," or "Mrs." can be included. Reference information for de-bugging and system reference purposes can be put in unobtrusive locations on output forms. An example is the number by which a person is recognized within the system. The order in which input data is required should be the natural order people expect. Use of the computer should eliminate redundancy. John McCarthy stated that it should be the right of each citizen to supply non-changing information to the government only once. Extensive use should be made of default values for input variables when those values predominate. Then input by exception can be the rule. Free-form input formats can eliminate the

Systems Programmers

If your interest is in large-scale systems, this advertisement was written for you.

Avco Computer Services has immediate openings in a young and dynamic systems programming section for individuals with software experience. If you have an interest in a large-scale IBM 360 environment including IBM 360/75/65/50/40 with applications in remote data transmission, graphics, time-sharing, systems modification or systems maintenance then here is the opportunity you've been waiting for.

Candidates should possess a minimum of a bachelor's degree. Salaries are fully commensurate with experience, benefits are generous and promotion will be rapid for individuals with ability and ambition.

Direct an outline of your professional experience to Mr. P. C. Dowd, Supervisor of Employment, Dept. N.D.

AVCO

AVCO COMPUTER SERVICES

201 LOWELL STREET, WILMINGTON, MASSACHUSETTS 01887

An equal opportunity employer.

CIRCLE 331 ON READER CARD

SOFTWARE PROGRAMMERS
SYSTEMS ANALYSTS
SALES MANAGEMENT

A Broad Company Expansion based on market acceptance of our

DATA COLLECTION SYSTEMS

For a young company, DATA PATHING, INC., has scored rapid, tangible successes in a relatively short time in the high-potential field of data collection/transmission systems. DATA PATHING brought its highly efficient system to market last year, where it found ready acceptance by major corporations throughout the country.

Current openings are for:

Software Programmers

with 360 assembler language and detailed O S experience. Positions are In Sunnyvale, California.

Systems Analysts

with background in pre and post sales systems design analysis with emphasis on Manufacturing and Financial applications. Positions in all parts of the country.

Sales Management

3 plus years experience probably with main frame manufacturer. Proven sales records dealing with top management of big companies. Should know systems design in application areas such as manufacturing and finance. High potential openings (all over the country).

For the professional who realizes the importance of RIGHT TIMING to career development, this is both the RIGHT COMPANY as well as the RIGHT TIME to join us.

For prompt reply, send resume in confidence to: **Mr. Herbert J. Cooke**
Director of Personnel

DPI

Data Pathing Incorporated

370 San Aleso Ave., Sunnyvale, California 94086

An Equal Opportunity Employer

CIRCLE 330 ON READER CARD

obnoxious "fill in the squares" requirements.

Forgiveness techniques should be used to the fullest degree possible. If the middle initial of a name is required for identification on input forms but only one last name matches the input name, it should be accepted without the middle initial. Misspelling which does not violate the uniqueness of input words should be allowed. Error outputs returned to the user should be gently, politely, and clearly described. A message offering the name of a person to contact for further assistance aids in humanizing a system. Use of the words "gently" and "politely" may sound facetious, but it is important. Whether we like it or not, customers of computers develop a camaraderie with them and look upon them as having human qualities; and as learned long ago, proper etiquette and politeness go a long way in human relations. We should stress the concept of these qualities originating with the programmers and only passing through the computer.

7. We should all be well informed on our subject and develop the ability to explain complex ideas, concepts and activities of our technology to the public. When we are to be quoted in newspapers or magazines, we should insist on reviewing the quotations before they are printed. We should be very careful that what we say is not misinterpreted by reporters and writers.

8. Finally, we must all behave in an impeccable ethical and generally professional manner. We should give no aid to the detractors of our technology and no reason for public concern resulting from unprofessional conduct. As the use of computers becomes more intensive in areas of public trust, we must increase our awareness of the ethical implications of our work as we make technical decisions affecting the safety and welfare of others. Our public support of codes of ethical conduct such as the ACM Guidelines for Professional Conduct can help instill in the public mind a trust in our technology and respect for it.

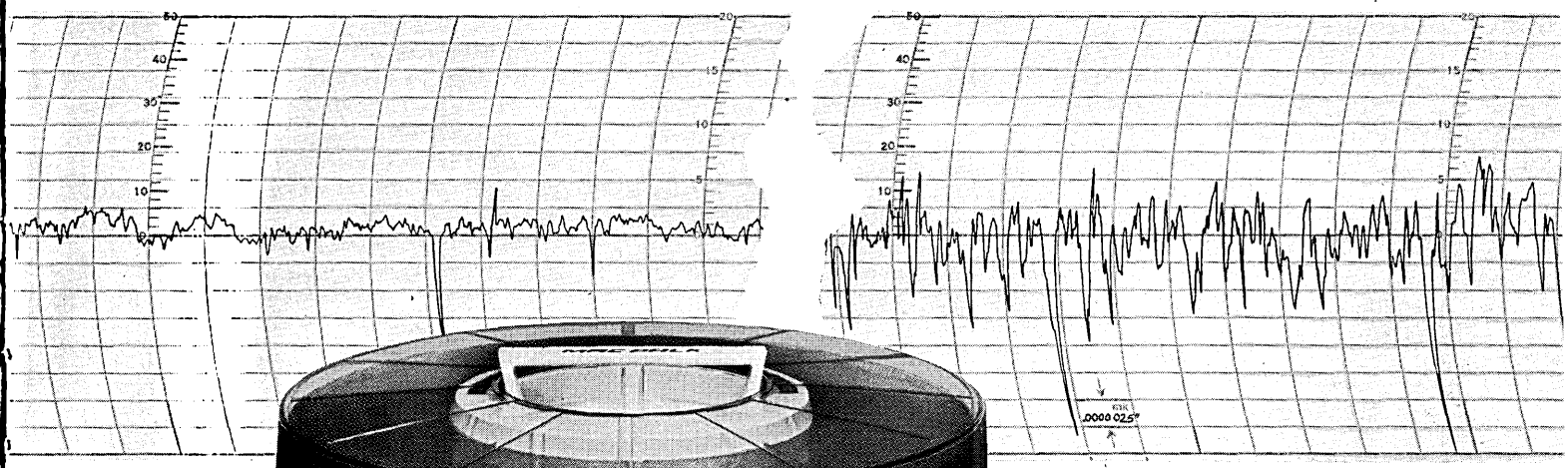
By following this eight-point program we can make progress in significantly reducing the fears of the public epitomized by the "giant electronic brain" and "monster" labels placed on our computers.

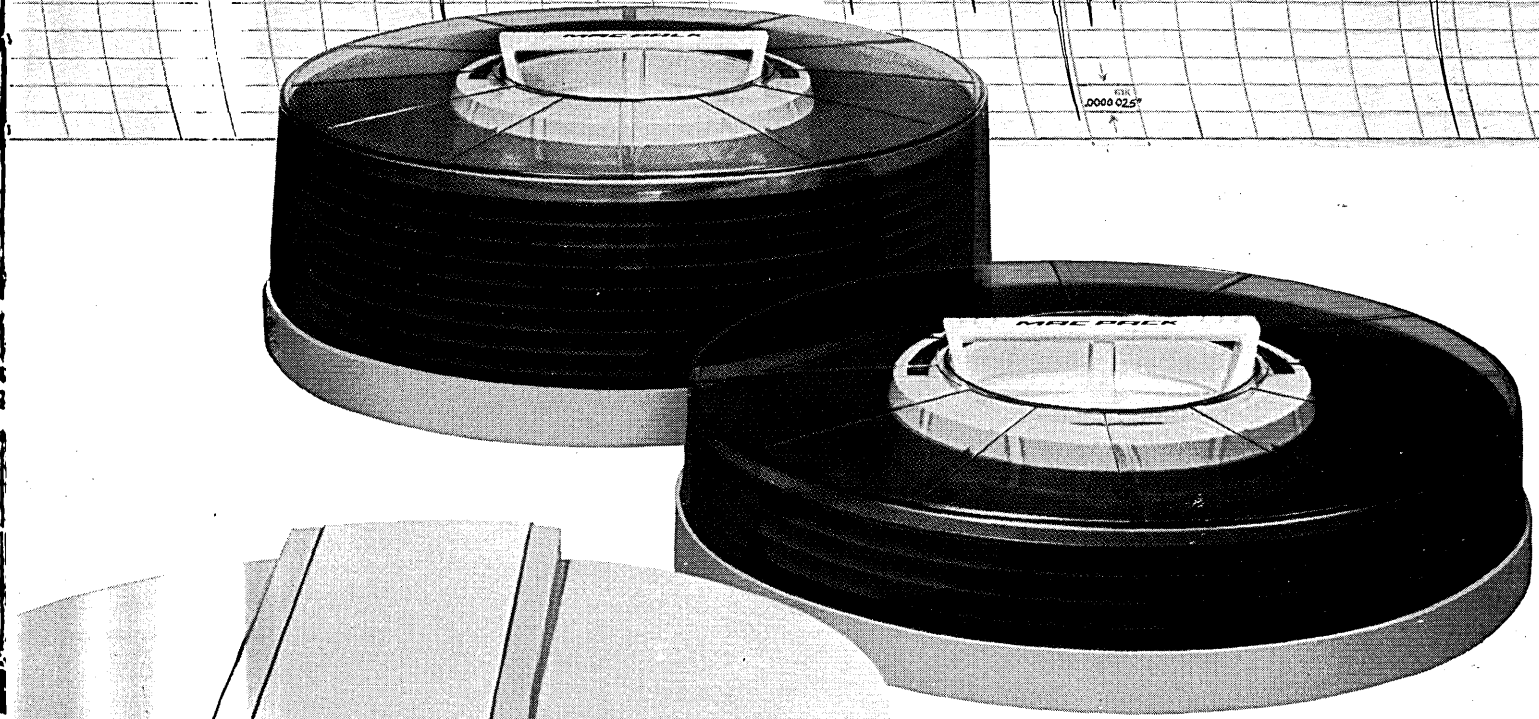
—DONN B. PARKER

MAC PACK

meets or beats the competition . . . and we ship off-the-shelf!

MAC PACK is guaranteed to meet or exceed specifications and performance standards of all other disk packs. These profilometer readings show one reason why. Compare the MAC surface on the left with a competitive disk, on the right. Which surface would you rather have revolving under the heads of your disk drives — at 1500 or 2400 RPM? To achieve this smoothness, MAC engineers developed new techniques to lay the coating on the substrate of the disk. MAC holds surface roughness to less than 2.5 microinches, average, compared to the industry standard of 3.5, while maximum deviation is 20 microinches instead of 30. Superior smoothness reduces the chances of dropouts and track reassignments, and increases signal uniformity. It is one reason MAC PACKS are guaranteed error-free.





- **MAC PACK is guaranteed to meet or exceed specifications and performance standards of all other disk packs**
- **Each MAC PACK is final-tested on IBM Computers before shipment and is certified error-free**
- **Lease or purchase plans available**
- **Delivery: IMMEDIATE**
- **Order your MAC PACKS through your local MAC representative or write us at MAC Panel Company, Box 5027, High Point, N. C. 27262**

CIRCLE 2 ON READER CARD

Want a fast 2½ D stack? We'll jet it to you in just 8 weeks

(Our secret lies in the "take-off")

At Ferroxcube, we "take-off" from standard designs and deliver 2½D stacks in as little as eight weeks. Now, that's pretty unusual in itself... but in addition we've manufactured more 2½D stacks than just about anyone you could name in our industry. And that's significant. Couple this with the fact that our 2½D stacks offer full-cycle times that are practically unbeatable as far as the state of the art goes, and you begin to get a picture of Ferroxcube memory stack capability.

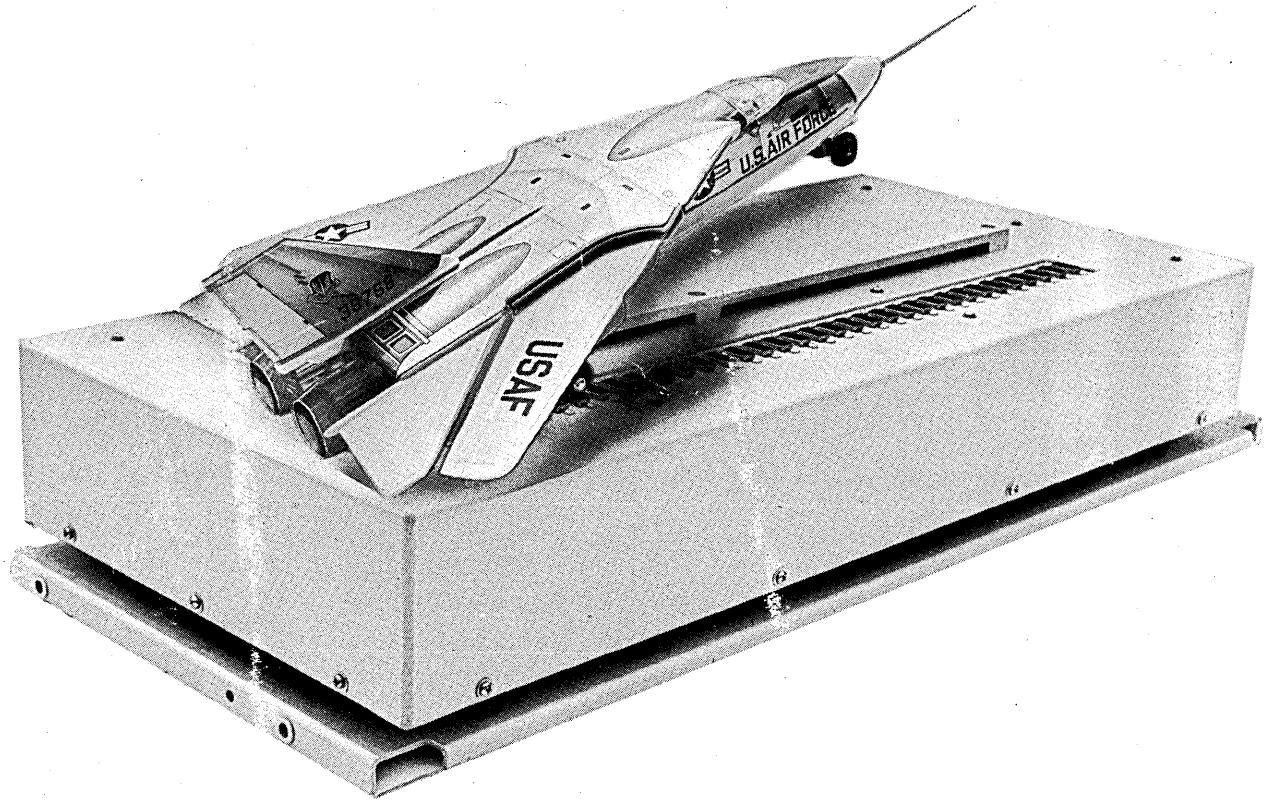
Actually, we can also give you other 2½D, 3D, mil and commercial off the shelf designs in the same short time —or even faster in some cases.

And you can't beat the Ferroxcube experts for quality. We control every vital stage of manufacture from the formulation of the powder for the cores to the planes and stacks that go out the door.

We're ready now with our 700 series 2½D units, in a variety of 20 mil core versions. Sizes to 16K x 37 currently available. And don't forget in addition to our fast "take-off" the speed on this stack is 700 nanosecond full cycle time.

Contact your friendly Ferroxcube experts for advice and service. We've logged more hours on 2½D than anyone in the industry.

Ferroxcube



Albuquerque—Electronic Enterprises, (505) 256-1585; **Baltimore**—Eastern Components, (301) 322-1412; **Burbank, Calif.**—(213) 849-6631; **Englewood, Col.**—(303) 771-2000; **Houston**—Noakes Engineering, (713) 529-6213; **Irving, Texas**—Noakes Engineering, (214) 255-0441; **Lansing, Mich.**—(517) 482-7140; **Minneapolis**—(612) 920-7955; **Northlake, Ill.**—(312) 261-7880; **Philadelphia**—Eastern Components, (215) 927-6262; **Phoenix**—(602) 264-3120; **San Francisco**—Wm. J. Purdy Agents, (415) 863-3300; **Saugerties, N.Y.**—(914) 246-2811; **Union, N.J.**—(201) 964-1844; **Waltham, Mass.**—(617) 899-3110; **Winston Salem, N.C.**—(919) 725-6306; **Toronto, Ontario**—Philips Electron Devices, Ltd., (416) 425-5161.

CIRCLE 3 ON READER CARD