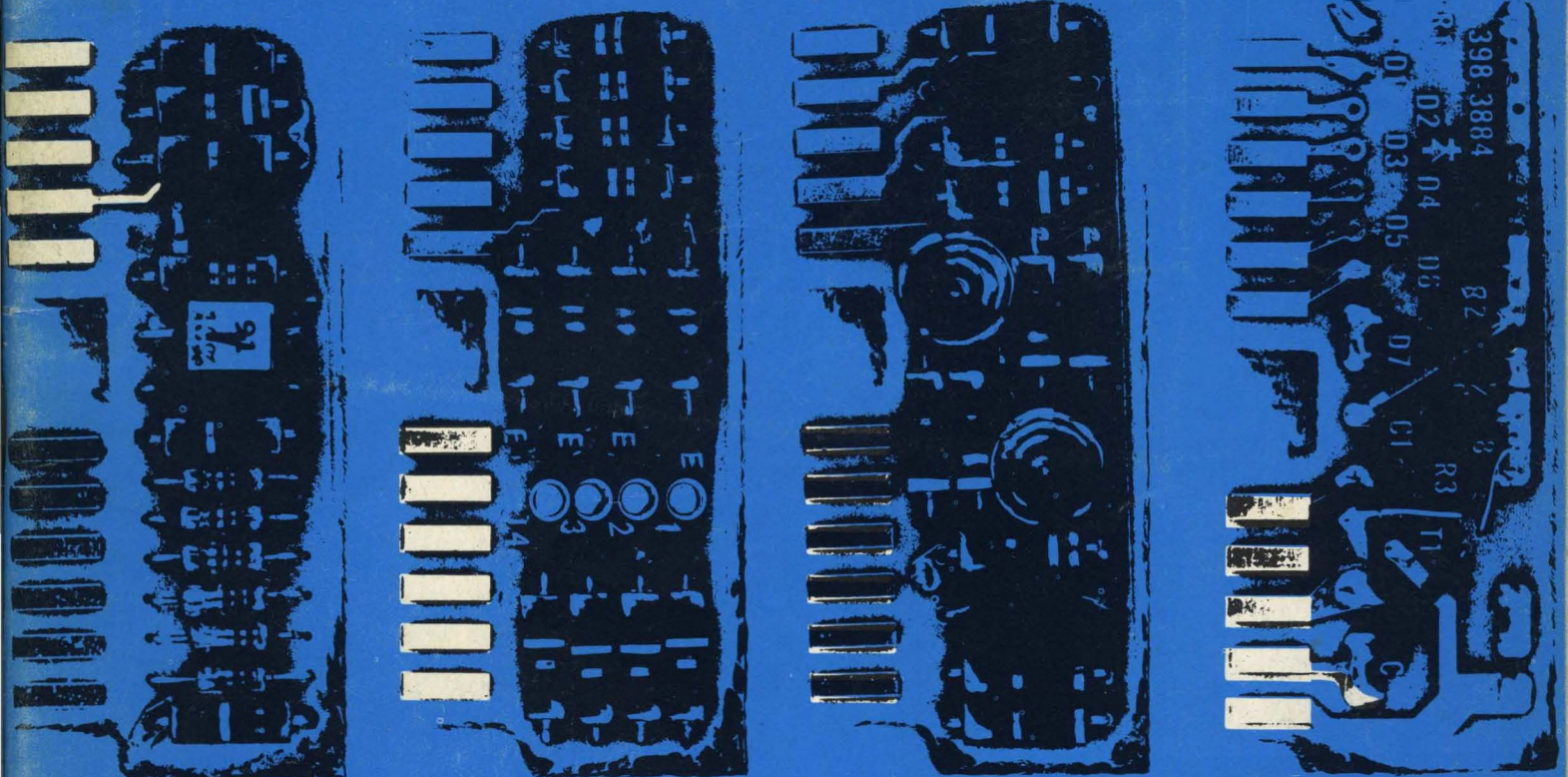
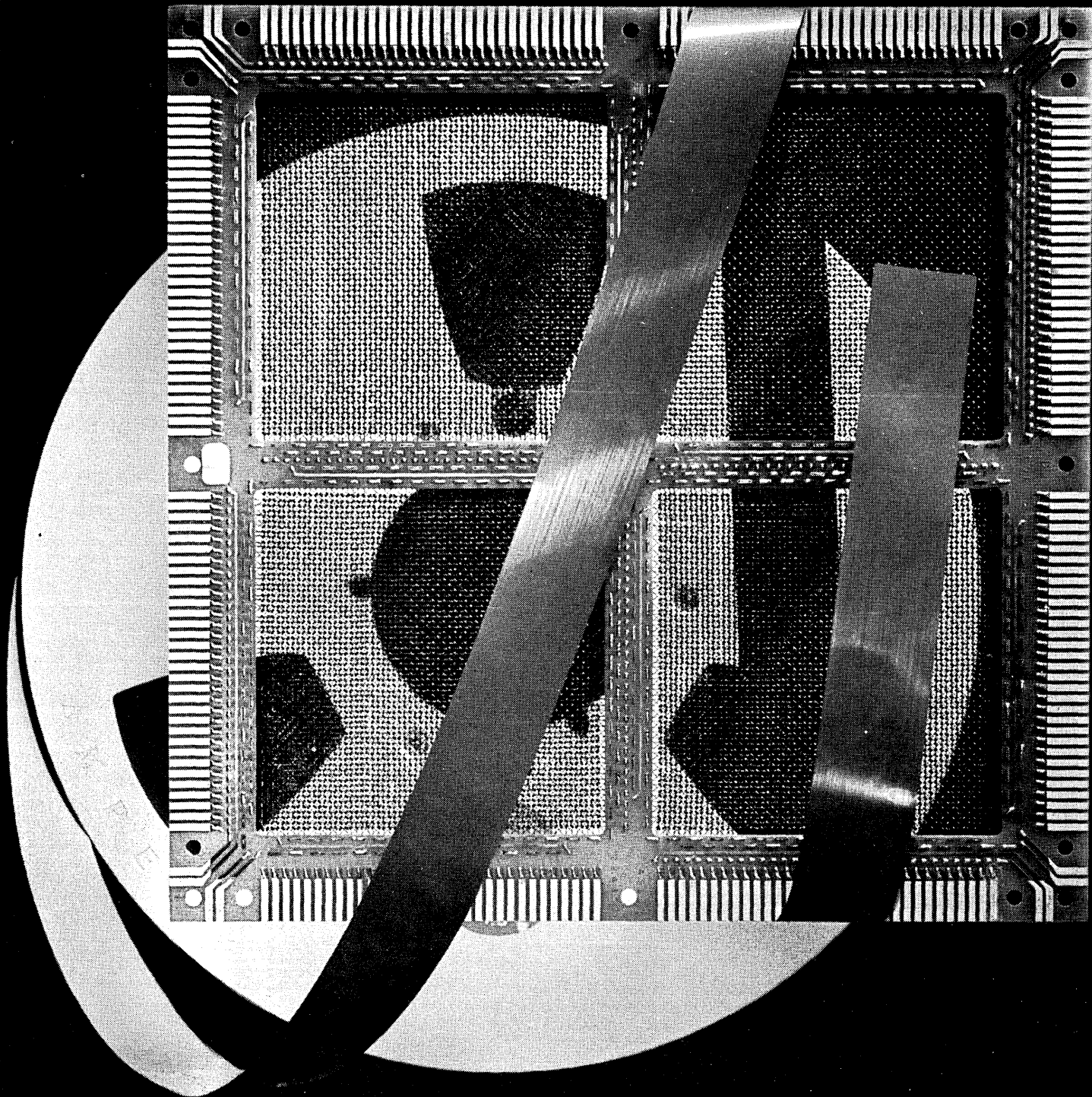




Page 24 PHILCO'S 212 COMPUTER
Page 30 COBOL AND COMPATIBILITY

12 212





MERGER

Telemeter Magnetics, Inc., and Ampex Corporation have merged. To shareholders this means increased "growth potential" . . . to an accountant "favorable financial consolidation" . . . to a marketing man "diversified product mix." But more important to you, the customer, it means more help where you need it most from the joined capabilities and resources of two of the

most respected names serving the computer industry. ■ Look to this important new source—Ampex Computer Products Company

—for highly advanced technologies in ferrite core and magnetic tape units . . . for a wide range of computer memory products . . . for knowledge, experience, and service that is dedicated to solving *your* problems. ■ Ampex Computer Products Company, 9937 Jefferson Boulevard, P.O. Box 329, Culver City, California.

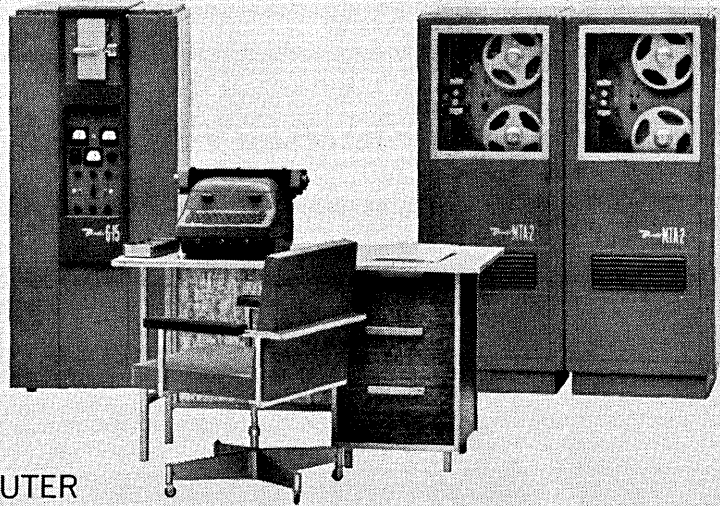
Look for this trademark. There's promise in it.

AMPEX



ALGO*

FOR THE BENDIX G-15 COMPUTER



Speeds and Simplifies Problem Solving

ALGO extends the problem-solving horizon of every engineer, focusing the speed and precision of the Bendix G-15 computer on any algebraically stated problem. ● A true mathematical equation solver, ALGO permits any engineer or scientist to program the computer in universal mathematical language. No previous knowledge of computers or programming is needed. Input/output, computation and data handling are all automatically controlled by the G-15 computer. ● Compare the number of steps in the ALGO program illustrated below with the number required to solve the same problem on a slide rule, desk calculator or any other computing system. You will see the time and cost-saving significance of this new Bendix G-15 automatic programming aid. ● Specifically designed to take advantage of the computing power and flexibility of the proven G-15, ALGO is the newest addition to an extensive library of Bendix automatic programming systems. See how the low-cost Bendix G-15 and ALGO combine to broaden application boundaries. Learn how this powerful team can save you valuable time... and greatly simplify problem solving.

* AN ALGEBRAIC COMPILER BASED ON INTERNATIONAL ALGOL.

PROBLEM:
$$I = \frac{E}{\sqrt{R^2 + (6.2832 FL - 1/6.2832 FC)^2}}$$

(For values of R, F & L as specified. For values of E ranging from 100 to 300 in increments of 50. For values of C ranging from .00002 to .000021 in increments of .000001.)

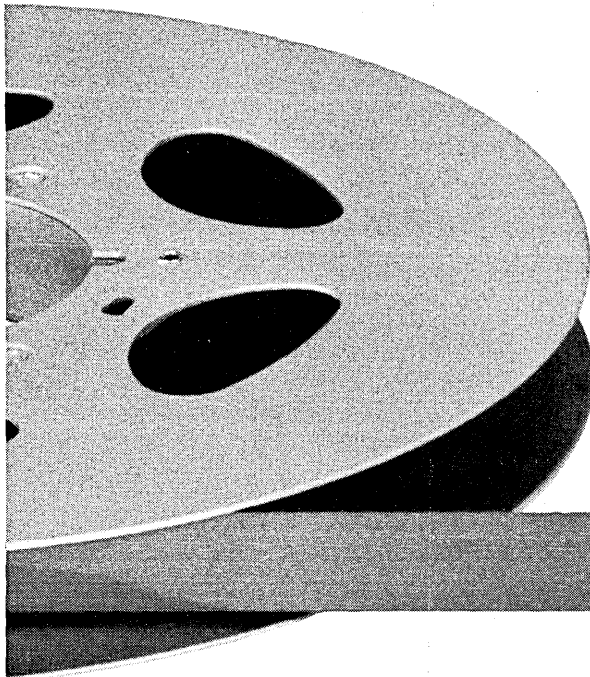
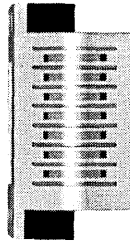
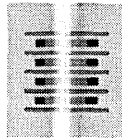
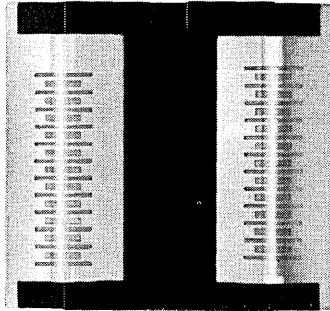
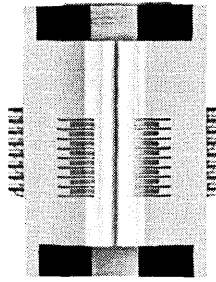
```
COMPLETE ALGO PROGRAM: BEGIN Ⓞ
R = 10 Ⓞ
F = 60 Ⓞ
L = 02 Ⓞ
FOR E = 100(50)300 BEGIN Ⓞ
FOR C = 00002(0000001)000021 BEGIN Ⓞ
I = E/SQRT(R ↑ 2 + (602832 * F * L - (1/(602832 * F * C))) ↑ 2) Ⓞ
PRINT (FL) = E Ⓞ
PRINT (FL) = C Ⓞ
PRINT (FL) = I Ⓞ
```

Write on your letterhead for the self-teaching ALGO manual.

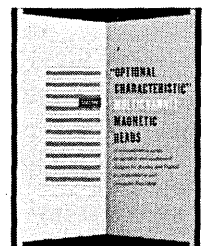
Bendix Computer Division
DEPT. E-23 LOS ANGELES 45, CALIF.
CIRCLE 4 ON READER CARD



standard heads
by Brush
fill 90%
of all
Magnetic Head
Applications



Why such an all-out claim? Because only Brush has kept pace with the many design requirements in recording technology. Continuous analysis of current and future trends enables us to maintain a design improvement program incorporating all field-proven advances in our *standard* heads. It's a must . . . to satisfy *all* customer requirements. The result? We've been able to standardize and meet all but a few highly specialized applications. You save engineering and testing time . . . and money. If you're one of the few with a "special" problem, Brush obviously has the engineering capability and manufacturing facilities necessary to fulfill *your* magnetic head application. With both standard and special heads, detailed mechanical drawings and specifications plus actual electrical characteristics are available *before the fact*. You can accurately predict system performance without costly time-consuming tests. Write now for our design and specification bulletin "Optional Characteristic Heads".



brush INSTRUMENTS
DIVISION OF
CLEVITE CORPORATION
37TH AND PERKINS CLEVELAND 14, OHIO

the automatic handling of information

volume 7, number **2**

Staff

Publisher **FRANK D. THOMPSON**

Vice President & General Mgr.
GARDNER F. LANDON

Editor **SANTO A. LANZAROTTA**

Managing Ed. **HAROLD BERGSTEIN**

Assistant Ed. **G. PATRICK ANDERSON**

European Editor **ETIENNE J. GUERIN**

Contributing Ed. **DR. HERB GROSCH**

Technical Consultant **DON B. PRELL**

Production Mgr. & Art Director
CLEVE BOUTELL

Circulation Mgr. **MARTHA KNOWLES**

Editorial Advisers

DANIEL D. McCracken
C. L. WANLASS

Sales Mgr. & Eastern District Mgr.
RICHARD W. NIELSON
141 E. 44th St., New York 17, N. Y.
MUrray Hill 7-5180

New England District Manager
WARREN A. TIBBETTS
434 Webster St., Manchester 4, N. H.
NATional 5-9498

Cleveland District Manager
ALBERT PUDVAN
3537 Lee Road, Shaker Heights 20, Ohio
WASHington 1-9370

Midwest District Manager

GILBERT THAYER
Midwest Representative
ROBERT W. HEATH
201 N. Wells St., Chicago 6, Ill.
FINancial 6-1026

Western District Manager
HAMILTON S. STYRON
10373 W. Pico Blvd., Los Angeles 64, Cal.
BRadshaw 2-2643

European Manager

E. J. GUERIN
Box 824
Stockholm 1, Sweden

EDITORIAL OFFICES

10373 W. PICO BLVD.,
LOS ANGELES 64, CALIF.

Articles

- 24 From the Philco 2000 Series — The 212
by Robert E. Steele and Richard A. Gorton
- 28 American Management Association's Seventh Annual
Data Processing Conference and Exhibit
- 30 COBOL And Compatibility *by Howard Bromberg*
- 36 Chairman Rochester Reviews EJCC
- 36 EJCC Program Highlights *by William P. Heising*
- 46 Chairman of NJCC Comments On AFIPS *by Morris Rubinoff*
- 56 DP Service Firms Form Association
- 58 Uptime Displays Speedreader at EJCC

Departments

- 6 Important Dates In Datamation
- 14 Datamation Abroad
- 17 Datamation In Business and Science
- 20 Book Capsules
- 23 The Editor's Readout
- 42 Datamation News Briefs
- 47 New Products In Datamation
- 55 People Moving Up In Datamation
- 60 New Datamation Literature
- 64 Advertisers' Index

THIS ISSUE — 34,450 COPIES

Cover

We hasten to admit that some artistic liberties have been taken with this picture of card modules used in the Philco 212 Computer. Philco representatives will identify this machine as being their company's (pardon the expression) STRETCH-class entry. Details beginning on page 24.

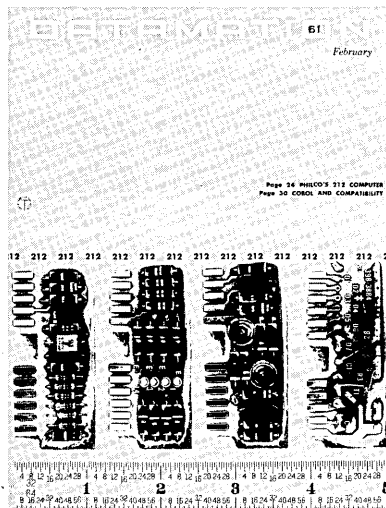
Circulation audited by
Business Publications Audit



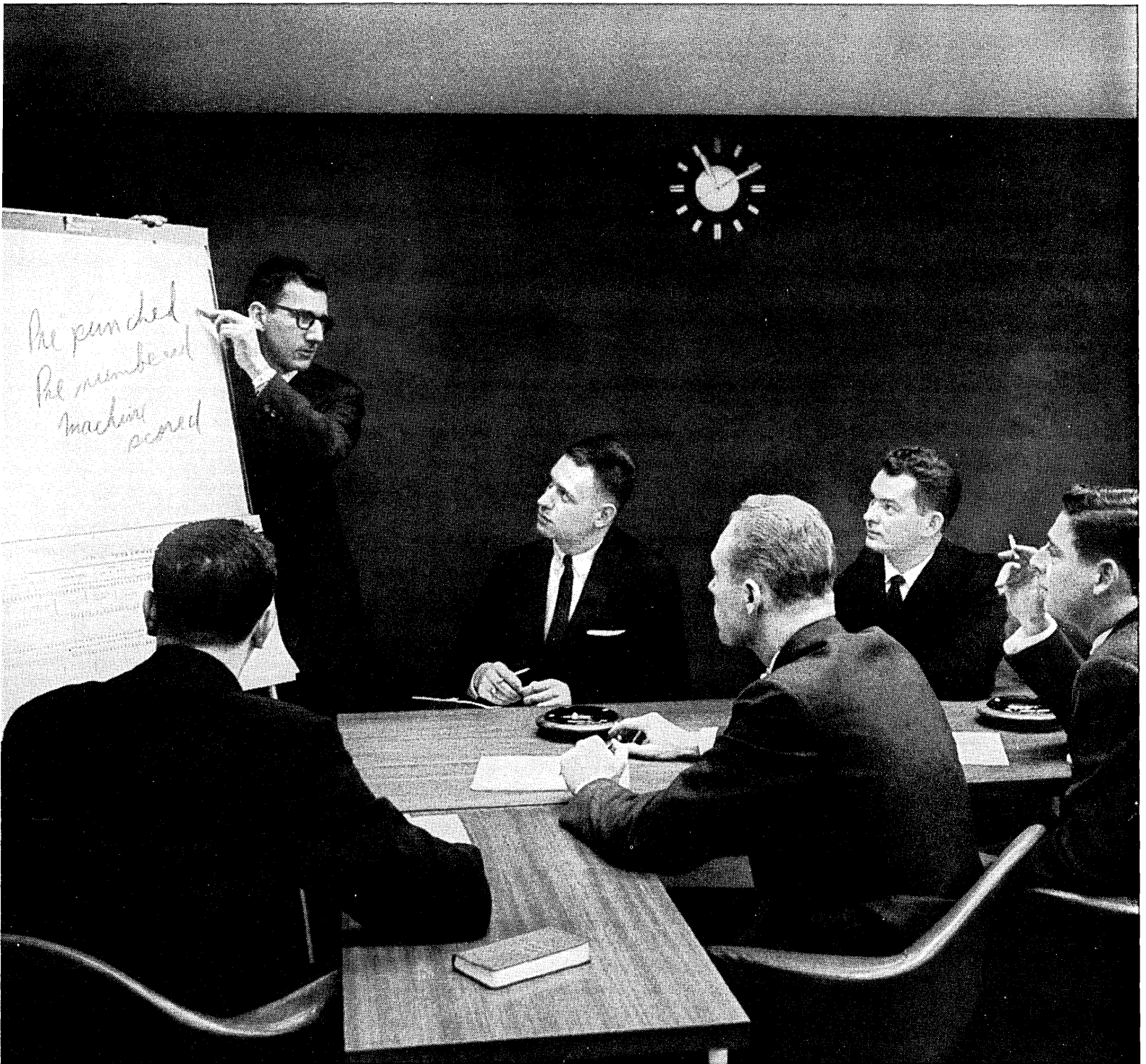
Member, National
Business Publications



DATAMATION is circulated without charge by name and title to the manufacturers and users of automatic, information-handling equipment in all branches of business, industry, government and military installations. Qualified individuals in the United States and Canada are invited to request this publication on their company letterhead, stating position and firm's business. Available to others by subscription at the rate of \$10.00 annually; single issue, \$1.00 when available. No subscription agency is authorized by us to solicit or take orders for subscriptions in the United States, Canada or overseas.



How this new team of IBM Supplies



IBM SUPPLIES SPECIALIST—uniquely trained to assist you in solving supplies problems promptly, efficiently and to your best advantage.

Specialists can help you

When it comes to cards, magnetic tapes or control panels, the IBM supplies specialists know—as few men do—just how to meet your needs. IBM supplies specialists are true experts...qualified by intensive training in IBM schools, plants, and design centers...qualified by extensive field experience.

Equally important, they represent a company that is unsurpassed for:

PROMPT SERVICE—IBM offers you same-day delivery on control panels and magnetic tapes, to meet emergency needs. In addition, through its nation-wide manufacturing and warehousing facilities, IBM can service *promptly* the card needs of any customer in America.

TECHNICAL ASSISTANCE—Through its network of Card Design Centers, IBM can assist you in developing card designs that will improve card handling techniques, reduce card consumption, and contribute to the economy of your data processing operations. As for control panels, your IBM specialist can help you profit from the ideas and experiences of others who have solved problems similar to your own.

PRODUCT QUALITY—IBM supplies are made to precise specifications which have been developed over more than 40 years of research, testing and performance analysis.

CUSTOMER EDUCATION—Through IBM's Customer Education Centers as well as through plant tours, supplies seminars and informative literature, IBM offers you an unsurpassed opportunity to achieve competence in the use and care of IBM cards, tapes and panels.

PRODUCT RESEARCH—To assure you the best supplies products possible, hundreds of IBM engineers and technicians work full time to develop new, improved products and techniques.

The next time you are in the market for punched cards, magnetic tapes, or control panels, call your IBM office. Talk to the IBM supplies specialist—an expert backed by experts—a man whose main job is to improve the return on your data processing investment.



DESIGN ASSISTANCE—you can profit by the ideas and experience of others who have successfully solved problems similar to yours.



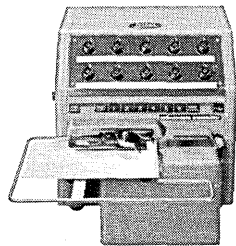
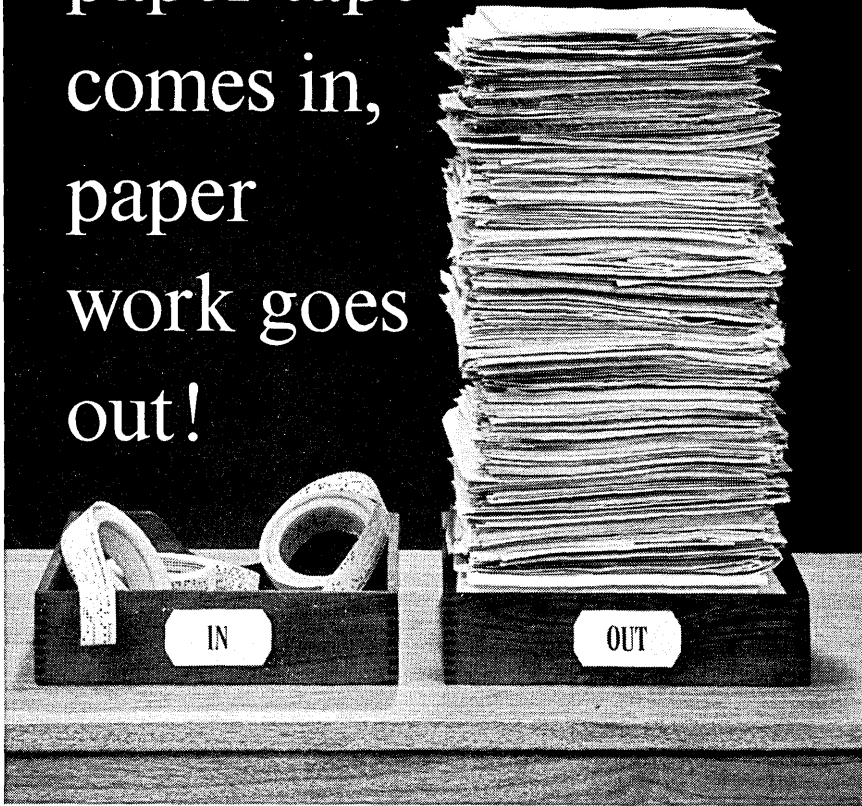
IMMEDIATE DELIVERY—control panels delivered "off-the-shelf" to meet your emergency data processing needs.

LONGER TAPE LIFE—assured by the unique IBM quality control program for new magnetic tape, plus an exclusive retest service which increases the life of your present tape by over 50%.



IBM DATA PROCESSING

Collectadata: when
paper tape
comes in,
paper
work goes
out!



The machine at left is a Friden Collectadata® Transmitter—key to a new system of internal data collection that virtually eliminates in-plant paperwork.

The system is simple. Transmitters, spotted in key reporting locations throughout the plant, are cable-connected to a central Collectadata Receiver. “Blank forms” are issued as pre-coded tab cards or Friden edge-punched cards. Each card becomes a “filled-in” report

after the worker inserts it in the transmitter, dials in variables and touches a key. The rest is automatic. The receiver records each report in punched paper tape, adds an automatic time code. At day's end, the receiver tapes are processed—converted to tab cards or fed directly into a computer to prepare comprehensive summaries of plant activity.

Collectadata users report substantial savings in time and money. But in many applications the *speed, accuracy and efficiency* of automated data collection are even more significant. For information, consult your Friden Systems Man. Or write: Friden Inc., San Leandro, Calif.

THIS IS PRACTIMATION: automation so hand-in-hand with practicality there can be no other word for it.

© 1961 FRIDEN, INC.



Frident

SALES, SERVICE AND INSTRUCTION
THROUGHOUT THE U. S. AND WORLD
CIRCLE 7 ON READER CARD

1961

IMPORTANT
DATES

- The IRE National Convention will be held at the New York Coliseum and the Waldorf-Astoria Hotel, New York City, March 20-23, 1961.

- The annual meeting of POOL, the LGP-30 and RPC-4000 computer users group, will be held on March 27-30, at the Jung Hotel, New Orleans.

- The annual meeting and Convention of the National Microfilm Association will be held April 4-6, 1961 at the Hotel Sherman in Chicago, Ill.

- The 7th meeting of CO-OP, the 1604 user's organization will be held at the Shoreham Hotel, Washington D.C., on April 12-13.

- The Cincinnati Section of the IRE and the Southern Ohio Section of the ARS will hold its 15th Annual Spring Technical Conference April 12-13 at the Hotel Alms in Cincinnati. For information contact R. P. Schlemmer, Engineering Specialities, 8115 Camargo Rd., Madeira, Cincinnati 42, O.

- The UNIVAC users association Spring Conference is scheduled for the Statler Hilton Hotel, Los Angeles, April 13-14. For information contact Donald Houghton, Secretary, UNIVAC Users Association, Westinghouse Electric Corp., 3 Gateway Center 15-West, Pittsburgh 22, Penna.

- The USE Meeting will be held in El Paso, Texas, April 18-21, 1961. For information contact James W. Nickitas, 315 Park Ave., N.Y.C.

- The 5th CUE Meeting will be held in April, 1961 in Chicago, Ill.

- TRANSAC Users Group Meeting No. 8 will be held in Hartford, Conn., in May 1961.

- The Western Joint Computer Conference is scheduled for Los Angeles' Ambassador Hotel, May 9-11, 1961. For information contact Dr. W. F. Bauer, Ramo-Wooldridge Co, 8433 Fallbrook Ave., Canoga Park, Calif.

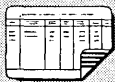
National 390

...a compact, multi-duty
Electronic Data Processing System

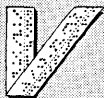


SYSTEMS MEN WILL BE INTERESTED IN THIS:

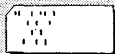
The 390 is the only electronic system today that provides all four of the following flexible methods of input and output:



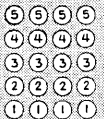
1 MAGNETIC TAPE LEDGER RECORDS



2 PUNCHED PAPER TAPE



3 PUNCHED CARDS



4 VERSATILE CONSOLE FACILITIES

...a complete E.D.P. system priced at **\$75,000**
—leased at **\$1,850** per month

- 390... an **"Electronic Statistician"** ... electronically analyzes mountains of paperwork—efficiently and economically.
- 390... an **"Electronic Accountant"** ... electronically maintains complete records that can be read by people and machines.
- 390... an **"Electronic Mathematician"** ... electronically performs all types of business arithmetic and formula computations—at speeds measured in 1/1000 of a second.
- 390... an **"Electronic Filing System"** ... electronically classifies and files data without the need for human decisions. Millions of digits can be stored on magnetic-tape ledger records, punched paper tape, and punched cards.
- 390... an **"Electronic Reporter"** ... electronically digests volumes of business data and provides complete, timely reports.

* TRADEMARK REG. U. S. PAT. OFF.

*National**

ELECTRONIC DATA PROCESSING
ADDING MACHINES-CASH REGISTERS
ACCOUNTING MACHINES-NCR PAPER

Investigate This Pathway to Increase Savings ... backed by 76 Years of System Service Experience

THE NATIONAL CASH REGISTER COMPANY, Dayton 9, Ohio

1039 OFFICES IN 121 COUNTRIES • 77 YEARS OF HELPING BUSINESS SAVE MONEY

CIRCLE 8 ON READER CARD

26 standard Adage modules, assembled to serve a special purpose

This digital a-c ratiometer, designed to customer specifications for Nike Zeus checkout systems, typifies the Adage way with special purpose devices.

AC-DC Converter Display and Output Amplifiers Reference Amplifier
 ADC Low Voltage Regulator
 Power Supply

Phase sensitive AC voltage ratiometer; 0.15% overall accuracy; 100 independent conversion per second; front panel display of sign plus 4 octal digits; 13 bit pure binary parallel output, with special voltage and current swings.

Adage design and production talents have been applied successfully to tailoring and delivering equipment for:

- analog-to-digital conversion
- production test and inspection
- data acquisition, reduction and analysis
- automatic checkout
- process control
- computer linkage

Adage assures rapid and economic design and delivery of special equipment with a variety of input-output functions:

AC-DC Conversion

Multiplexing

High Input Impedance

Programmed Ranging and Mode Selection

Differential Input

Limit Test

Min-Max Peak Reading

Magnetic Tape, Paper Tape, Typewriter & Printer Outputs

For high-speed, reliable, and accurate systems components engineered to *your* specifications, contact . . .

Adage
INC

292 MAIN ST., CAMBRIDGE 42, MASS.

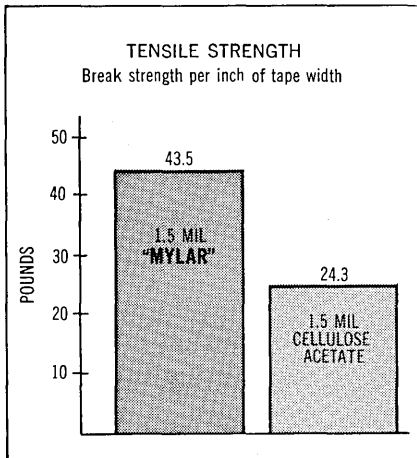
West Coast Facility: 1145 East Ash Avenue, Fullerton, California

CIRCLE 9 ON READER CARD

How magnetic tapes of "Mylar"[®] cut costs of tape breakage

Tapes of "Mylar"* polyester film protect your valuable data from hazards of breakage or stretching in high-speed transport equipment. Because of its greater strength and durability, "Mylar" minimizes chance for error or loss of data. The additional cost for tapes of "Mylar" is more than offset by savings on tape replacement and the costly reconstruction of broken or damaged tape. Here's why:

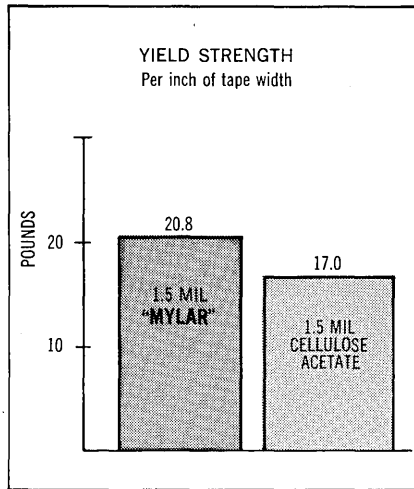
CHART NO. 1



Less tape breakage
Tensile strength of "Mylar" is higher

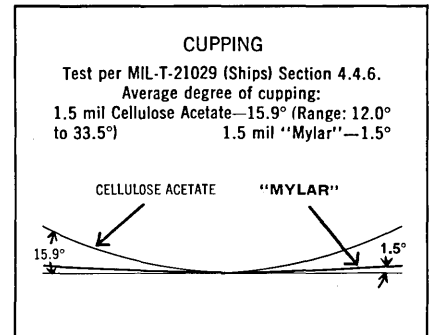
than any other plastic film used as an instrumentation-tape base. Chart 1 compares break strength of "Mylar" and cellulose acetate. And "Mylar" does not lose its strength with age, repeated playbacks or storage, because it has no plasticizer to dry out.

CHART NO. 2



Resistance to stretching
The higher yield point of "Mylar" compared to acetate is shown on Chart 2. Greater resistance to stretching under load minimizes the chance of signal distortion.

CHART NO. 3



Fewer signal dropouts
Temperature or humidity change causes negligible change in dimensions of "Mylar". Chart 3 compares cupping of "Mylar" with cupping of acetate due to environmental change. Insignificant change in "Mylar" minimizes possibility of signal dropout due to loss of total contact with the recording or playback head.

Tapes of "Mylar" polyester film can make an important contribution to the reliability and economy of your data processing. Ask your magnetic-tape supplier to recommend the specific instrumentation tape of "Mylar" for your requirements.



Better Things for Better Living . . . through Chemistry

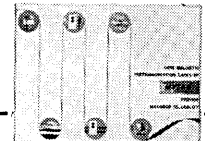


*"Mylar" is Du Pont's registered trademark for its polyester film.

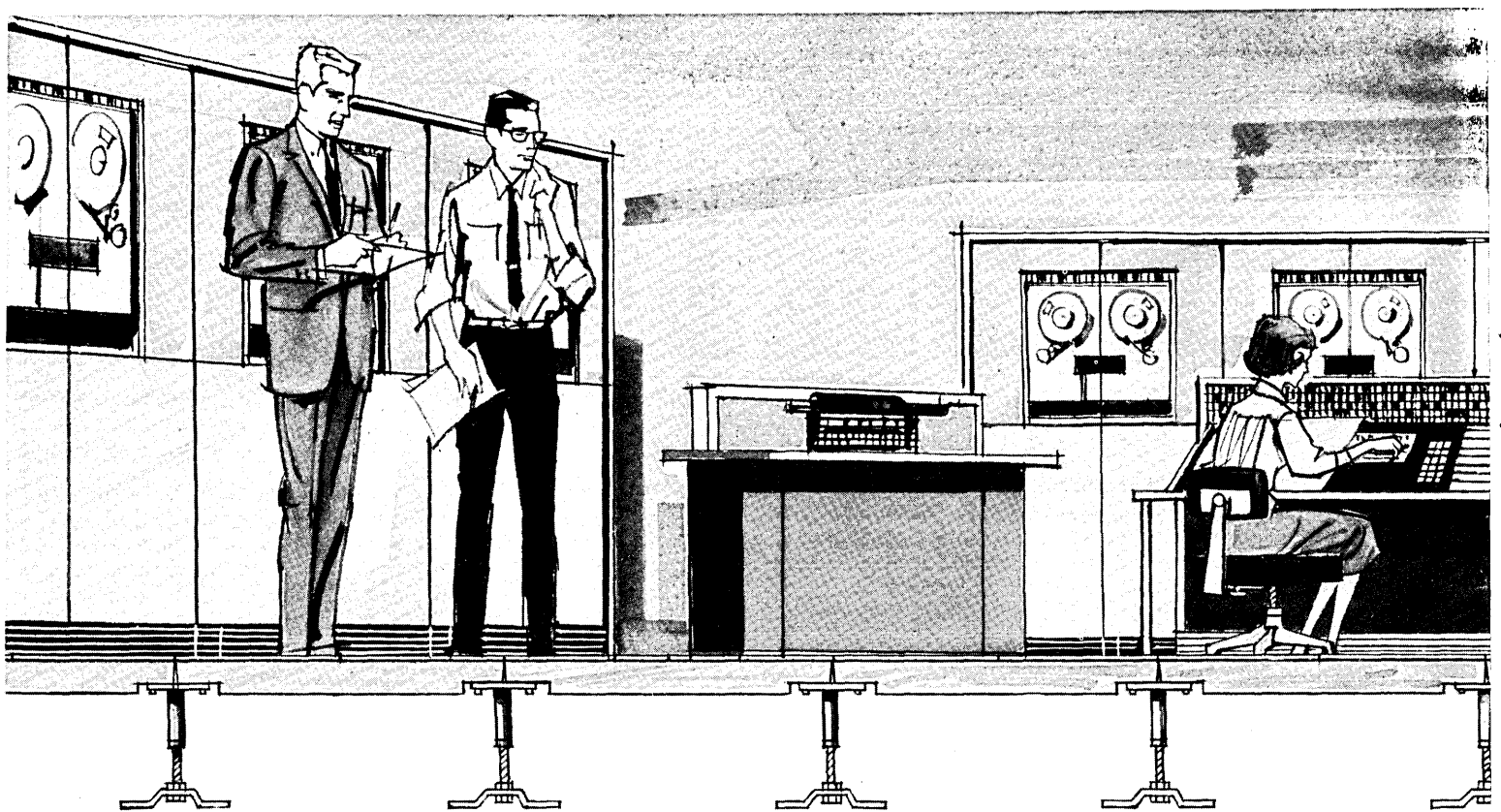
E. I. du Pont de Nemours & Co. (Inc.)
Film Department, Room D-9, Wilmington 98, Delaware

Please send free, 12-page booklet of comparative test data to help me evaluate magnetic-tape reliability.

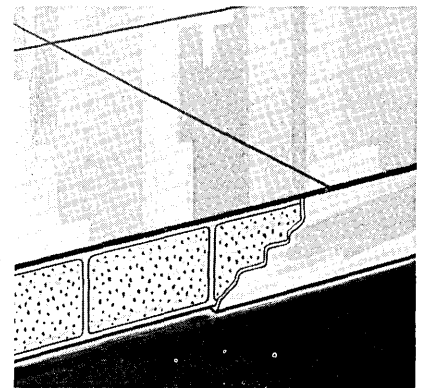
Name _____ Position _____
Company _____
Address _____
City _____ Zone _____ State _____



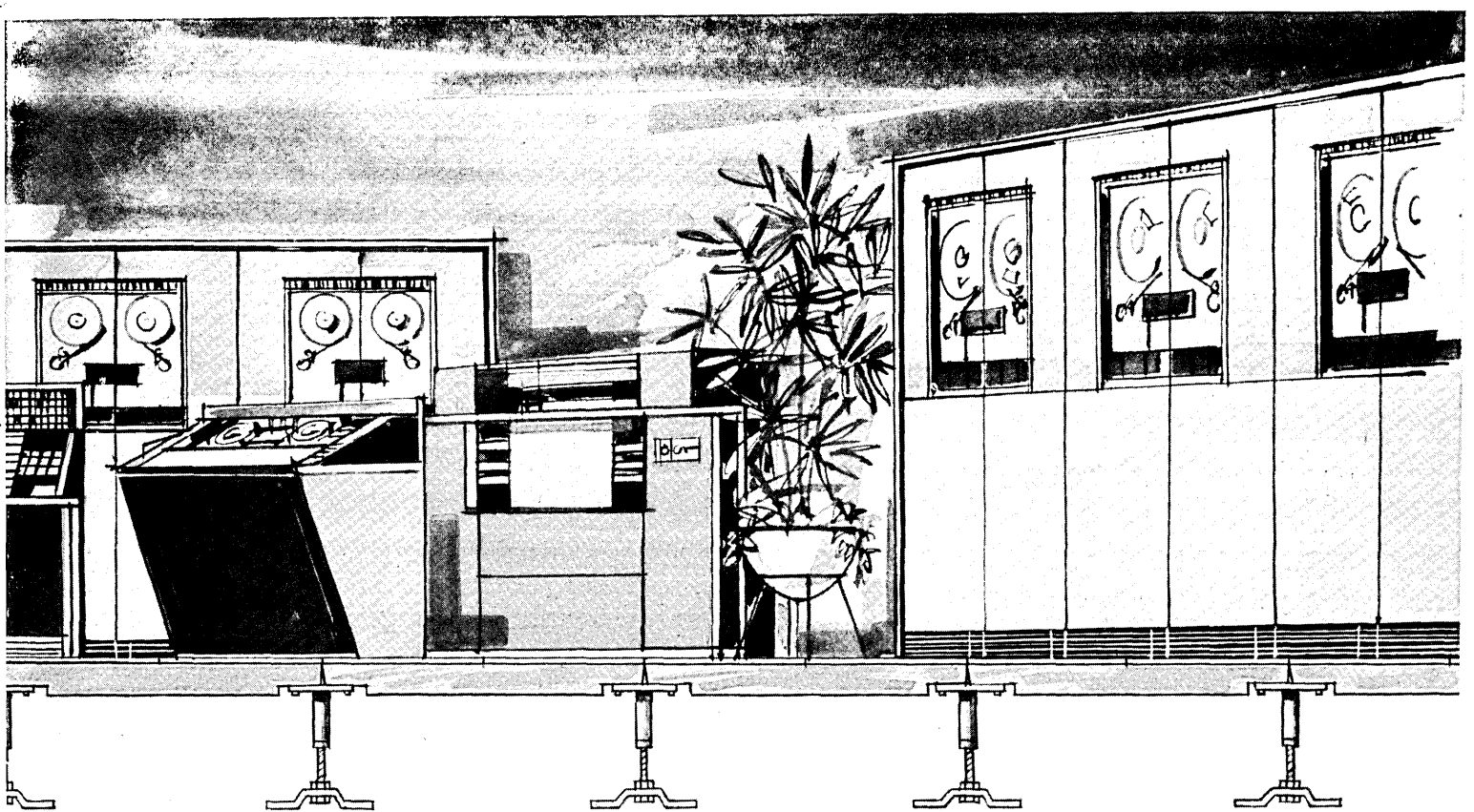
CIRCLE 10 ON READER CARD



LUPTON develops a distinctly improved aluminum **RAISED FLOORING SYSTEM**



Exclusive cavity design gives highest strength-weight ratio available. Meets maximum load requirements of all computer manufacturers. Permits use of sound-deadening and insulating materials inside.



FOR COMPUTER ROOMS

- Component parts standardized for economy
- No expensive preparation or grid needed
- Lightweight and easy to install
- Uniform panels completely interchangeable
- Every inch of metal covered to assure safety

LUPTON's new raised flooring system features simplicity, adaptability, and strength. Cable or duct entry panels can be placed at any location in the floor area. Cutouts can be made at the site. The free space under the 2' x 2' aluminum panels offers *total* access to any point for laying cable or installing ducts. Because of their limited depth, these panels reduce the height of the raised floor. Their smooth undersurface assures top efficiency for plenum use. To eliminate physical and electrical hazards, all metal is completely covered by flush-fitting tile or carpet, installed as an integral part of the area. You have a choice of attractive tile colors.

Perfectly level base at any height

The adjustable supporting pedestals compensate for unevenness in original flooring. A perfectly level base for computer equipment is assured at any height. Connection with adjoining construction is neat and *exact*. You can order the Lupton Raised Floor System on a material delivered basis or as a complete installation. In either case LUPTON will supply an experienced field supervisor for the installation.

Write today for a comprehensive illustrated brochure on LUPTON's distinctly improved raised flooring system.

LUPTON®

ARCHITECTURAL ALUMINUM

MICHAEL FLYNN MANUFACTURING COMPANY

Main Office and Plant: 700 E. Godfrey Ave., Philadelphia 24, Pennsylvania
West Coast Office and Plant: 18111 E. Railroad St., City of Industry, Calif.

SALES OFFICES

New York 17, N.Y., 51 E. 42nd St. • Stockton, Calif., 1441 W. Fremont St.
LaGrange, Ill., 633 S. LaGrange Road • Dallas 19, Texas, 4232 Herschel St.
Cincinnati 8, Ohio, 3434 Michigan St. • Cleveland 15, Ohio, Hanna Bldg.

If you missed the Eastern Joint Computer Conference because of the snow that covered Manhattan at that time you also missed the debut of the most acclaimed single item at the show, the Speedreader 2000, a radical new approach to cardreader design. Most of the plaudits concerned the mechanical simplicity of the Speedreader 2000. (Because the Speedreader reads and times cards electronically there is no need for complicated mechanics or for the problems connected with them.) This purity of design allows the Speedreader 2000 its great speed and reliability. And speaking of reliability the Speedreader 2000, as usual, operated thruout the conference at peak capacity with no down-time and no difficulties.

Uptime also offers a buffer that reads out either column at a time or row at a time. Complete checking circuitry is also available.

Prices and delivery dates are available on request.

WORLD'S
CHAMPION
CARDREADER

Speedreader
2000

400 to 3000 cards per minute

Complete reliability of
reading and timing

No mechanical timing
adjustments

Completely electronic
reading and timing

for further information write or wire Uptime Corporation, 175 Commerce Street, Broomfield, Colorado, HArrison 8-1151 INgersoll 6-8233

Through one full year . . .
 no failure . . . no preventive
 maintenance . . . no corrective
 maintenance . . . no adjustments

It's really a remarkable report on periquip reliability.

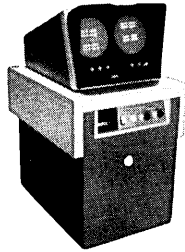
Data Display's first dd51 electronic display unit now has functioned over a full year with *no* downtime for repairs or maintenance . . . resulting of course in *no system* downtime attributable to the dd51.

Data Display's first dd51, built with the Company's proprietary technique of character generation, was delivered in January, 1960.

The computer manufacturer receiving the dd51 used it continuously 144 consecutive hours a week testing a large-scale system.

In August, 1960, it was shipped half-way across the country with the completed system. On arrival, the dd51 required no maintenance and no adjustments. It went to work at full operating efficiency . . . has been doing so ever since, without a failure and without a repair!

The dd51, through design refinements and increased production is more economical than ever. For realtime data monitoring, computer maintenance testing, debugging, rapid display of alphanumeric information with the most dependable equipment, talk first to Data Display. Or write for further information.

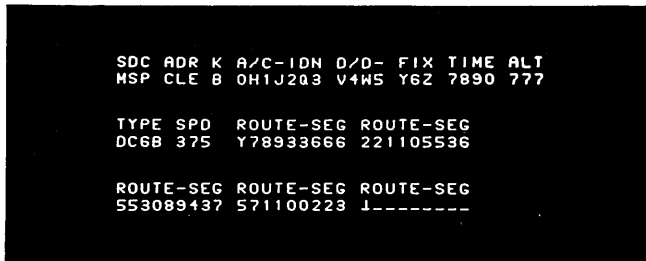
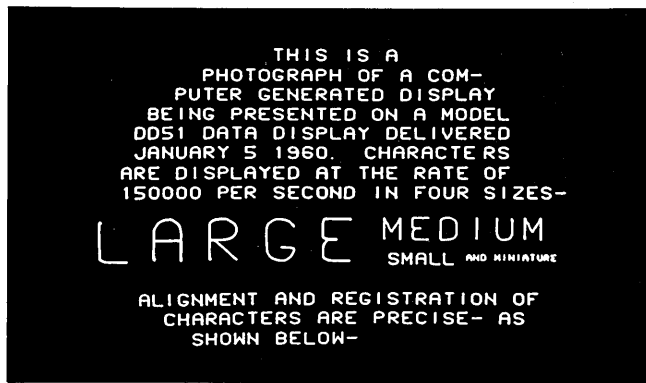
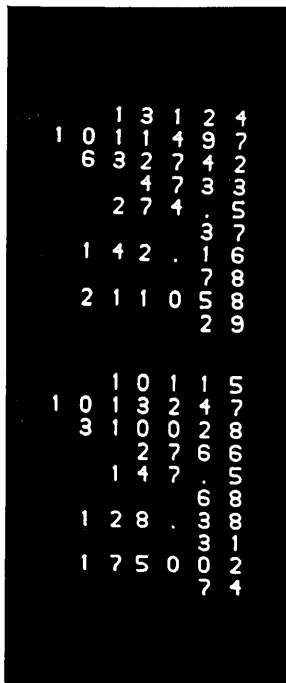


Data Display dd51 proves fully reliable

A few prominent features of the dd51:

- Flicker-free, jitter-free image, easily seen in ordinary room light.
- Character size and intensity programmed and/or controlled manually.
- 43 character repertoire.
- Character generation time: 5.4 microseconds per character.
- Displays up to 150,000 characters per second.
- Character size controllable from computer, in a ratio as high as eight to one, each character independently controlled. Four sizes of characters may appear on scope simultaneously.
- More economical than ever, because of design refinements and increased production.
- Magnetic core memory included at a slight cost increase.
- Display tubes up to 16" (12" standard).
- Solid-state circuitry, compact construction, low power consumption.

Reproductions of unretouched photos show information being displayed on the dd51. Figures are easily readable, character registration is precise, four sizes of characters may be displayed at one time. Scopes available up to 16" (12" standard).



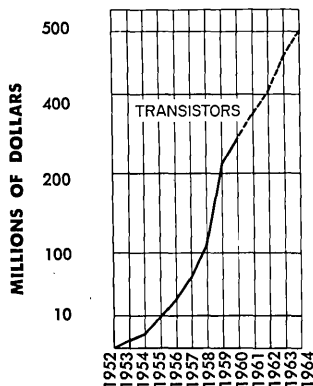
DATA DISPLAY INCORPORATED
 1820 COMO AVENUE • SAINT PAUL 8, MINNESOTA
 MIDWAY 6-8673

CIRCLE 13 ON READER CARD

Computer Analysts

New Openings in one of General Electric's fastest growing technical areas.

The Semiconductor Products Department of the General Electric Company has new openings for qualified personnel experienced in computer applications. These are permanent, career opportunities involving the design of computer data systems for advancing semiconductor technology—the fastest growing area in the electronics industry (see graph, right).



RESPONSIBILITIES: Designing large data systems and developing data retrieval techniques for reliability and process-improvement studies for semiconductor devices.

QUALIFICATIONS:* Successful applicants should have a B.S. degree in mathematics or the physical sciences and two years experience with the 704 or 709. Citizenship is not required but permanent visa status is mandatory.

**(Relocation assistance will be provided. Information about General Electric's extensive benefits program is available upon request.)*

These openings offer outstanding growth potential, if you have a basic knowledge of computer applications. Here is your opportunity to learn to apply this basic knowledge in the semiconductor field—where the need is vital and the rewards are noteworthy. And you'll be working for a diversified company that is a recognized leader in the markets which it serves.

If you are interested in a career with General Electric write in confidence to:

Mr. J. H. McKeehan
Section 220-15
Semiconductor Products Department
General Electric Company
Electronics Park, Syracuse, New York

GENERAL  ELECTRIC

CIRCLE 76 ON READER CARD

DATAMATION abroad

BRAZIL: The First Brazilian Symposium on Electronic Computers will be held in Rio de Janeiro, Brazil, April 2-9, under the joint sponsorship of the Executive Group for Application of Computer Electronics, The National Council of Research, IBM, Remington Rand and Burroughs.

The exhibition of computing equipment will run from April 2 to April 9. Conference and lectures will be held April 7, 8 and 9th. The lectures will be divided in two groups: for the general public and for specialized technicians. The theme of the lectures will be related to programming, equipment, usage, and problems of service and installation.

Tours as well as visits to the various Processing Centers in Rio and Sao Paulo are being organized and a contest for Brazilian University students is being held; with prizes of a year's scholarship to the United States, a round trip to the U.S. and Cr \$10,000.00.

Foreign delegates as well as Brazilian technicians are expected to attend and to submit lectures to be presented at the Symposium and to be printed in a special magazine.

RUSSIA-FRANCE: An exhibition of French calculating machines and electrical computers sponsored by the Compagnie des Machines was opened at Moscow's Polytechnical Museum December 6, 1960. On the same day and at the same location, a joint Danish exhibition of electronic measuring instruments was held in a 200 exhibit display. The exhibition was opened by the Danish Minister of Commerce, Industry and Shipping, Lars Jensen. Firms exhibiting equipment are Bruel & Kjaer, Dan Bridge, Disa Electronic and Radiometer.

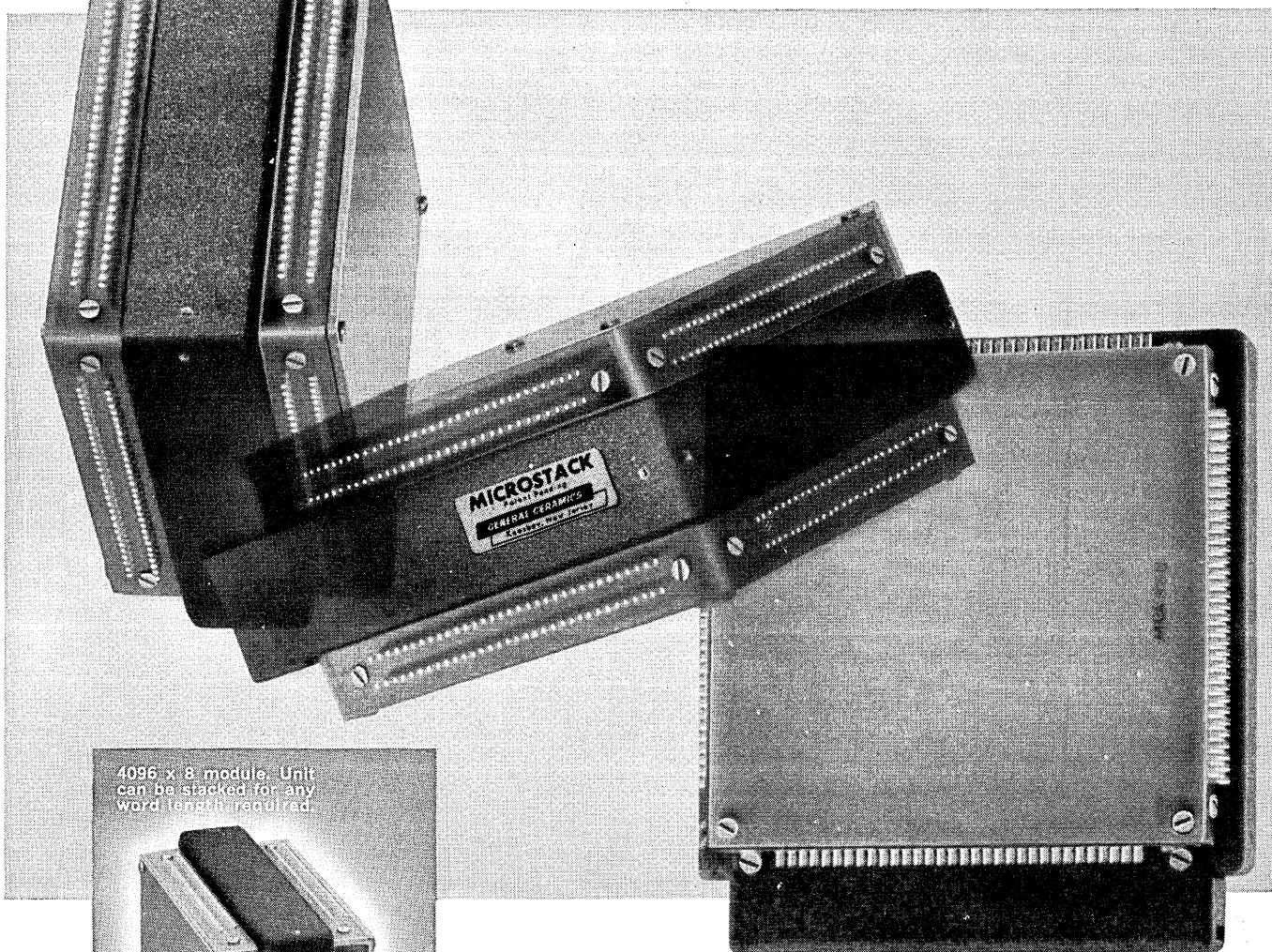
JAPAN: The first Univac computer ordered for Japan is now nearing completion at the Remington Rand plant in Philadelphia. The computer has been purchased by the Tokyo Electric Power Co. and will be used to control the 30 or more Tokyo metropolitan region plants and sub-stations of the firm.

ENGLAND: The Automatic Programming Information Centre is holding an intensive two-day school, April 5-6, at the Brighton Technical College, Brighton, England, in ALGOL 60. The object of the school will be to provide those attending not only an opportunity to hear explanations of the language, but also, to write short exercise programs in ALGOL under supervision.

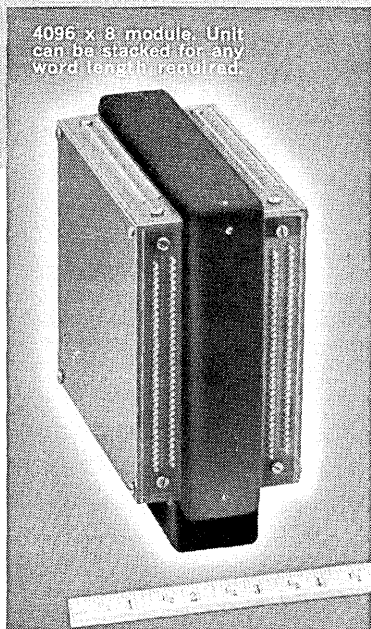
New temperature controlled MICROSTACK® meets

-55°C to +85°C

MILITARY REQUIREMENT



4096 x 8 module. Unit can be stacked for any word length required.



The General Ceramics MICROSTACK, one of the most important advances in memory core packaging, now operates in a temperature range of from -55°C to $+85^{\circ}\text{C}$. Core characteristics remain constant. By maintaining temperature stability inside the MICROSTACK unit, General Ceramics engineers have developed a memory core package that is smaller, more rugged, requires no external cooling or heating, and meets MIL shock and vibration specifications.

For additional information, please write on company letterhead. Address inquiries to Section H2.

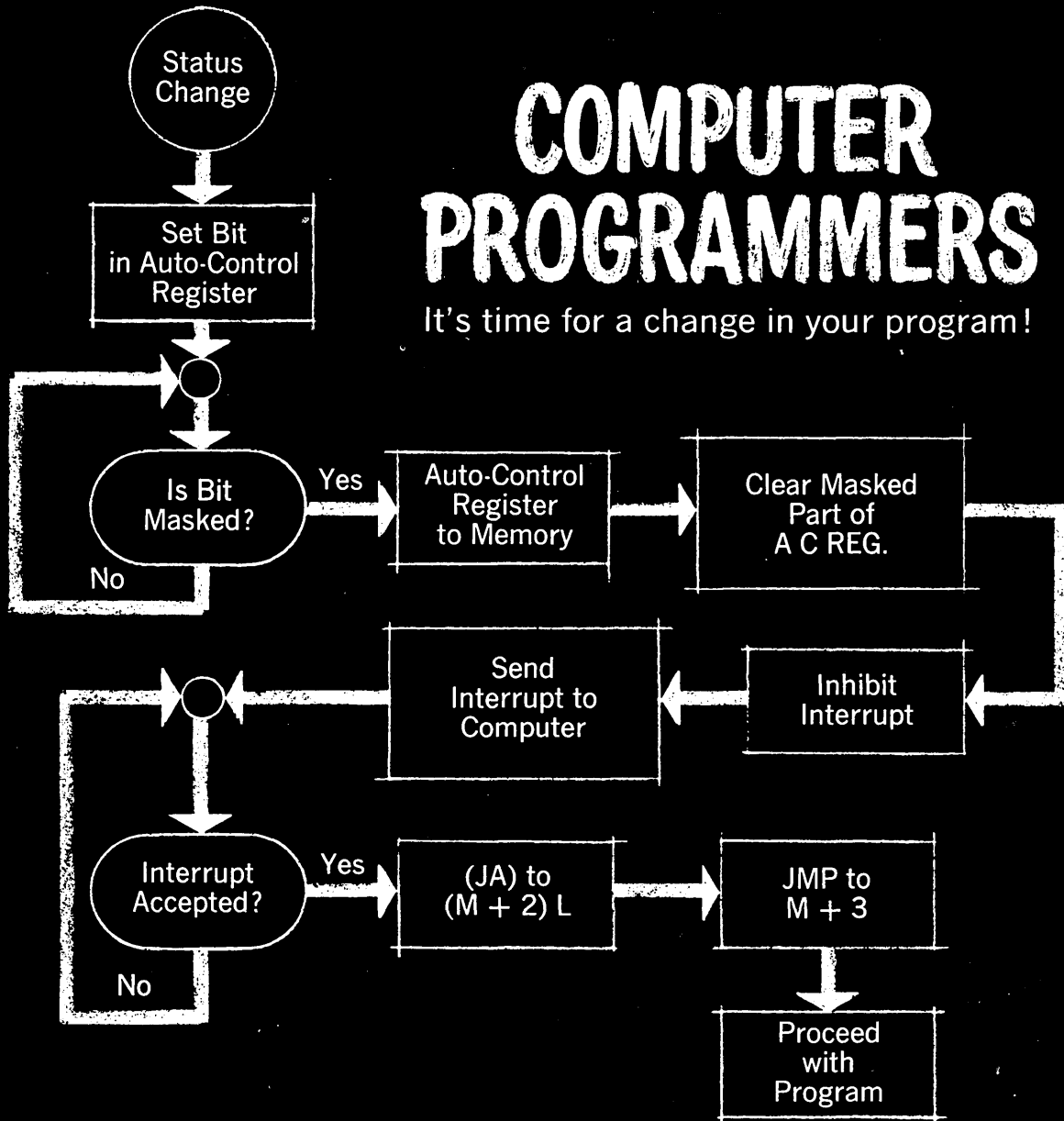


APPLIED LOGIC DEPARTMENT
GENERAL CERAMICS
KEASBEY, NEW JERSEY, U.S.A.

TECHNICAL CERAMICS, FERRITE AND MEMORY PRODUCTS
CIRCLE 14 ON READER CARD

COMPUTER PROGRAMMERS

It's time for a change in your program!



The Auto-Control Unit of the PHILCO 2000 provides a means of interrupting a program whenever specified conditions appear . . .

Right now, is the time for you to take action to change your career program. Philco needs experienced Programmers. Have you written and debugged a variety of scientific and/or commercial programs on a large-scale binary computer? If so, Philco offers you unlimited growth opportunities in a carefully expanding organization.

Upon completion of approximately two months of training, new employees will be assigned to either the headquarters staff or at our expense to one of our regional offices in a major metropolitan area.

If you are a Mathematician, Physicist or Electronic Engineer, or equal, you are invited to investigate Programmer Opportunities in Applied Mathematics, Automatic, Commercial, Scientific and Diagnostic programming. Inquiries are also invited from experienced Computer Sales Representatives and Field Engineers.

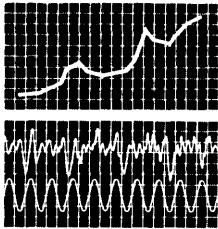
APPLY

Mr. John Felos
Professional Employment Mgr.
PHILCO COMPUTER DIVISION
Willow Grove, Pennsylvania

PHILCO®



Famous for Quality the World Over



DATA MATION *in business and science*

SYLVANIA CHANGES MIND ON 9400

There has been a change of mind at Sylvania Electric Products, Inc. DATA MATION learned late last month that a 9400 system would not be installed at the General Telephone installation in Santa Monica, Calif., replacing an IBM 705. In fact, a Sylvania spokesman said that contrary to a Nov. 15 news release which said the system would be marketed "solely to federal agencies and operating telephone companies," the system would be available only to government customers. What seems to have happened is this. Sylvania has long been weighing the risks of entering the commercial arena. Towards the end of last year, a test-the-water-with-your-toes decision was made and the General Tel announcement (nine pages of copy and three pictures) was released. Then, profit minded forces within the company became alarmed at the expenditures which might be involved in the telephone company venture and called it off. Only one 9400 will be installed as an in-house system -- that in the Needham data systems operation. As a matter of policy, Sylvania does not plan, now or in the foreseeable future, to market a commercial general purpose or special purpose computer, DATA MATION was told.

NEW SYSTEM ANNOUNCED BY ALWAC

Alwac Computer Division of El-Tronics, Inc., located in Hawthorne, Calif., is developing a new solid state general purpose computer to add to its product line. Company officials told DATA MATION that the new system will feature "large storage capacity and a versatile command structure." The main memory will be a 16,000 word drum. A faster memory for communication with main memory, (probably not core) has not been specified.

This computer's predecessor, the Alwac III-E, sells for \$79,000. However, as a result of the new solid state program, a few of these systems used as in-plant test machines, are available at reduced prices.

The new computer will employ III-E peripheral gear including card, paper tape and magnetic tape equipment, a line printer and an electric typewriter.

STRETCH NO. 1 RESCHEDULED FOR APRIL

IBM's first STRETCH system, which was supposed to be delivered to Los Alamos Scientific Laboratory last June, has been rescheduled (for the fourth time) for delivery on April 1. Dr. Bengt Carlson of Los Alamos said the project "is moving along fairly well but not as well as we had expected." He said that early trouble in the system's fast memory had long since been overcome but the STRETCH central processing unit, with its thousands of transistors, was being debugged very slowly. "We are having no really serious difficulties," Dr. Carlson said, "but there is definitely a reliability problem." IBM diagnostic routines are running well, he said, but Los Alamos production codes and test problems are barely running at all. "What we're after is six to eight hours operation with 90% good time. Then the system can be moved to Los Alamos for final acceptance tests," the doctor stated. He added that the April 1 date for moving the machine

from Poughkeepsie "is entirely an IBM estimate. I think it's rather optimistic."

What effect these developments will have on other proposed STRETCH installations is not known. A commercial version of the machine is scheduled for delivery to C-E-I-R in Los Angeles late in 1962. C-E-I-R president Dr. Herbert Robinson, interviewed by DATAMATION in December, seemed completely confident in IBM's ability to deliver fully operational hardware with complete programming backup. A top IBM official told DATAMATION a week later, however, that while the multiprogramming problem would probably be licked by January 1963, the real question mark was the communications problem and the related tremendous investment involved. The word "risk" was featured prominently in the later conversation.

Finally, this magazine learned through unofficial sources that two STRETCH letters of intent, from McDonnell Aircraft Corp. in St. Louis and Dahlgren Navy Proving Ground in Maryland, had reached IBM and that the company had received others.

McDonnell has opened an Automation Center in St. Louis staffed by over 300 computer specialists. A 709 was replaced by 7079 last year and this year a 705 II will be replaced by a 7080 and several 1401's.

Amid unsubstantiated reports that CODASYL's COBOL committee and Minneapolis-Honeywell have fallen out, DATAMATION was able to verify the fact that an M-H representative has officially proposed to the Office Equipment Manufacturers Institute's X-3 (data processing) committee that it take over the management of COBOL affairs and do full time what CODASYL has been able to do on a part time basis. This proposal was to have been made at an OEMI meeting in New York on January 20, blizzard permitting. One member of the X-3 committee is the chairman of CODASYL's executive committee, Charles Phillips.

For a computer company which originally wasn't going to fool around with such bothersome details as programming, Control Data Corp. came out with a fairly impressive news release recently. In reporting on a recent meeting of CO-OP, the 1604 users group, the following items were listed: A CO-OP Manual with over 75 programs developed by members, a FORTRAN-II compatible compiler, an ALGOL-60 compiler, a COBOL compiler, various simulators and CODAP, a symbolic assembly program.

New internal speeds for the H-400 central processor have been announced by Minneapolis-Honeywell. The new cp reportedly will perform about 10,000 three-address operations per second and can accommodate eight tape units instead of six. The 400 also now has an independent console with breakpoint switches plus console printer and keyboard for i/o. The printer now has 120 fixed printing positions and M-H says the FACT compiler will be available with the 400 in January, 1962. Details in the March DATAMATION.

Computer Sciences Corporation has established a Manhattan office and has named Carl Byham manager. The office will have a staff of something close to a dozen initially but will expand rapidly during the next year, according to CSC president Fletcher Jones.

MC DONNELL
CENTER HAS 7090, 7080 DUE

OEMI ASKED
TO TAKE OVER COBOL

PROGRAMMING
NOW IMPORTANT CDC PRODUCT

NEW SPECS
ANNOUNCED FOR H-400

CSC OPENS
OFFICE IN MANHATTAN

ATLANTIC CITY ELECTRIC COMPANY

STATEMENT OF YOUR ACCOUNT
DUE AND PAYABLE WHEN RENDERED

BUSINESS OFFICE ATLANTIC CITY	PAST DUE AFTER NOV 25 '60
TO ASSURE PROPER CREDIT RETURN THIS STUB WITH YOUR PAYMENT	EL AMOUNT BILLED 12.49
1315561850002	12.49
ACCOUNT NUMBER	TOTAL DUE

Farrington Optical Scanners on the Job

UTILITY COMPANY CUTS COSTS WITH MACHINE THAT READS DATA FROM CUSTOMERS' BILL STUBS



When you send in your electric bill with payment, a machine may be waiting to read it and to translate what it says into computer language. Atlantic City Electric Company already uses a Farrington Optical Scanner for this purpose.

Here's how it works: bill stubs are run through the Scanner (also known as the EYE) at the rate of 240 a minute. The Scanner reads each account number and the amount paid. It instantly converts this "people language" into "machine language" (computer tape, punched cards or magnetic tape).

By eliminating time-consuming and laborious manual punching, the Farrington Scanner makes possible such high-speed, high-accuracy cash accounting systems. You'll find it also being used for Insurance Premium Cash Accounting and for Subscription Promotion Entry.

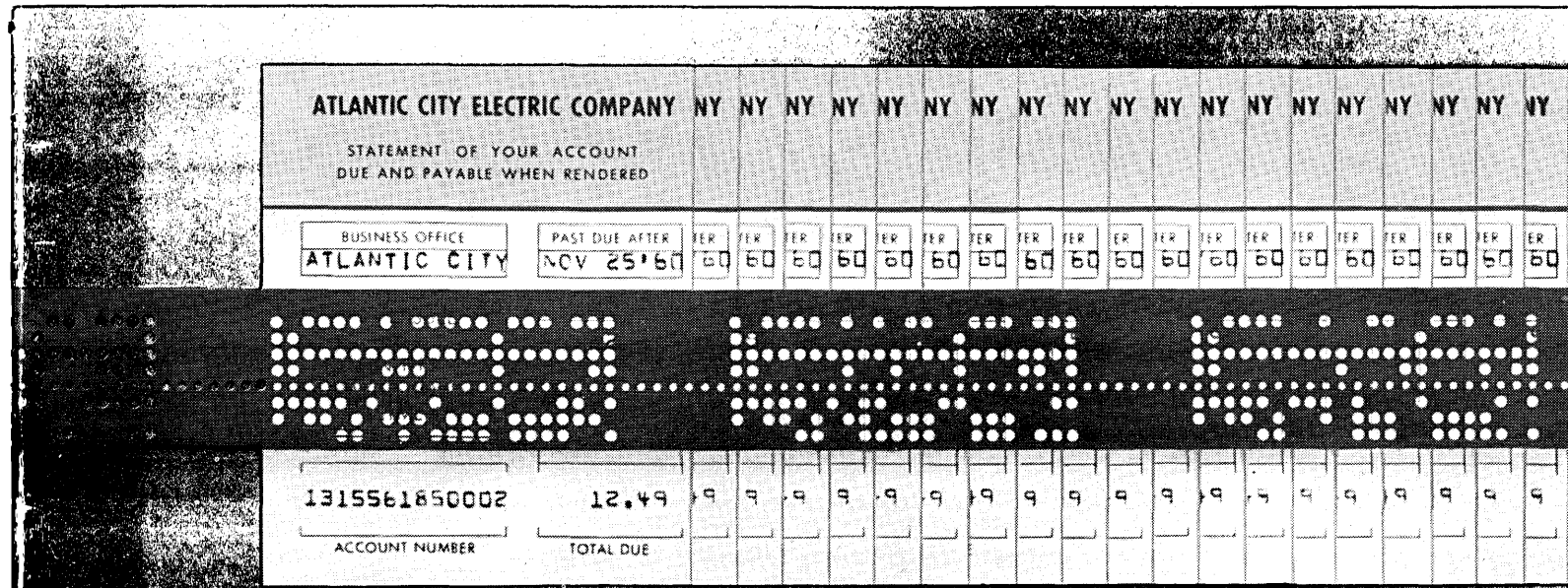
The versatility of Optical Scanning permits almost unlimited applications. You can build an entirely new system around it. Or, if your present system uses three or more operators who read and punch, chances are that you can profitably use an Optical Scanner right now. Only Farrington has the experience to go with it.

For further information, write Farrington Electronics Inc., Needham Heights 94, Massachusetts

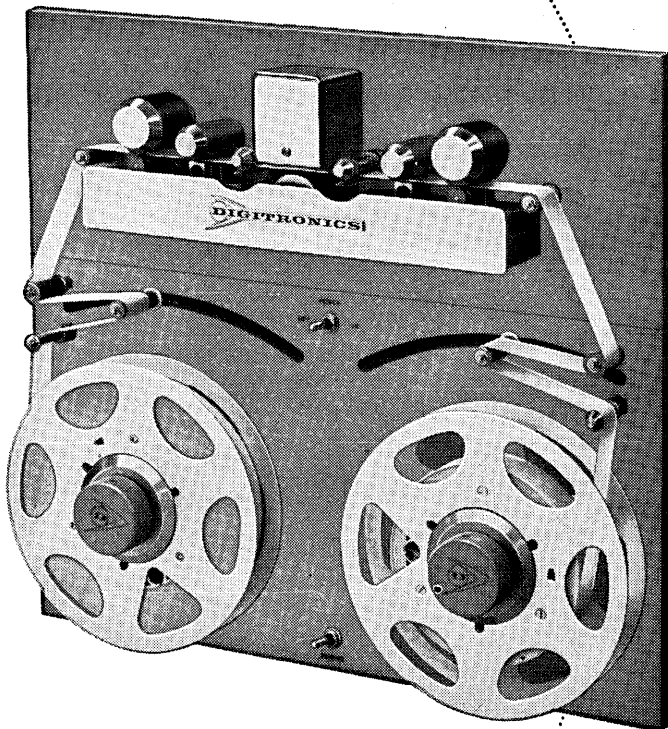
CIRCLE 16 ON READER CARD



FIRST NAME IN OPTICAL SCANNING



when
every bit
counts...



(MODEL B3500 READER SHOWN WITH MODEL 4566 HANDLER)

New Dykor®
Bi-Directional, High Speed

PERFORATED TAPE READERS and HANDLERS

PERFORATED TAPE READER... All solid-state photo-electric readers that give you *Performance*... stops before the next character at 1,000 characters per second; *Versatility*... handles 5 to 8-level tape, interchangeably; *Speed*... single or dual, up to 2,000 characters per second with complete dependability.

PERFORATED TAPE HANDLER... High speed... handles up to 500 feet of standard 5 to 8-level tape, in either direction, at speeds to 400 characters per second... rewinds at 150 inches per second... captive knob expansion hubs for ease of loading. Designed for use with uni-directional Model 3500 or bi-directional B3500 tape readers. For full technical information on these and other models, please write


DIGITRONICS
ALBERTSON, NEW YORK. PHONE HT 4-1000

SEE DIAL-O-VERTER SYSTEM DEMONSTRATED AT THE AMA CONVENTION, STATLER HILTON, MARCH 6-8
CIRCLE 17 ON READER CARD

**BOOK
capsules**

ANALOG COMPUTATION IN ENGINEERING DESIGN by A. E. Rogers and T. W. Connolly, 1960, McGraw-Hill Book Co., 330 West 42nd Street, New York 36, N.Y., 450 pp., \$16.00.

This edition provides specific computing techniques for solving partial differential equations and algebraic problems, as well as information on the adjoint technique and statistical methods in investigating linear systems. Of particular importance is the problem of preparation procedure, explained in detail.

STATISTICAL PROCESSES AND RELIABILITY ENGINEERING by Dimitris N. Chorafas, 1960, D. Van Nostrand Co., 120 Alexander Street, Princeton, N.J., 438 pp., \$12.75.

This study of the theory and application of mathematical statistics is designed primarily as a tool for reliability engineers. The text is divided into six parts which cover engineering statistics, statistical experimentation, stochastic processes, basic concepts of cybernetics and information theory, statistical quality control, and reliability engineering.

ANNUAL REVIEW IN AUTOMATIC PROGRAMMING, VOL. 1, Edited by Richard Goodman, 1960, Pergamon Press, Inc., 122 East 57th Street, New York 22, N.Y., 300 pp., \$10.00.

This volume contains the papers read at the Working Conference on Automatic Programming of Digital Computers organized by the Dept. of Mathematics of Brighton Technical College, England. In addition to the 18 papers presented at the Conference, this volume includes two pioneer papers on Computable Numbers by the late Dr. A. M. Turing.

BASICS OF ANALOG COMPUTERS by T. D. Truitt and A. E. Rogers, 1960, John F. Riders Publisher, Inc., 116 West 14th Street, New York, N.Y., 394 pp., \$12.50.

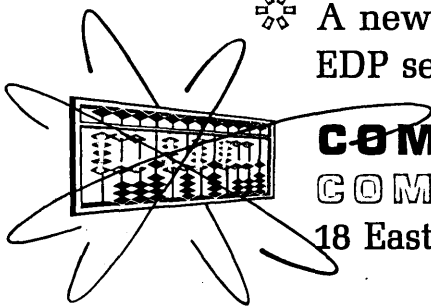
This text is designed to serve as a basic course in the concepts, devices and applications of the analog computer. Among the subjects covered are the d-c differential analyzer; general-purpose analog computers; linear computing components; monitoring and control; programming techniques, problems and applications.

A NEW CONCEPT * **IN MACHINE AVAILABILITY...** RESULTING IN A BREAKTHROUGH IN PRICE AND FLEXIBILITY!!

* For example, you may use the following Data Processing Systems at these rates per hour (or fraction thereof):

IBM 1401	\$ 50.	IBM 7070 (10K)	\$160.
IBM 7090	from 400. to 560. (depending on monthly usage)	IBM 705-II	245.
		IBM 650	50.

* A new service by the nation's leading professional EDP service organization



COMPUTER TIME SALES DIVISION
COMPUTER USAGE COMPANY, INC.
 18 East 41st Street, New York 17, New York

CIRCLE 18 ON READER CARD

BRYANT MEMORY DRUMS FOR EVERY STORAGE APPLICATION

Whatever your immediate or long-range computer requirements, Bryant is equipped to provide "right now" response to your needs for prompt delivery of custom-designed memory drums, standard storage units, read/record heads, and other precision memory system components.

Remember—Bryant Magnetic Memory Drums offer these special features:

- Time-proven reliability
- Super-precise ball bearing suspension
- Dynamic runout less than .0001"
- Dynamically balanced at operating speed
- Precision integral-drive induction motors
- Exclusive tapered drum design

For more detailed information, or if you'd like to discuss your particular storage drum application problems, contact your Bryant Representative, or write direct.

61-35-CP

BRYANT

COMPUTER PRODUCTS

852 LADD ROAD • WALLED LAKE, MICHIGAN • MARket 4-4571

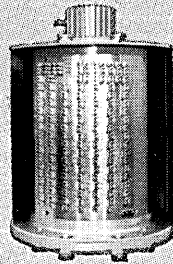
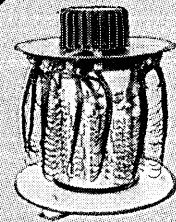
A DIVISION OF EX-CELL-O CORPORATION
EX-CELL-O FOR PRECISION



CIRCLE 19 ON READER CARD

GENERAL MEMORY

Capacity—20,000 to 2,500,000 bits @ 130 bits per inch . . . **Tracks**—40 to 420 . . . **Speed**—600 to 24,000 rpm . . . **Size**—5" dia. x 2" long to 10" dia. x 19" long . . . **Access time**—As low as 2.5 ms (one head per track) . . . Aerodynamic heads optional.

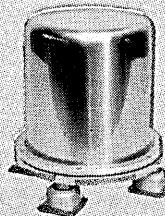
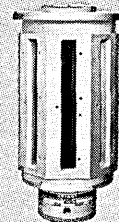


MASS DRUM MEMORY

Capacity—Up to 6,210,500 bits with fixed heads—25,000,000 bits with movable heads . . . **Tracks**—Up to 825 . . . **Speed**—900, 1800 or 3600 rpm . . . **Size**—18.5" dia. x up to 34" long . . . **Access time**—As low as 16.6 ms (one head per track).

BUFFER APPLICATIONS

Capacity—Up to 225,000 bits . . . **Tracks**—Up to 150 . . . **Speed**—Up to 60,000 rpm . . . **Size**—3" to 5" dia. x 1" to 8" long . . . **Access time**—As low as 0.25 ms (4 heads per track @ 60,000 rpm).



AIRBORNE SYSTEMS

Capacity—Up to 250,000 bits . . . **Tracks**—Up to 150 . . . **Speed**—Up to 18,000 rpm . . . **Size**—As small as 6" dia. x 6" long . . . **Weight**—As light as 7 lbs . . . **Access time**—As low as 3.3 ms (one head per track). Designed to meet MIL-E-5400.

SPECIAL PURPOSE MEMORIES

Analog recording . . . **Multispeed operation** . . . **Speed**—As low as 2.5 rpm . . . **Aerodynamic heads** for high density, high frequency recording . . . **Flux-sensitive heads** for low-speed playback . . . **Air bearing drums** . . . **Magnetic Disc Files** for mass storage up to 600,000,000 bits.



*editor's
readout*

BUGS IN THE JOURNAL

Newspapermen everywhere know that to build something up in print can be rather dull but to tear it apart invariably makes for good copy. Lately, computers and computing have come in for a healthy share of the latter treatment. As last year ended, a particularly bad piece of reporting was foisted upon a large and influential segment of the population.

In this article, computers were pictured as grossly irresponsible machines which were overpriced, oversold and overrated. An inaccurate, undocumented illusion was created to the effect that a majority of computer users were unhappy with their equipment and were just looking for an excuse to shove everything out of the nearest window.

Burroughs Corporation, Thompson-Ramo-Wooldridge and Autonetics Division of North American were given the dubious honor of being singled out for specific mention but the piece was in fact a rather poor attack on the entire industry.

None of the above-mentioned firms really needed defending. There have been tens of dozens of machines (manufactured by a wide variety of firms) which have been installed and then removed one, five or eight months later. There have been thousands installed and operated successfully year in and year out (including over 30 220's and more than 25 RW-300's).

Automation will be a vital factor in the oil industry and most other industries within the next few years. No one really doubts that fact. Our post office system will automate successfully. Computing is now an irreplaceable part of our missile effort and our national military and space picture generally. Dull copy, perhaps, but true.

These machines are here to stay. They are not sacred cows but they, and the people who build them and use them, are entitled to a fair shake. And a fair shake in this case would have been a more accurate, complete, organized job of reporting than what was found in the Wall Street Journal article, "Bugs in Automation," appearing on December 27.

BETTER CONFERENCE WEATHER AHEAD?

There are those who attend computer conferences who have been wondering for years why Eastern Joint Computer Conferences were scheduled in December and Western Joint Computer Conferences planned for May. Last year (and in '61) they could ask further why the eastern meeting was scheduled to take place less than two weeks before Christmas. The exigencies of obtaining hotel and meeting hall accommodations considered, some action to change this trend was clearly called for.

This perplexing situation could not have been dramatized more definitely than at the last EJCC when New York greeted conferees with 17 inches of snow. Like amounts were deposited over a wide area of the east. Many who started for the conference on Monday reached the New Yorker Hotel on Wednesday and even Thursday.

The National Joint Computer Committee now has before it a recommendation suggesting how this arrangement might literally be reversed. The proposed plan would have conferences run as scheduled through the WJCC in May of 1962. In September of that year, an International Conference of Information Processing Societies Congress is planned for Munich, Germany. It is proposed that this meeting replace the EJCC slated for December of '62 and that the next Eastern be held in May, 1963. The '63 WJCC would then be held in December. Barring insurmountable scheduling difficulties, it would appear that computer conference weather might soon be taking a turn for the better.

THE MODEL 212 computer is the latest addition to the Philco 2000 series of computers. A new Philco central processor has been designed to blend with an existing system to produce greater speed, higher performance, and a more economical operation.

This design philosophy provides a method of gradually advancing the state of the art without sacrificing the time, effort, and money already invested in a computer system. Thus, a system can grow with its user. The user replaces only those system components which no longer suit his requirements, and adds components to meet his new requirements.

Historically, each time the components industry has met its user's needs, the businessmen, scientists, and engineers have come up with larger and more complicated problems to be solved. The products produced to meet these problems have taken many forms. Larger memories, new organization philosophies and better techniques are typical developments. The end result of all of these is basic—increased system speed. The challenge presented to the industry is now and always has been how to achieve this speed economically.

Philco's latest answer to this challenge is the Model 212 computer. This new computer is quite naturally an outgrowth of the Philco 2000 systems. From its experience



with these systems, Philco determined where improvements in computer operation would most readily benefit the user. For example, a survey of instruction frequency was made and findings showed that the number of occurrences of a small group of instructions was significantly higher than the average. This was obviously one area in which even the slightest increase in speed would result in major improvements on the overall problem. All possibilities for improving the 2000's operation were investigated and evaluated. Those which proved out economically were incorporated into the design. The end goal was to provide a maximum computation per dollar ratio by increasing speed and improving performance.

Philco's computers

The Philco 2000 is a customized system. User's needs govern the make-up of the system with regard to computer speed, number of tape units, size and speed of memory, and degree of simultaneity. These variations of the Philco 2000 system are possible because of its asynchronous design. Asynchronism not only allows the computer to process

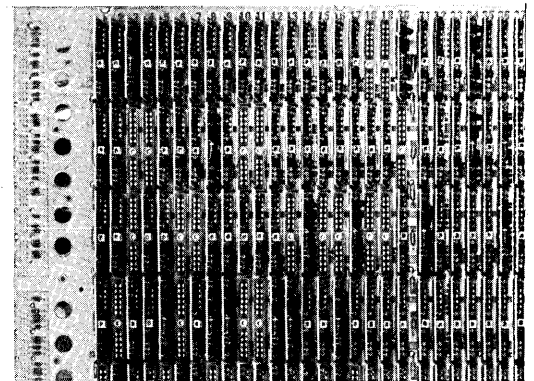
without clock-pulse limitations, but also permits new units to be added with little or no change to the rest of the system. Thus, programs that were written years ago for use with the Model 210 computer can be run on either the Philco 211 or 212 computer.

The computers in the Philco 2000 series, though different, have many common characteristics. A forty-eight-bit word, providing two instructions per word, is used throughout the series. A set of 225 instructions allows ease of programming with all the computers. In the newer computers, this set has been expanded to give even more program flexibility. Automatic counting and indexing are provided by eight index registers.

Two core storage systems are currently available with Philco 2000 systems. The Model 2200, a coincident-current core storage device, has an access time of 10 microseconds. It can be used with either the Model 210 or 211 computer.

The Model 2100 memory is a two-microsecond, linear-selection, core storage device. Originally designed as a fast replacement for the 10-microsecond memory on Model 211 systems, the Model 2100 memory can be used even more effectively by faster computers. This memory is made up of 8,192-word banks of core storage. Each bank has its own address and data registers. Thus a bank can proceed independently as soon as the information is pre-

FROM
THE
PHILCO
2000
SERIES



sented either to or from the system. For example, if a word is to be written into memory, the word and its associated address are transferred to the memory bank. As soon as this information is received, the rest of the system is released. With this method of operation, effective memory access time can be reduced to approximately one microsecond with a computer that can efficiently utilize information at that rate.

A further goal was set for the Model 212 computer. The ideal system would include a Model 212 working in conjunction with a Model 2100 memory in a manner which kept the two-microsecond memory working at its highest rate. The Model 212 computer has achieved this goal.

logical organization

The Model 212 computer is four times faster than the Model 211—its immediate predecessor. Much of the speed is derived from the implementation of a unique logical organization.

Four-way processing is possible because the computer is logically partitioned into four inter-dependent units. These units asynchronously process as much work as is presented to them. This asynchronous processing permits operations to proceed without unnecessary delays. The use of the memory is improved because, rather than handling a single memory request at a time, the computer is organized so that three of its units may be processing

Pictured Above: (Left) A typical Philco 2000 installation. (Center) A section of a Model 212 page showing the card modules in place. (Right) The Model 212 Console.

memory requests while a fourth is doing arithmetic. Figure 1 is a simplified block diagram of the Model 212 showing the Instruction Unit, the Indexing Unit, the Arithmetic Unit, and the Store Unit.

the instruction unit

The Instruction Unit supplies the proper instructions to the rest of the computer for processing. This unit contains the Program Address Register and the Program Register. These double-ranked registers allow a total of four instructions to be held in the unit for processing.

The flow of information through this unit is such that when a memory request is initiated from the Program Address Register, the pair of instructions is read out of memory into the program buffer (PR^o). When a signal is received from the Program Register that both of the instructions contained therein have been presented to the Indexing Unit for processing, the contents of the program buffer are transferred to the program register, and the contents of the Program Address Register are transferred to the address buffer (PA^o). At this point, the address in PA^o is placed in the Program Address Register and that number is incremented. Another memory request is then initiated and the cycle is continued.

Controls are located in the Instruction Unit to sequentially select the left-or-right-half of the word in the Program

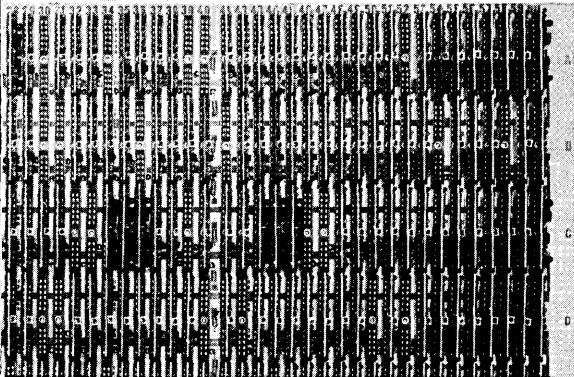
by **ROBERT E. STEELE** and **RICARD A. GROTON**,
Computer Division, Philco Corporation

the Arithmetic Unit is working on a previous instruction. In some cases, such as with the repeat instruction, the instruction is completed in the Indexing Unit. Therefore, it is not necessary to send it to the Arithmetic Unit. The independent memory accessing and anticipation of the Indexing Unit make it a most important link in the Model 212 organization.

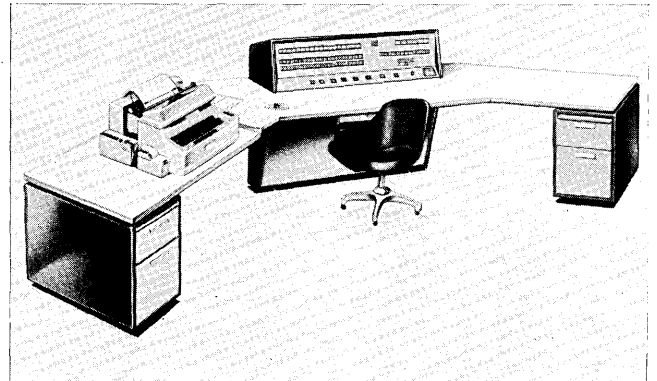
the arithmetic unit

The above paragraphs show how the organization of the Model 212 computer prepares instructions for processing. The asynchronous nature of the Arithmetic Unit permits it to begin working on this information as soon as it has completed previous tasks. Each time the Arithmetic Unit completes an operation, it signals the Indexing Unit that is ready to begin a new one. Since the Indexing Unit anticipates this request, continuous operation of the Arithmetic Unit is possible.

There are three major addressable registers in the Philco 2000 computers: the accumulator, the quotient register, and the data register. In the Model 212 all three



THE 212



Register for processing. Similar controls are also associated with the program buffer so that the repeat mode has the ability to repeat all four of the instructions contained in the Instruction Unit.

The advantage of this unit is that instruction access time is virtually eliminated because whenever a new instruction is needed, it is ready and waiting for processing.

the indexing unit

The Indexing Unit performs that part of the instruction which can be done before the actual execution of arithmetic. The major function is to pick up operands and have them ready when the Arithmetic Unit needs them. This of course, involves determining an effective address for the operand. When an instruction is loaded into the instruction register, it is classified to determine whether an effective address is necessary and if so, how that address will be used. If it is determined that an index register is used, the contents of that register are transferred to an index register buffer and added to (or subtracted from) the instruction address. Thus, the effective address of the instruction is created and placed in the Operand Address Register. If an operand is indeed required from memory, a request is initiated and the operand is read into the Operand Register where it is held until needed by the Arithmetic Unit. Thus, in the Model 212 computer, the instruction is readied for execution during a period when

of these registers are double ranked in an unusual manner. At any particular instant, only the computer knows which of the pair of registers is actually the one being addressed. For instance, if a number in the accumulator were to be shifted, it would be sent through the shifter to the other accumulator and the computer would remember which register was actually the true accumulator. This anonymity eliminates redundant transfers of information.

The Arithmetic Unit has its own instruction register from which the command is decoded to set up controls for the instruction.

Emphasis in design was placed on shifting networks which resulted in much faster shifting than previously used. Rather than perform a series of single-bit shifts, the information is shifted more than one position at a time if necessary. Combinations of four positions right, two right, one right, one left, two left, and zero shifts are used to satisfy the requirements of any shift orders called for. The speed factor realized from this method of shifting is demonstrated by the eight-to-one speed advantage of a Model 212 over its predecessors on an eight-position-right shift.

The Arithmetic Unit of the Model 212 also contains control hardware such as the Jump Address Register which keeps track of the flow of the program by recording the locations from which jumps take place. This is a program

THE PHILCO 212

addressable register and is a big factor when considering ease of programming.

the store unit

Another function of a computer is to preserve results of its operations. In the Model 212, when the results of an operation in the Arithmetic Unit are to be stored in memory, the information and its address are transferred to the Store Unit. With the Arithmetic Unit free to go on to another instruction, the Store Unit takes over and requests a memory access. Thus the Store Unit takes charge of writing all information from the computer into memory.

four-way processing

The units described above combine to form a computer organization which can process stages of several instructions at a time. The important fact, however, is that the organization permits continuous operation of the Arithmetic Unit. Information necessary to that unit is prepared in anticipation of the need, and all results of operations are released immediately upon their availability. Under these conditions the effective execution time of an instruction can be reduced to that time which is allocated to the instruction by the Arithmetic Unit. Naturally, this is the best case possible and there are times when the Arithmetic Unit finds itself without work. But well organized programs can keep these instances to a minimum.

The speed of the Model 212 has been improved beyond that achieved through four-way processing by advances in circuit design using diode-transistor logic. The speed attained by using these circuits can be illustrated by the

following examples. Multiplication has a range of between three and 12 microseconds. Average multiplication time is approximately eight microseconds. Carry-ripple time is also indicative of the speed of the 212. A ripple time of under 10 nanoseconds per bit yields a worst case time (including controls) of about one-half microsecond for an entire operation. These examples show the range of speeds being experienced in all phases of the Model 212 computer. The impact of these speeds can only be appreciated when they are viewed with the knowledge that they have been achieved at an increase in cost which is relatively slight.

instruction catalog

One of the features that contributes to the high performance of the Philco 2000 computers is the versatility found in the instruction catalog. In addition to a large variety of arithmetic and logical operations, transfers, jump shifts, and comparisons . . . special instructions appear in the list.

For the Model 212 computer, 23 new instructions have been added to the 225 instructions in the standard list. The expansion of the list without hampering compatibility was possible because of the manner in which the list was originally defined. Of the 256 combinations possible within the eight-bit command structure only 225 were considered valid. All others were considered as faults and thus "accidental instructions" were eliminated. Therefore, it was possible to use these command faults for new instructions of the Model 212 computer without violating compatibility. The extension of the repeat mode is an example of the manner in which these additions were made.

In the Model 210 and 211 computers, repeat instructions permit automatic looping of either one or two instructions. On the Model 212 computer, this repeat mode has

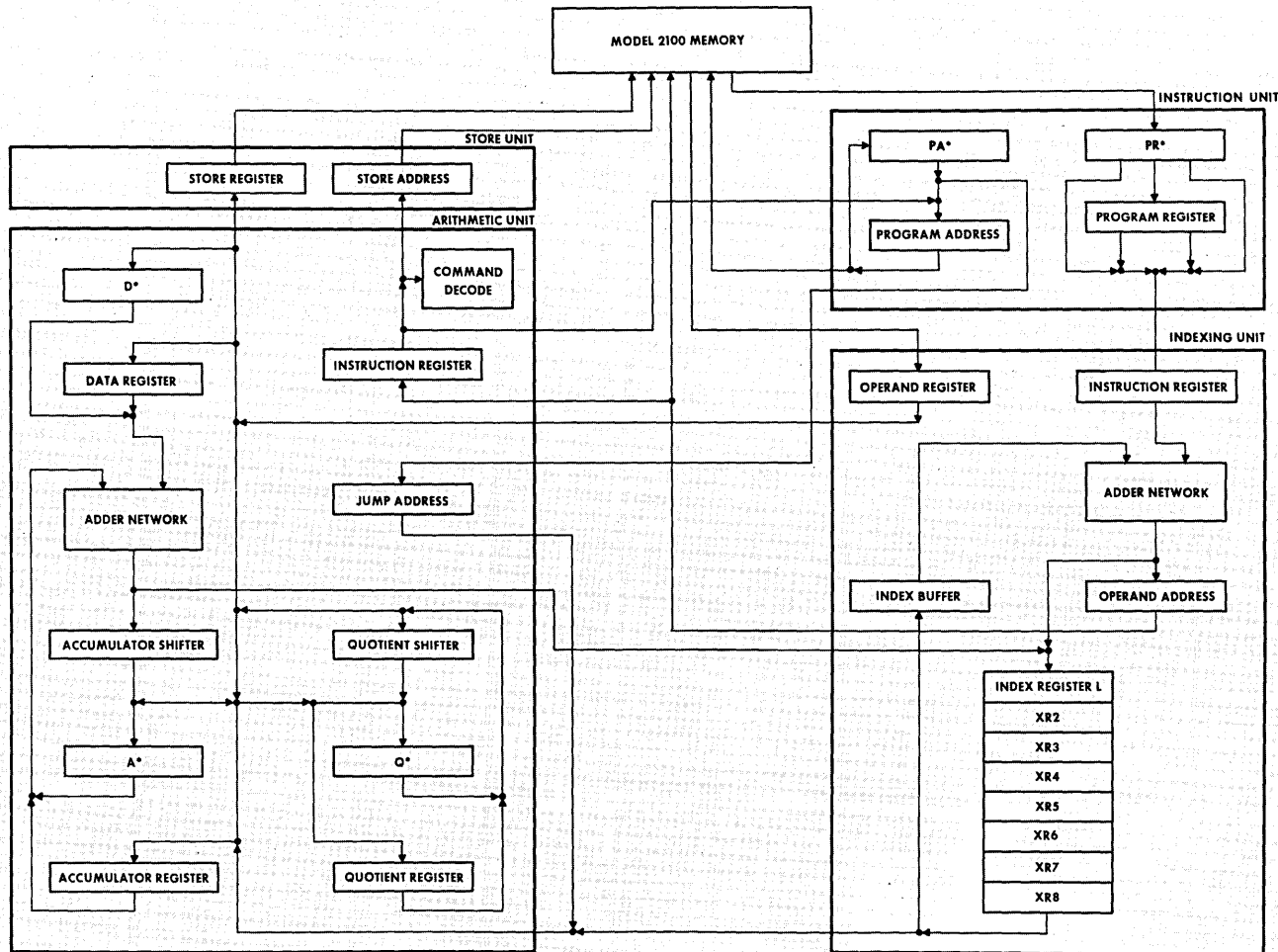


FIGURE 1 SIMPLIFIED BLOCK DIAGRAM MODEL 212 COMPUTER

been extended so that three or four instruction loops may be repeated. Thus, a tool is provided for handling the many programming situations which require these short loops.

Another area of expansion in the Model 212 instruction catalog is the list of index register instructions. Since this type of instruction appears in most programmed loops, its frequency of occurrence is considerably higher than normal. The new instructions that have been added are extensions of the sets of testing and modification instructions and make possible single instruction housekeeping of most loop situations.

The index registers themselves have been modified on the Model 212 by adding an extra control bit to each of the registers. This bit allows them to be automatically incremented or decremented by a variable quantity each time they are used. To maintain the functions found on the Model 210 and 211 index registers without violating compatibility, the new control bit is handled in a special manner. Some of the original index register instructions, which are not normally concerned with this heretofore non-existent bit, have the new function of clearing it. In addition, a new set of instructions is available for complete manipulation of the new control. Thus, by redesigning the original instructions and including some new instructions, complete compatibility is maintained and a new function is added to the Philco 2000. The complete flexibility thus accorded the index registers permits them to be handled in the most natural and efficient manner possible for a given situation.

Maintenance is another important consideration in the design of the 212. The method of packaging is a critical part of maintenance. In the 212, ease of access to all components is assured without sacrificing packing density by means of a book-like arrangement. The book is made up of seven 3 by 5-foot pages. The card modules which actually comprise the computer are mounted on these pages. The size of these modules allows a total of six basic types to be used throughout the computer, thereby reducing the spare parts problem and providing ease of maintenance. Three of the six types of card modules are shown in Figure 2 (and on the cover). Figure 3 shows a section of a page with modules in place, illustrating the high packing density achieved. The rear of a page seen in Figure 4 is an example of how wire build-up is minimized on the Model 212 computer.

The physical arrangement for the 212 computer has also changed. The computer itself is housed in a 7' x 5' x 3' cabinet. The operator's console, which has been redesigned, has been physically removed from the computer to permit greater freedom in laying out installations.

software

When describing the 212 computer, software cannot be neglected. Assemblies (TAC), compilers (ALTAC and COBOL), business routines, and a variety of utility programs have been written for the Model 210 and 211 computers. The 212 is compatible with these computers. Therefore these programs, including sort and merge routines and mathematical routines like matrix inversions, are automatically available for use with the 212. The versatility of its instruction catalog provides an important tool for simulation, giving the Model 212 user the advantage of a smooth transition period when changing from other than Philco 2000 computers.

the future

The Model 212's speed and versatility are matched to the Philco 2000 system in a way which leaves doors open for the future. Higher performance tape systems, larger rapid access storage devices, and more system simultaneity are only a few of the developments in Philco's plan to increase the 2000 system capabilities.

CIRCLE 130 ON READER CARD

Blades cut mustard

Computer Programmed To Design Computer

What is described as the first computer completely built from wiring information and parts lists furnished by another computer has been shipped to Ascension Island, near the target area of the Atlantic Missile Range. The computer is to be used in connection with NIKE-ZEUS, the U.S. Army's anti-missile defense system.

Bell Telephone Laboratories engineers stated that the entire logic network of the digital computer, consisting of 47 sub-assemblies, had been built from wiring diagrams, assembly information, and parts lists produced by a specially programmed IBM 7090. The NIKE-ZEUS computer was built here by the Western Electric Company.

The Bell Laboratories Automatic DEsign System, abbreviated BLADES, required less than 25 minutes per sub-assembly to produce manufacturing information which would have consumed an estimated four man-weeks of manual effort. The BLADE System was developed by Bell programmers.

In addition, studies indicate it may be possible to convert into a control program for an automatic wiring machine, which would do the actual assembly work.

The first step in designing the computer was the synthesis of the logic network to perform the necessary functions. This network was then converted into a set of topologic equations, expressing both the topology and logic of the network, in computer language.

The 7090 then used these topologic equations to produce sheets of instructions specifying the number of modular logic packages to be used in a subassembly.

The instructions also specified the pins to be interconnected, the size and length of wire to be used in connecting them, and the wire paths to be followed for minimum path length. Any special-purpose logic packages to be used in a subassembly were also specified by the computer.

After the wiring information sheets were completed, a complete parts list including logic packages, externally wired resistors and capacitors, and necessary wire was prepared.

The majority of the logic packages in the Zeus computer are of a single general-purpose type. Any logic function can be performed anywhere on the subassembly by varying the interconnections among the packages. The module package contains four individual and independent logic switches which can be interconnected to form 2-, 3-, or 4- terminal logic gates, or flip-flop circuits.

The computer, shipped in January, uses about 2500 of these logic packages, plus about 200 packages of other types in its 47 subassemblies. The BLADE System, as currently designed, can handle up to 12 different types of packages.

Separate wiring instructions for power and signal wiring are provided. Also, power wiring is arranged so that no two successive logic functions are supplied by the same power bus.

AA AMERICAN MANAGEMENT ASSOCIATION, INC.
seventh annual
Data Processing Conference &
exhibit
 MARCH 6th THRU MARCH 8th

STATLER-HILTON HOTEL, NEW YORK CITY

monday, march 6

9:30 a.m. Conference Opening Grand Ballroom

Welcome by Chairman Stevens L. Shea, vice president, data processing, American Insurance Company, Newark, N.J. and vice president of American Management Association Administrative Division.

10:00 a.m. The Economic Realities of EDP in Practice: Payoffs vs. Payouts — A Panel Discussion

The current trend among business and industry leaders is to make EDP pay its own way as is the case with any other company investment in systems and equipment. This panel will discuss how EDP costs are balanced against the savings and profits realized by each piece of EDP equipment and each EDP application.

11:00 a.m. Management Information Systems in Focus — Achieving This Much Sought After EDP Objective Profitably

Rapid Advances in boosting the profitability of business operations have recently been made possible by new management information systems. Reason for the gains is that the new systems give operating executives, in all company functions, more right information at the right time.

12:30 p.m. Get-Together Luncheon

Terrace Ballroom

CONCURRENT SESSIONS

Grand Ballroom

2:00 p.m. Advances in Information Retrieval and Data Acquisition

Because many companies have neglected the field of information retrieval when designing their data processing production lines, a great waste of information gathering potential has resulted. The speaker will explain why an EDP system cannot tap the vast reservoir of useful knowledge available unless specific procedures are set up to feed it into the system.

Georgian Room

2:00 p.m. Information System for Managing the Over-All Business

A number of companies are well along the road to using EDP systems as a basis for managing their over-all business operations. This presentation will show how all steps in processing these companies' end-products or services are directly tied to the information system to provide intelligence for planning and control.

about the conference

IMPORTANT PAY-OFFS are going to companies that act now to employ a major new concept in EDP—one that has critical significance for executives in every phase of company activity.

Target for this new approach is a network of information and reporting systems that supply timely, useful, easily interpreted data for scientifically sound decision-making . . . for improved management planning and control of business operations as a whole—and for each separate function, division, and cost center.

This type of information center is effective because it can give you and your associates a chance to solve current problems on the basis of up-to-the-minute data—rather than on historical records, derived from past situations. At the same time, it makes your current EDP operations more profitable by giving you higher computer processing rates, machine utilization—and fuller realization of equipment capacities.

AMA's 7th Annual Data Processing Conference is going all out to bring you reports of actual company experience in creating integrated data production lines and management information systems. Speakers are operating executives who have planned these systems and made them work.

At the Conference you will learn how much the computer is just one element of the new data processing production line . . . how much emphasis is needed on problems of information retrieval, data automation and data collection—and on effective data transmission and reception.

Speakers will point out the economic realities of EDP in modern practice . . . highlight the important advantages management information systems can bring . . . describe recent advances in information retrieval, data acquisition, and data collection.

You'll also hear how information systems are used in over-all management of the company—and in functions like marketing, manufacturing, purchasing, inventory control and accounting.

And, at the Special Exhibit of Data Processing Equipment held in conjunction with the Conference, you will see the latest tools for this job . . . begin at once to plan what you will need to build a more effective data processing operation.

GABRIEL N. STILIAN,
Conference Sponsor, AMA

Grand Ballroom

3:00 p.m. Advances in Data Collection and Source Data Automation Systems

This session will analyze and evaluate the advances being made in breaking through some of the biggest bottlenecks on the EDP production line—the collection of raw data and the accurate and economic automation of source information.

Georgian Room

3:00 p.m. Information Systems for Management of Marketing

This session will show how companies are setting up information systems to process complete sales data by EDP . . . describe how they achieve a reports output that can provide methodology for managing the over-all marketing effort.

tuesday, march 7

CONCURRENT SESSIONS Grand Ballroom 9:30 a.m. Advances in Data Transmission and Reception

Problems in data transmission systems have created a vast number of difficulties that jeopardize the effectiveness and economic justification of current computer systems. As a result, the cost of data communications and systems is now a major factor in evaluating the worth of most EDP projects. This session will explore the new and advanced communications media, methods, and equipment that are available to help overcome this problem.

Georgian Room

9:30 a.m. Manufacturing Management Information Systems and Applications

This session will cover the many significant strides being taken to make manufacturing planning and control one of today's major EDP applications. It will illustrate the essential application of the computer as an adjunct to the production shop . . . show its use in cutting production costs, improving flow and control of in-process production,

warehousing and distribution . . . demonstrate how it reduces manufacturing cycle times and improves delivery.

Grand Ballroom

11:00 a.m. Advances in Data Input Methods and Systems

With the advent of random access and inquiry . . . magnetic character recognition . . . optical scanning . . . COBOL . . . and other input advances, the way has been opened for achieving major progress in cutting costs of the over-all data processing function, and in making the total EDP effort more effective. This preparation will show how the new developments become particularly important in overcoming problems faced in the conversion to large-scale systems and for achieving on-line, real-time data processing in the company's total systems project.

Georgian Room

11:00 a.m. Product Process Development, Design and Control by Computers

Computers have long been used effectively in product and process design. This presentation discusses new advances which are being made in setting up information systems that provide critical design information from the first step of development through the pre-production, production, and distribution stages.

wednesday, march 8

CONCURRENT SESSIONS Grand Ballroom 9:30 a.m. Advances in Data Processing Methods: On-Line, Real-time Systems

This session will describe advanced data processing plans and relate them to the pattern that is now shaping up for future use of on-line, real-time information systems. And it will explain how these plans for a new concept of management planning and control for decision-making in all areas of business operations.

Georgian Room

9:30 a.m. Finance and Accounting Management Information Systems

Now that the "integrated information systems" approach is coming into wider use, data processing is able to improve effectiveness of the finance and accounting function by providing information for financial planning and control that was never available before. This presentation will explain why the integrated approach is superior to the individual applications of EDP that have "machining" of data as their main objective.

Grand Ballroom

10:30 a.m. Advances in Data Output Methods and Systems

One of the least talked about and most neglected segments of the integrated data production line is the data

output system—even though many profitable advances have been made in this area. This presentation will explain how these gains can be applied for special purposes.

Georgian Room

10:30 a.m. Purchasing and Inventory Management Information Systems and Applications

Materials management and purchasing are two key areas where EDP can be used for intensive profit-improvement efforts. This session will demonstrate how the most successful pay-offs are being achieved today.

Terrace Ballroom

12:30 p.m. Data Processing and Management Information Systems in Perspective

L. C. Guest, Jr., Vice President & General Controller, General Telephone & Electronics Corp., New York, N.Y. Guest believes that management wants data processing to function like any other element of the company—with a clear understanding of its organizational role . . . of how it will contribute to the profit improvement objectives of management and to the continued success of the company. During this luncheon presentation, he will suggest a course of action that forward-looking managements can follow to ensure that EDP makes a real, measurable contribution to the company's profit position.

Grand Ballroom — Georgian Room

2:30-4:30 Informal Conference Sessions

exhibitors

New Exhibit Hall

2-6 p.m. Tuesday Following is a Partial List of Exhibitors:

- | | |
|---|---|
| Addressograph-Multigraph Corp., Cleveland, Ohio | Mac Panel Co., High Point, North Carolina. |
| American Telephone & Telegraph Co., Long Lines Dept., New York, N. Y. | Minneapolis-Honeywell Regulator Co., Electronic Data Processing Division Wellesley, Mass. |
| Bendix Computer, Division of Bendix Aviation Corp., Los Angeles, California | Monroe Calculating Machine Co., Orange, N. J. |

- | | |
|--|---|
| Datamation, New York, New York. | The National Cash Register Co., Dayton, Ohio |
| Digitronics Corp., New York, New York | New York Telephone Co., New York, N. Y., |
| Farrington Electronics, Inc., Needham Heights, Mass. | Remington Rand Univac, Division of Sperry Rand Corp., New York, N. Y. |
| International Business Machines Corp., New York, New York. | Royal McBee Corp., Port Chester, N. Y. |
| Jonker Business Machines, Inc., Gaithersburg, Md. | Stromberg, Division of General Time Corp., Thomaston, Conn. |

ON DECEMBER 6, 1960, a live demonstration of Common Business Oriented Language (COBOL) compatibility was achieved through the use of the only two presently existing COBOL compilers. These compiling systems are the Remington-Rand UNIVAC COBOL compiler and the RCA 501 COBOL Narrator.

To fully appreciate the impact of this demonstration, it is necessary to understand how the COBOL system itself was developed. In May, 1959, a group of interested people gathered in Washington, D.C. to consider the desirability and feasibility of a common programming language for business applications. This group (which was composed of computer manufacturers and representatives from Government, Users, and Universities) unanimously agreed that this was the time for the development of such a language, which would be digestible by all computers and powerful enough for a large majority of data processing problems. As a result, the Department of Defense, which is the largest single user of computers, undertook the sponsorship of this task and immediately organized the Conference on Data Systems Languages (CODASYL), with Mr. Charles Phillips as chairman. Three working committees were then established. They were the Short Range Committee, The Intermediate Range Committee, and the Long Range Committee. These committees all reported to the Executive Committee of CODASYL. The Short Range Committee was originally chartered for a four month duration during which time it was to investigate the existing and proposed

**BY HOWARD BROMBERG,
RCA CODASYL REPRESENTATIVE**

Problem Oriented Language Systems with a view of moving toward a merger of these systems. The Intermediate and Long Range Committee functions were to consider the next generation of computer languages, and possibly to augment the previous committee's undertakings.

The Short Range Committee was composed of representatives from Burroughs, IBM, Minneapolis Honeywell, RCA, Remington-Rand UNIVAC, and Sylvania as well as from the two Government installations, Air Materiel Command, USAF; and Bureau of Ships, USN. This committee held its first meeting on June 23, 1959. At that time, it was decided that the task of the committee fell into four general areas for which the following working groups were established: Data Description, Procedural Statements, Application Survey and Usage and Experience.

The first two groups held frequent meetings and prepared proposals for consideration by the full Short Range Committee which met August 18 through 21, and August 24 and 25, 1959 for the purpose of preparing a report for presentation to the Executive Committee. This report essentially stated that the committee felt it had prepared a framework upon which an effective common business language could be built. It was recognized that the report contained rough spots and needed certain additions. Consequently, it was requested that the committee be authorized to complete and polish the system by December 1, 1959. It was also requested that the Short Range Committee continue beyond the date of December 1 in order to monitor the implementation. Both of these requests were granted. The committee held several meetings between September 18 and October 21, 1959 and proceeded steadily in its task of completing and polishing the language. The name COBOL was adopted. A sub-committee was then appointed to organize and integrate the COBOL system. This group worked continuously from October 26

COBOL AND

to November 7, 1959 and prepared a report which was reviewed and approved by the Short Range Committee during the week of November 16, 1959. During the next two weeks, the sub-committee completed its editing and the report was forwarded to the Executive Committee of CODASYL on December 17, 1959. In January 1960, the Executive Committee accepted and approved for publication the report of the Short Range Committee. Subsequently, from January through April 1960 this report underwent further editing for typographical and other minor errors and was then made available for general distribution by the Government Printing Office in June 1960.

committees dissolved

The Executive Committee then dissolved the three committee structure of CODASYL, including the Short Range Committee, and established a Technical Committee, a Maintenance Committee, and a Development Committee. The Technical Committee's function was to consider from a manufacturers' standpoint all proposals to supplement COBOL for need, technical feasibility and practicability. These considerations were then to be approved or disapproved as a committee action. Proposals generated within this Technical Committee were to be sent to the Executive Committee for assignment of a proposal number and referral to the Maintenance Committee for concurrent consideration. The membership of the Technical Committee was to consist of one representative from each of the six electronic computer manufacturers who participated in the Short Range Committee effort plus any other manufacturer interested in participating in the maintenance of COBOL. It was requested that membership on both this Technical Committee and the Maintenance Committee be held by the top person in automatic programming techniques or his representative. In addition, this member should be in a position to speak for the company.

Similarly, the function of the Maintenance Committee was to consider from the user standpoint all proposals to supplement COBOL for need, technical feasibility and practicality. A committee action was also necessary for approval and disapproval. Proposals generated within the Maintenance Committee were sent to the Executive Committee and then referred to the Technical Committee for concurrent consideration. An attempt was made in the establishment of the original membership of the Maintenance Committee to secure a cross-section of computer users from both single and multiple computer installations.

The function of the Development Committee was to review developments in the field of programming, which will permit all systems analysts, regardless of their professions or subject matter specialty, to describe processes to be performed in such a manner as to be meaningful and appropriate for any concept of implementation. Proposals for Development Committee projects may originate in the committee itself, the Executive Committee, or from outside sources. The committee makes periodical reports on the status of such projects. The membership of the Development Committee consists of representatives from industry, government, universities, consultants, manufacturers of data processing systems, and others with confidence and interest in the furthering of automatic programming development. By March, 1960, both the Technical and Maintenance groups had started to function and have since been meeting in joint and in individual sessions. Their primary responsibilities involve the preparation of an official interpretation and the clarification of all ambiguities found within the COBOL system, the institution of such changes as experience shows necessary and the addition of

COMPATIBILITY

new features to augment the power of the language. Proposals which are passed by both the Technical and Maintenance Committees will periodically be distributed by the Government Printing Office in the form of a COBOL supplement.

Recently, both the Technical and Maintenance Committees have been merged into a single COBOL Maintenance Committee. This committee is composed of a Manufacturers' Task Group (the old Technical Committee) and a Users' Task Group (the old Maintenance Committee). Recognizing that there existed a common goal of maintaining the language, it became increasingly more frequent that these two groups requested joint meetings for consultations and clarifications. The current mechanism accommodates this need through the assimilation of the two groups into a single committee by having them meet at the same time and location in both separate and joint sessions.

COBOL structure

To fully understand the notion of program compatibility, it is necessary to keep in mind the exact structure of COBOL. As a general definition it may be stated that COBOL is a set of rules used to describe problem solutions for a wide range of computing systems. Each computing system, then, must contain a translation mechanism, an automatic coding program, which recognizes problems written according to this set of rules. The function of an implementing compiler is to accept a series of English statements in COBOL which describe a data processing application and to translate these statements into a machine-coded object program. While it is admitted that complete naturalness cannot presently be achieved, it is intended that the language offered with these compilers shall simplify the process and reduce the time required to describe the general class of business data processing problems. The primary appeal of COBOL's usefulness is for those not familiar with machine coding. Consequently, those terms common to business applications rather than to computing systems are reflected in the language.

The preparation of a problem in COBOL involves the writing of four logical divisions. The first is the IDENTIFICATION DIVISION. This division does not affect the compiling process, but rather supplies labeling information for the various output listings that the compiler produces. This labeling information includes such items as the name of the program, the author's name, the date it was written, and various remarks that the programmer would like to see included on the output listings.

The second division is called the ENVIRONMENT DIVISION. For convenience, the ENVIRONMENT DIVISION is divided into two parts, namely the CONFIGURATION SECTION and the INPUT-OUTPUT SECTION. The CONFIGURATION SECTION is further divided into three paragraphs; they are the SOURCE-COMPUTER, which defines the configuration of equipment on which the compiler is to run, the OBJECT-COMPUTER which defines the equipment configuration on which the compiled object program is to run and the SPECIAL-NAMES paragraph which relates mnemonic names to such equipment as the low volume input-output devices used by the ACCEPT and DISPLAY verbs. Another application is to give names to the breakpoint switches for use in conditional expressions. The INPUT-OUTPUT SECTION consists of two parts; they are the FILE-CONTROL Paragraph and the I-O CONTROL Paragraph. The FILE-CONTROL instructs the compiler to set aside memory and input-output hardware for the logical files of data in the program. The

I-O CONTROL contains additional information regarding input-output and also contains the rerun provisions and the required memory sharing. Thus, the function of the ENVIRONMENT DIVISION is to present the "outside world" to the compiler.

The third part of a COBOL program is the DATA DIVISION. This division consists of entries which describe the layout of the data to be manipulated by the compiled program. In effect, this division "maps" the inside of the computer for the compiler and directs the compiler in the selection of those machine instructions which best handle the data described. The entries in the DATA DIVISION are sub-divided according to the types of data they describe. There is a FILE SECTION which contains the description of the records to be manipulated and the label records needed for control purposes. The WORKING-STORAGE and CONSTANTS sections consist solely of Record Descriptions and unrelated Record Description entries. These may be tables of constants, or portions of data from the files temporarily stored for further processing.

The fourth and last division of COBOL input is the PROCEDURE DIVISION. This division specifies the steps the user wishes the computer to follow in order to manipulate the data as described in the DATA DIVISION according to the particular configuration specified in the ENVIRONMENT DIVISION. These steps are expressed in meaningful English statements which are labeled sentences, paragraphs, and sections. Only sections and para-

RCA AND REMRAND EXCHANGE TWO PROGRAMS

graphs can be named and therefore are the only procedure elements which can be referenced. This procedure portion of the COBOL problem statement is commonly called the program, but by itself is not sufficient to describe the entire situation. This is true because repeated references are made, either explicitly or implicitly, to information appearing in other divisions.

compatibility

From this short description of the elements of a COBOL program, it is clear that not all of these divisions contain what is classified as problem-oriented elements. Consequently, it is necessary to discuss compatibility in a proper frame of reference. In general, compatibility refers to a program sharing ability by different computer systems. When the code used in writing a program contains certain features not meaningful to one of two different computer systems, a transcription must be made of the original problem code into the order-codes of the other computer. This is due solely to the hardware-oriented restrictive nature of machine code. Only this transcription of machine code can create the "compatibility" of various programs. However, with COBOL, compatibility means the ability to take a COBOL program originally written for one computer and recompile it to run on a second and different computing system. This is possible because of the substitution of a problem-oriented program description for the machine coded program. The various compilers serve as the transcription mechanism to create that order-code which is recognizable by each individual computer. Because COBOL is not presently totally problem-oriented, certain modifications are necessary to accommodate the machine dependent features of a COBOL program description.

To further classify the problems of COBOL compatibility, consider the following two categories:

COBOL COMPATIBILITY

1. Language Content
2. Language Structure

The first category concerns the problem-oriented elements of the language. Of the three major divisions within COBOL (Environment, Data and Procedure) only the Procedure Division may contain machine independent terms exclusively. This means that the verbs in this division will operate in an identical manner on any machine having a COBOL compiler. The sole exception is the ENTER verb which allows the introduction of machine-oriented pseudocode or machine code. Therefore, Procedure Divisions are compatible only after any ENTER statements are revised to reflect the proper code for each computer upon which the program is to run. The Environment Division contains totally machine-oriented terms and must therefore be rewritten. Information concerning the computer and any special names would not be applicable when transferring a program to another machine. For example, the statement, "OBJECT-COMPUTER. UNIVAC 2." would presently have no validity when processed by the 501 COBOL Narrator. However, the files to be manipulated and the rerun information will still be valid so that the rewrite of this division to maintain compatibility is relatively small.

The Data Division will require a lengthy revision only when it is desirable to change the memory mapping requirements to take advantage of the hardware features of different computers. Organization of data is usually machine-oriented and should be revised dependent upon the computer's requirements. File names, record names and item names will, however, remain unchanged.

The second category concerns the structure of the language in relation to each individual implementation. This involves the problems of format and presence or absence of features. In order for a program written for one machine to be recompiled on another, the COBOL compiler used for recompilation must contain at least those elements included in that compiler which was used for the initial compilation. More precisely, those features used in writing a COBOL program must be contained in and processable by each COBOL compiler.

theory to practice

With this concept of compatibility, consider the first concrete step taken in that direction. The first move toward the demonstration of COBOL compatibility occurred on Friday, August 26, 1960 at the ACM National Conference in Milwaukee, Wisconsin. The last item on the program was a Hall of Discussion on COBOL. During this period, much mention was made of the RCA announcement of the COBOL Narrator as well as the progress and availability of both RCA and Remington-Rand UNIVAC COBOL compilers. During the discussion, a question was asked from the audience concerning the effect of taking a COBOL program and compiling it on both the RCA and UNIVAC systems. This question contained the seed of the idea for demonstrating compatibility.

Subsequently, in September during RCA's customer field test plan, a program from a Government activity in Washington was compiled and run on the RCA 501. This program was then suggested to the CODASYL Executive Committee by the activity representative as being a proper and desirable program to use for a demonstration of COBOL compatibility. During the Executive Committee discussion of the demonstration one of the members, who represents a large industrial organization, suggested that it would be advantageous to demonstrate not only on a Government program but also an industrial program. This suggestion was accepted and forwarded to both RCA and

Remington-Rand UNIVAC and was immediately taken up. By the middle of October, plans were well underway. Dr. Grace Hopper of Remington-Rand UNIVAC requested a copy of the Government program which RCA had already run and RCA in turn requested a copy of the industrial program which Remington-Rand UNIVAC had run as part of their systems test.

As members of the COBOL committee, both companies recognized the fact that total compatibility was not immediately at hand. Consequently, they attempted to show both to themselves and to the outside world, the degree of compatibility enjoyed at the moment. Therefore, it was decided to have no meetings between the two technical organizations. The only information exchanged was the source program information, the layout of the data, and all of the inputs necessary for compilation. All further questions that either organization had were handled by the representative of either the Government installation or the industrial corporation.

government program

It is important to note that both of these programs were written by members of the respective customer organization and not by either RCA or Remington-Rand UNIVAC. As a matter of fact, the Government program was actually written by the Chief of a Data Processing Division. This program was initiated at the request of the accounting branch of the activity's controller's office. The program arranges data and prepares the proper format for the following two reports:

1. 789 Credit or Zero Balance Report which consists of all outstanding accounts and those customer accounts which have a zero balance. This report is used to determine the amount of money that is outstanding.
2. Cash Sales, Advanced Accounts and IOTV Invoices Report. In cases where time is of the essence, normal Government requisitioning procedures are too time consuming. Therefore, when Government accounts desire material in a hurry, they can go directly to their regional warehouse. Purchases can be made in either of three ways; Cash - which is the payment of cash directly at the warehouse, Advanced Account - in which a Government account builds up a reserve and then purchases made are credited at the warehouse against this reserve and IOTV - which is the Inter-Office Transfer Voucher. The activity is divided into ten regions each with its own warehouse. When one regional warehouse is out of

A section of RCA's final problem solution for the Industrial Program which was compiled and run on the 501 on December 7, 1960.

FACTOR-2	FACTOR-3	FACTOR-4	RATE-2	RATE-3	RATE-4	FACTOR-5
379	350	29	126.33	116.67	9.67	37
379	350	29	126.33	116.67	9.67	37
379	350	29	126.33	116.67	9.67	37
3706	2390	1316	163.45	108.64	59.82	370
967	649	318	161.17	108.17	53.00	96
4673	3039	1634	166.89	108.54	58.36	467
4770	3426	1344	153.87	110.52	43.35	477
4770	3426	1344	153.87	110.52	43.35	477
19734	13822	5912	149.50	104.71	44.79	1973
19734	13822	5912	149.50	104.71	44.79	1973
6044	4060	1984	163.35	109.73	53.62	604
23263	15267	7996	157.18	103.16	54.03	2326
2807	2120	687	165.12	124.71	40.41	280
1899	1485	414	158.25	123.75	34.50	189
34013	22932	11081	158.94	107.16	51.78	3401
59977	41373	18604	152.61	105.27	47.34	5997
11747	8652	3695	150.60	103.23	47.37	1174
667	985	318	133.40	197.00	63.60	66
18514	14404	4110	149.31	116.16	33.15	1851
90905	64814	26391	151.51	108.02	43.49	9090
467	342	125	155.67	114.00	41.67	46
802	754	48	160.40	150.80	9.60	80
1269	1096	173	158.63	137.00	21.63	126
10130	6953	3177	155.85	106.97	48.88	1013
841	581	260	168.20	116.20	52.00	84
11067	9040	2927	138.34	113.00	25.34	1106
22038	16574	5464	146.92	110.49	36.43	2203

stock on an item that one of its accounts needs in a hurry, this regional warehouse may purchase the item directly from another regional warehouse through the use of an Inter-Office Transfer Voucher. This program arranges the Input into proper report format and compares the grand total amount against the last message on the Input file. This last message is a control message and the comparison is done as an accuracy check. Management, desiring to keep these types of transactions at a minimum, uses this report to check on the volume of purchases made directly at the warehouse level. Both reports are accomplished through this program which consists of two input files and one output file prepared for the on-line printer.

industrial program

The industrial program concerned a profit and loss analysis. The actual purpose of this program was to give management in the central operations group of a large corporation a clear picture of the production situation in various plants. The program went beyond just preparing production totals and included an analysis of cost and profit ratios for each department. This was further broken down by product type as some products were produced in several different plants. The input to the program consisted of all the cost, profit, and weekly production figures for the previous quarter. These were coded to show division, department, and product identification. As output, the program produced an off-line statistical summary which made the profit status readily apparent as it concerned various plants and products manufactured within these plants.

An initial perusal of this problem clearly indicated that a high degree of compatibility was existent. By far the changes needed were results of hardware configurations rather than restrictions or limitations of the language itself. As would be expected, changes were made to the ENVIRONMENT DIVISION, for example the mode of data recording and the name of the computer. Certain size entries in the DATA DIVISION were also changed to accommodate the "synchronize" clause which deals with fixed word length. The File Description entry for each file was modified because of data differences on the two computers. In addition, because the Government problem was written for an on-line printer, modifications were made in order to accommodate this on the UNIVAC II computer system which contains only off-line printing options. The two changes that affected the language were the labeling

A section of Remington-Rand UNIVAC's final problem solution for the Industrial Program which was compiled and run on the UNIVAC II on December 6, 1960.

TE-4	FACTOR-2	FACTOR-3	FACTOR-4	RATE-2	RATE-3	RATE-4
9.67	379	350	29	126.33	116.67	9.67
9.67	379	350	29	126.33	116.67	9.67
9.67	379	350	29	126.33	116.67	9.67
9.82	3706	2390	1316	168.45	108.64	59.82
3.00	927	649	318	161.17	108.17	53.00
3.35	4673	3039	1634	146.89	108.54	58.35
3.35	4770	3426	1344	153.87	110.52	43.35
3.35	4770	3426	1344	153.87	110.52	43.35
4.79	19734	13222	5912	140.50	104.71	44.79
4.79	19734	13222	5912	140.50	104.71	44.79
3.62	6004	4060	1984	163.34	109.73	53.62
4.03	23263	15267	7996	157.18	103.16	54.03
4.41	2927	2120	687	165.12	124.71	40.41
4.50	1209	1485	414	152.25	123.75	34.50
1.78	34013	22932	11081	152.94	107.16	51.78
7.34	59977	41373	18604	152.61	105.27	47.34
7.37	11747	8052	3695	150.60	103.23	47.37
3.60-	667	985	318-	133.40	197.00	63.59
3.15	1814	14404	4110	140.31	116.16	33.15
3.49	90905	64814	26091	151.51	108.02	43.49
1.67	427	342	125	155.67	114.00	41.67
9.60	802	754	48	160.40	150.80	9.60
1.63	1269	1096	173	158.63	137.00	21.63
8.88	10130	6953	3177	155.85	106.97	48.88
2.00	841	581	260	168.20	116.20	52.00
5.34	11067	9040	2027	138.34	113.00	25.34
6.43	22038	16574	5464	146.92	110.49	36.43

and editing entries. It was necessary for RCA to modify the label conventions for the industrial problem in order to conform to the standard label conventions that the Narrator accommodates. This did not include the ending reel and file label conventions. The other change was the creation of certain additional level 2 data moves, in order to accommodate zero suppression and other editing features that were being performed off-line by means of the printer plugboard. The 501 printer has no zero suppression plugboard editing ability.

About two solid days of effort proved to be ample time to both analyze the problem in order to make the necessary modifications before compilation and to convert the input data from cards to tape. While the technical groups were busy proving compatibility, invitations were being sent to both the CODASYL Executive Committee and Users Group. Two successive days were planned, one to witness the demonstration at Remington-Rand UNIVAC and the other at RCA. On December 6, 1960, the guests assembled at the UNIVAC Engineering Computer Center in Philadelphia to witness the first live demonstration of COBOL compatibility. Both programs were compiled and the object programs produced were run against the "live" data. During the compilation, the guests were furnished a detailed description of the compiling process as well as with the COBOL print-outs which were produced during compilation. After the execution of the object programs, copies of the problem solutions were distributed. On the following day, the group witnessed the same compilations on the 501 at the RCA Cherry Hill System Center. Copies of the compiler print-outs were again produced as were the results of the problem solution. A discussion was conducted concerning the previously mentioned modifications made to the source program and the meeting culminated in a favorable comparison of the object program solutions.

some conclusions

The conclusions which can be drawn from this demonstration are promising. Each of two radically different computers was able to run successfully a program originally intended for the other. Each program was written with a particular computer in mind by employing the COBOL primers written by the particular manufacturer. These manuals necessarily reflected those elements indispensable for the individual systems. In spite of this, it was possible to sustain a 90% compatibility due to our participation on the COBOL committees.

For those who believe that compatibility must be achieved unconditionally, this demonstration has shown that these conditions requiring change can be readily removed. In this case, they were removed manually. However, it is neither unreasonable nor impractical to consider their removal by automatic means and perhaps as an adjunct to each compiler. The intelligence mechanism that each compiler would then exhibit would be not only data manipulation "for," but also "from."

The major compatibility considerations, however, are two-fold. First, a procedure must be established that will facilitate and expedite the compatibility endeavor. Second, we must not forsake our souls just for compatibility. We are obligated to continue to improve the entire system so that its efficiency, power, and scope are constantly augmented. Both of these considerations must be cognizant of the Manufacturers' stumbling blocks such as substantial cost, early delivery schedules, and limited computer product life, as well as of the user fears concerning extensive delivery time and an impotent compiler.

In anticipation of these problems, the Manufacturers Group of the COBOL Maintenance Committee passed the following resolution on August 26, 1960:

"That a single official version of COBOL be defined and published at most once per year, that these pub-

COBOL COMPATIBILITY

lications contain no elements or features for which a clear and complete definition has not been agreed upon, that certain elements or features may be identified as optional for immediate implementation. All other features are required for a compiler to qualify as a COBOL compiler. First priority shall be given to the selection and clarification of the required features."

At a meeting on September 2, 1960, the Users Group of the COBOL Maintenance Committee made a complementary statement which said, in part:

"The Manufacturers Group should identify those ambiguities which prevent first level compiler implementation. Resolution of these ambiguities will be the first order of business for the COBOL Committee. Elements of the COBOL manual which involve difficulties on the part of the Manufacturers Group for reasons other than ambiguity should be recommended by that group for placement in the second or subsequent levels of implementation with reasons therefor."

COBOL '61

The Executive Committee of CODASYL took action on September 23, 1960. Believing in the need for a clarification and progressive improvement of COBOL as well as in the necessity for "freezing" the specifications to permit orderly implementation, the Executive Committee canceled the regularly scheduled Maintenance Committee meetings and established a "Special COBOL Task Group." This group was chartered to make an intensive and complete review of the April 1960 COBOL report and all proposals pending before the Maintenance Committee for the purpose of preparing specifications for "COBOL-1961." The group held its first meeting on September 26, 1960 and will complete its task on February 6, 1961. The initial April 1960 specifications are now considered COBOL-1960."

The Special Task Group has the responsibility of preparing the first version of COBOL in the annual updating procedure that was adopted. Subsequent versions will be produced by the regular Maintenance Committee and will be published about the first of each calendar year. The representation of the Special Task Group consists of designated representatives from the Users Group together with the members of the Manufacturers Group. All members of this task group are able to participate in discussions. However, only those representatives from manufacturers who have made firm written commitments to develop COBOL compilers, citing equipment models and acceptable target dates for completion of their compilers, shall vote. At present, the voting list includes Bendix, Burroughs, Control Data Corporation, General Electric, IBM, Minneapolis-

Mr. Bromberg's article represents, in DATAMATION's opinion, the most complete, objective report on COBOL development ever published. It is also our opinion, however, that there is another side to the COBOL story. Many of those who hold serious reservations concerning COBOL have contacted us during the past year and a half and offered both facts and opinions. In our March issue, we will present "COBOL Supplement — Bottlenecks and Brickbats."

The author, Howard Bromberg (left), with Charles Phillips — Chairman of CODASYL Executive Committee, and Dr. Grace Hopper — Chief Engineer, Research Automatic Programming, Remington-Rand UNIVAC, witnessing the first "live" demonstration of COBOL compatibility.



Honeywell, National Cash Register, Philco, RCA, Remington-Rand UNIVAC, Royal Precision, and Sylvania.

Beginning with COBOL-1961, the terms "Basic COBOL," "Extended COBOL" and "levels of implementation" have been eliminated. The specifications will only distinguish between "Required COBOL" and "Elective COBOL." As stated by the Executive Committee:

"The goal shall be to include the maximum feasible features in "Required COBOL" in order to achieve the highest possible degree of compatibility among manufacturers. In order for a manufacturer to properly identify a compiler as being based upon COBOL-1961, such a compiler must include (to the full extent of the "hardware" capability) all features and elements of "Required COBOL." The elements or features identified as "Elective COBOL" are expected to be principally those which are machine oriented and are therefore limited in application to a particular class or model of equipment."

It must be noted, however, that each successive publication will not invalidate those programs written according to the previous specifications. The process of updating is being done in an evolutionary rather than revolutionary manner. No area of radical change will be incorporated into the COBOL-1961 publication. Instead, the primary intention is to insure understanding and permit implementation through clarification and rewriting. Thus, current COBOL program will not be wasted because of major differences in the forthcoming specifications. It is the intention of the Maintenance Committee to establish a procedure wherein each previous year's Required COBOL is included within the current specifications. This is not to preclude new ideas which, by definition, must modify the existing cosmology, but only to temper these changes with experience and need.

Thus, the future of COBOL concerns itself with both compatibility and with increased power. Each subsequent edition of COBOL specifications will augment the existing Required elements both with Elective features and with new abilities developed throughout the previous year of regular maintenance. The idea of a common language is workable only so long as it is aware of and accepts changing conditions. To the task of applying such changes only after sufficient experience in its use has established the wisdom and need for them and to the ardent pursuit of a compatible and effective language, we in COBOL are dedicated.

Ampex's second-generation TM-2 uses design principles already proved the hard way — *in on-site computer use*. And with these proved principles, it gives performance far exceeding any available industry standards: tape speed to 150 ips; closely controlled 2.0 ms start/1.5 ms stop times; up to 200 Kc net character transfer rate (1" tape). **Ampex performance standards set the pace in maximum system thru-put.**

Ampex — the world's largest corporation devoted solely to magnetic tape technology — has sold over 3,500 digital tape transports. Experience encompassing design, development and production of virtually every type of head and tape transport has evolved the present use-proved principles. Fifteen of the world's leading computer manufacturers specify Ampex because Ampex systems reflect unmatched knowledge and specialized experience, besides offering new industry performance standards and world-wide service. **User acceptance is the true measure of Ampex's contribution to maximum system thru-put.**

For TM-2 details and specifications please write:

AMPEX COMPUTER PRODUCTS COMPANY
 BOX 5000 • REDWOOD CITY, CALIFORNIA

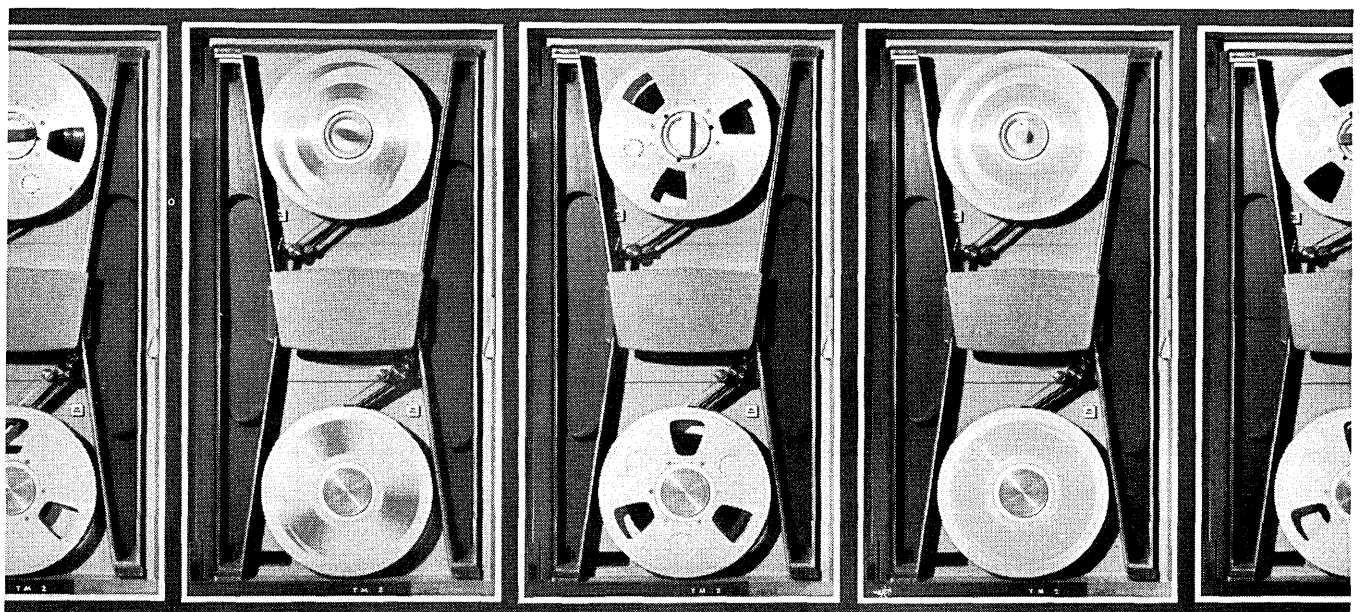


$$(TM-2) = \frac{Q_{max}}{\$}$$

WHERE (TM-2) = AMPEX TM-2 MAGNETIC MEMORY SYSTEM

Q = ACTUAL SYSTEM THRU-PUT

\$ = MAGNETIC TAPE TRANSPORT INVESTMENT



CIRCLE 15 ON READER CARD

CHAIRMAN ROCHESTER REVIEWS EJCC

MANY PEOPLE surmounted many hardships in order to play their parts in the 1960 EJCC in spite of a 17-inch snowfall which broke the New York City record for an early blizzard.

The exhibitors put on an impressive display of computing machinery, but behind the scenes they put on an even better display of hard work, perseverance, and good will as they struggled with problems created by the weather. When I arrived at the hotel late Sunday night, I found Al Meacham and John Whitlock, the exhibits chairman and manager, and a few wise exhibitors who had gotten their displays in early. On Monday morning it was clear that we were in for desperate troubles, and the day that should have been spent setting up the exhibits was spent trying to get truckloads of exhibits through stalled traffic some 50 miles away, and some just out on 34th Street, but all of it inaccessible. In the face of these obstacles, bitter competitors were seen helping each other move crates and even set up exhibits. By 11 a.m. on Tuesday when the exhibits opened, almost all of the material was within 100 yards of the hotel, and most of it was on the exhibit floor, but only about two thirds of the exhibits were really ready for the public. By Wednesday, the show was in excellent shape although there were a few very late exhibits not set up, and some that never made it.

The 1960 EJCC Committee had planned its final meeting for 9:30 Monday morning at the Hotel New Yorker, but only the three of us who met the night before were on time. The day that had been planned for attention to final details was devoted to struggling to the hotel and then recovering from major near disasters. The two secretaries who were to organize the advanced registration, and the sign painter didn't show up. Moving the Proceedings, the registration forms, the final programs, and the slide projector all provided its unique problems. The Proceedings provided a tense situation since the schedule was originally planned for printing after the meeting as in 1959. In May the NJCC asked us to have them ready to hand out at registration. This required some quick replanning from the committee and real speed from the authors, printer, and binder. Then it looked as if, at the last minute, the snow would spoil delivery from lower Manhattan. However, with the help of three separate trucking companies, the Proceedings arrived. When registration opened at 6 p.m. on Monday, all of the essential materials were on hand.

The speakers and session chairmen all arrived in time to go on stage, but of the six scheduled meetings which the session chairmen called to assemble speakers, few were held. Many of these people had experiences like that of Jerry Axel, who left his home in Philadelphia at 7 a.m. and arrived at the Manhattan Center at 1:30 p.m. in order to participate in the afternoon session which began at 2 p.m. This sort of experience gave Elmer Kubie, the program chairman, some bad moments, but still the show went on.

Fifteen-hundred-twenty stalwart conferees registered and others visited only the exhibits which were open to the public. Many found to their dismay that no taxicabs were running. Some walked through the bitter cold from Grand Central Terminal.

The people at the Hotel New Yorker were very helpful in almost all respects. They couldn't help running low on oil on Monday and having to shut off the heat on the ex-

hibit floor until the oil company managed to get a truck through. The Manhattan Center was different. When the committee discovered what sort of a facility had been reserved for us, we investigated all alternatives and found none available that were large enough for the number of people (3000-3600) that were expected. A projected hotel, the Americana of New York (formerly named the Americana West, and before that the Zeckendorf) is scheduled for 1962 completion and is planned with excellent large scale convention facilities. If this hotel does not materialize, a study of the alternatives in New York City has convinced us that either the 1964 EJCC be held in some other city, or that the character be changed. With many parallel sessions, rather than one big one, or with a restricted attendance, New York City has much to offer.

As a final remark, we recommend that the NJCC Conference Manual have a new section entitled "The Problems of Running a Conference in the Face of Disrupted Transportation."

— Nathaniel Rochester
General Chairman, 1960 EJCC

EJCC Program Highlights

by WILLIAM P. HEISING

FROM THE VIEWPOINT of general technical excellence, the 1960 Eastern Joint Computer Conference (December 13-15) must be judged a considerable success. It was unfortunate that the heaviest snowstorm in more than a dozen years struck New York just before the Conference and undoubtedly reduced attendance far below expectations.

The Manhattan Center was probably never more than half full, however the Proceedings of the Conference are already available, and will convey the flavor of the meeting to many who could not attend.

As befits a joint conference of the three sponsoring societies, A.I.E.E., I.R.E., and A.C.M., the program spanned a very broad range of computer science. However it seemed that the relative emphasis on usage problems as opposed to hardware papers was greater than at any E.J.C.C. since the 1955 Boston Conference. Although this year's E.J.C.C. had no theme, perhaps the cumulative effect of so many rapid technological advances in recent years in design and construction is taking its toll—new usage techniques are required to keep pace. Doing proven applications the same old way, only faster, won't serve to broaden the application base of the industry.

Reports were made, however, on new machines designs, tunnel diode circuits, and a radical machine organization for a cryogenic system, indicating that more raw speed is still coming in the next five years.

Petrick and Willett of the Air Force Cambridge Research Laboratories described a technique they have used in making a digital computer recognize isolated spoken words. Eighteen band pass filters in parallel select adjacent acoustic channels from the voice input. The output of each filter is rectified and then digitalized to give a single octal digit representing the acoustic energy for each channel. Thus each sample yields a number with eighteen octal digits. Up to eighteen samples equally spaced in time over the standard two second period constitute the digitalized word to be

when
men
must make
large-scale

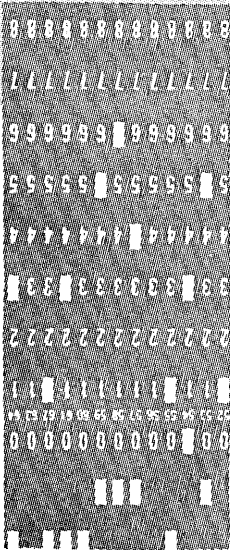


decisions

The military decisions of today are frequently of a scale new to man. They are based on vast

amounts of information gathered from huge spatial and geographic areas. They may involve world-wide forces.

And they must be made quickly in response to events of the moment. ■ When men must make decisions on that scale, they use a new information technology—systems designed to help men make decisions and exert control. ■ Sage is such a system. The SAC Control System, which is in development, is another. We are a major contributor to both, and we are beginning work on several new contracts for extremely large systems. ■ Our efforts consist primarily of the analysis and synthesis of these systems, training men for their use, instructing great computers on which the systems are based—and research into future generations of these systems. ■ We have developed a close interdisciplinary approach to system development. Computer Programmers join with Human Factors Scientists, Systems Engineers and Operations Research Scientists in the development of these systems. Scientists and engineers of these persuasions are invited to write concerning new positions in our expanding activities at Santa Monica, California and Paramus, New Jersey. Address Mr. R. L. Obrey, 2401 Colorado Avenue, Santa Monica, California.



EJCC Program Highlights

recognized. The computer program consists of two parts: (1) introducing the vocabulary and (2) recognizing a spoken word by selecting a best match from among the words stored in its vocabulary. For a series of tests the number of time samples per the two second period is fixed, for example, at five. Thus each input word is represented as 90 octal digits, which might be considered a point in a 90 dimensional space. Introducing the vocabulary is performed by pronouncing each word to be entered several times and entering via a typewriter the spelling of the written word to be associated with the spoken word. Recognition consists essentially of determining which vocabulary word has its corresponding "vector" nearest to that of the "vector" representing the unknown word. The effect of varying the number of channels, the number of time samples, and different speakers was reported. With a sufficient number of channels and samples, recognition from a vocabulary of eighty three words is one hundred per cent if the test speaker was the same speaker who introduced the vocabulary. Recognizability was well below perfect for a particular speaker, however, if the vocabulary had been introduced by another speaker. The effect was greatest between male and female speakers, possibly because the computer recognition program makes no allowance for pitch variations.

A. E. Miller of Auerbach Electronics and M. Goldman, RCA, gave the first public comprehensive description of the Checkout Data Processor (CDP), a major subsystem of the Ballistic Missile Early Warning System (BMEWS). The CDP monitors the overall operation of BMEWS, and introduces simulated radar returns at the antenna which are

processed by the rest of the system exactly like actual radar return data. The simulated returns at several stages of data processing throughout BMEWS proper are sent back to the CDP, for evaluation. Since the CDP controlled the introduction of the simulated data initially, it can determine if the rest of BMEWS is operating correctly and reducing data within prescribed tolerances. To make the operation as realistic as possible, CDP controls the frequency of the return so as to introduce the appropriate Doppler shift representing range velocity, and the time delay appropriate to the range of the simulated missile.

The entire computer operation must be tied in real time to the radar main bang timing. The program itself has two main parts (1) the simulation program to prepare digital values of the return (which go thru A/D converters to the antenna pickoffs) and (2) the evaluation program which compares the data from BMEWS proper with the target generated by the simulator, printing out monitor reports. The evaluation program runs diagnostics on its own when not otherwise occupied. The CDP has two memories (1) conventional variable core memory and (2) a fixed wired-core memory. The latter contains the program which is thus protected from alteration by any system malfunction.

The audience was informed that there was no significant disadvantage in having to rewire the machine to make a program change, this being hardly ever necessary since their problem had been well defined. This made a powerful impression on many listeners.

T. F. Kavanagh, of General Electric reported on TABSOL, a tabular programming language for systems and procedures work in data processing. Its essential element is the "decision structure table". This work was begun in 1955, and a form of it will be GECOM, a new compiler for the GE225. This work has similarities to the method reported to the NMAA by Orren Evans of Hunt Foods, his work in turn being influenced greatly by ideas of the Sutherland Company, Peoria, Illinois.

Redmond and Mulvehill discussed the advantages of a binary computer in Chrysler Corp. data processing applications. This is an ancient controversy which the authors do not claim to have settled finally, however their report is of interest since their list of advantages of binary computers is backed up by many concrete instances drawn from Chrysler's four major applications.

A paper by R. M. Beck of Packard Bell reported on the PB-250, a small computer with 300 transistors and magnetostrictive delay line storage. This paper is of interest particularly owing to the storage medium which has not been used often in this country, although Ferranti has produced a number of computers in England utilizing this principle. Some delay lines used the torsional and others the longitudinal vibration mode, these modes having differing propagation velocities. Optimum programming considerations should be considered to best utilize the machine. The particular form that the optimum programming problem assumes is partly dictated by the memory medium, and partly by the logical design. Some details were given.

The program arrangement was such that this paper was immediately followed by a paper by Blosk of IBM on the STRETCH instruction unit, thus affording a striking contrast on the range of today's new systems. This paper supplements a paper of Cocke and Kolsky (1959 EJCC) and illustrates how high performance can be obtained by overlapping execution of successive instruction. An example is given showing as many as ten instructions simultaneously in various stages of execution.

Space limitations preclude mention of many other interesting papers, and the reader is again referred to the published Proceedings.

Announcing

The Establishment of

S. HIMMELSTEIN AND COMPANY

Consulting Engineers

to be located at

3300 West Peterson Avenue

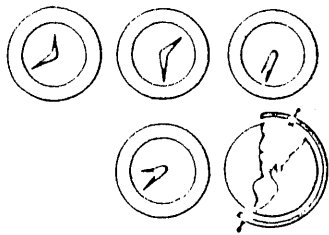
Chicago 45, Illinois

a firm specializing in

magnetic recording systems

and computer peripheral equipments

CIRCLE 20 ON READER CARD



APPLIED DATA DEVELOPS LARC GENERATOR

Applied Data Research of Princeton, N.J. is currently developing a generalized sort and merge program for the Remington Rand LARC. The generator will utilize advanced sequencing and selection techniques. It will handle record sizes up to 1,000 words with up to 20 full or partial word keys and will permit records to be edited, deleted, added or altered in size during the first or last pass. The program will automatically produce a sequenced file of up to 5,000,000 ten-word records without operator intervention. The total elapsed time to sort 25,000 ten-word numerical records will be less than one minute.

DU PONT, IBM INVESTIGATE PROCESS CONTROL AREA

A joint research program to investigate advanced concepts of computer control systems for chemical processes is being conducted by E. I. du Pont de Nemours & Company and the International Business Machines Corporation. The research, including advanced mathematical control schemes and computer techniques, is aimed at bringing a new approach to the control of chemical processes.

The research is being conducted

jointly at Du Pont's Repauno Development Laboratory, Gibbstown, N.J., and IBM's Research Center at Yorktown Heights, N.Y. The contract for the program is scheduled to run until June 30, 1962, but a computer-controlled, chemical reactor is expected to be in operation at Gibbstown by the Fall of 1961.

TEN SESSIONS PLANNED FOR '61 WESTERN JOINT

Ten sessions have been scheduled for the Western Joint Computer Conference, Dr. Walter F. Bauer, general chairman for the 9th annual meeting, announced here.

Sessions will be held on information retrieval, pattern recognition, automata theory and neural models, problem solving and learning machines, automatic programming, modeling human mental processes, computers in control, simulation, computers in communications and large computer systems.

According to Dr. C. T. Leondes, program chairman for the May conference, papers will be presented by technical, business, academic and industrial personnel to emphasize the conference's theme, "Extending Man's Intellect."

The theme for the 1961 conference

was chosen to feature the expanding potential of the use of computers in widely varying applications. Nearly one hundred firms will display computers, readers, calculators, data processing systems and other computer components with exhibits keyed to the theme of the meeting.

Over 2,000 people are expected to register for the May 9-11 meeting sponsored by the Institute of Radio Engineers, the American Institute of Electrical Engineers and the Association for Computing Machinery.

SDC TEACHING SYSTEMS MAY RELIEVE SHORTAGE

A computer operated teaching system, with the ability to tailor its instructions to an individual student's talents, has been developed by Systems Development Corporation, Santa Monica, using a Bendix G-15.

Dr. John Coulson, director of SDC's automated teaching research project, said that such a machine may be one of the country's best hopes in the face of a teacher shortage that may amount to 250,000 instructors within five years.

(A feature article on the SDC project will appear in an early issue of DATAMATION.)

LFE DISPLAY SYSTEM PASSES FIRST TESTS

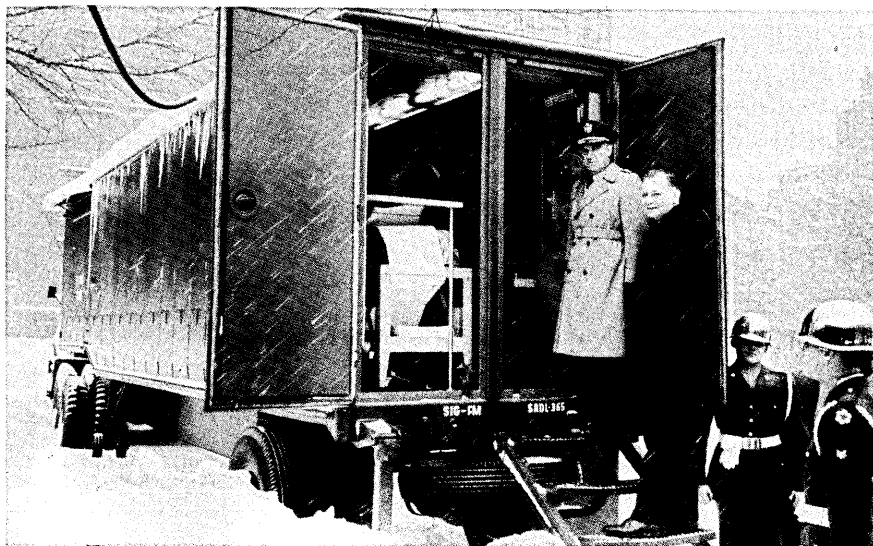
U.S. Army Corps of Engineers has completed initial acceptance tests on its first RD-900 Random Access Storage and Display System developed by Laboratory for Electronics, Inc. RD-900 can randomly select any desired information from its memory and display it on a view screen. The system can handle page, tabular, graph, chart, map or any other form of display.

Henry W. Harding, LFE president, said the 900 will function in "... areas of high-level command and control situations where decisions vital to national defense will have to be made quickly on the basis of information retrieved from the system's ... storage files."

RCA OFFERS MEMORIES

RCA is now producing custom-designed computer memory systems. In the past, RCA has supplied components for computer manufacturers to

Sylvania Electric Products Inc. scheduled a showing of their MOBIDIC computer in New York City the day before the Eastern Joint Computer Conference. As things turned out, Sylvania was able to demonstrate the system's ability to withstand environmental extremes and 17 inches of snow. Brig. Gen. J. C. Monahan of the Army Signal Corps and Sylvania's Henry Lehne appear to be smiling through but the troops were noncommittal. The first MOBIDIC was to be shipped to the 7th Army in West Germany early this year.



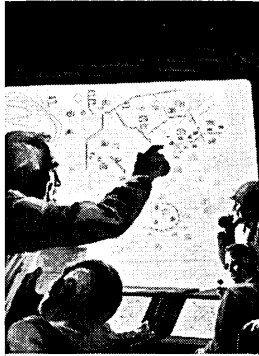
ARTOC

THE COMMANDER'S ELECTRONIC ASSISTANT



ARTOC...the Army Tactical Operations Center
...mobile electronic command post geared to
the stepped-up pace of tomorrow's battleground.

ARTOC...a synthesis of the newest techniques
in communications, electronics and data processing
...gives the field commander a comprehensive,
up-to-the-minute visual display of the battle situation
...helps him make the right decision at the right time.



ARTOC... is being developed by Aeronutronic Division of Ford Motor Company for the U.S. Army Signal Corps. It is one of many Aeronutronic programs aimed at simplifying military and industrial problems through the use of an advanced computer and data processing technology. These programs — and many others related to advanced weapon and space systems — are underway at Aeronutronic's Engineering and Research Center in Newport Beach, California. They demonstrate Ford Motor Company's rapidly-growing capability in meeting the needs of science and defense in the changing world.

A booklet describing Aeronutronic's accomplishments and capabilities is available to you on request.

AERONUTRONIC

AERONUTRONIC DIVISION *Ford Motor Company*, DEFENSE PRODUCTS GROUP

Ford Road, Newport Beach, California

WEAPON AND SPACE SYSTEMS • COMPUTERS AND DATA PROCESSING SYSTEMS
MISSILE RANGE SYSTEMS AND INSTRUMENTATION • ADVANCED ELECTRONICS
Career opportunities are open for engineers and scientists

CIRCLE 21 ON READER CARD

use in building their own memory systems. Now, according to Kenneth M. McLaughlin of the Semiconductor and Materials Div., "RCA becomes the first company in the country to offer a full array of computer elements, ranging from transistors and other semiconductor devices to complete memory systems."

FIRST BASICPAC TESTS COMPLETED AT MONMOUTH

Philco has delivered a Basicpac FIELDATA computer to the U.S.A. Signal Research and Development Laboratory at Fort Monmouth, N.J. for acceptance tests. Designed and built by Philco's Computer Division, Basicpac is a synchronous, binary computer operating at a clock frequency of one mc.

Mode of computation and data transfer is serial-parallel. Six bits, or one alpha-numeric character, are operated on and transferred in parallel. Six characters of a 36-bit word are operated on serially. Arithmetic and information transfer operations generally require one microsecond for each character, or six microseconds per word. Time for a single addition, including two memory accesses, is 24 microseconds.

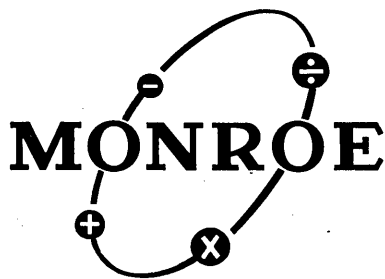
CDC DESIGNED COMPUTER CHECKED OUT FOR POLARIS

Under a prime contract with the U.S. Navy Bureau of Weapons, Control Data Corp. has developed the advanced geoballistic fire control digital computer for the POLARIS Fleet Ballistic Missile. A full scale prototype of this submarine-based computer was designed, built and checked out by Control Data in a period of ten months. This design and development program was greatly expedited by the use of the company's computer building blockline.

Control Data is also designing the analog-to-digital converter system to form a closed loop incorporating the computer and the POLARIS submarine's sensory elements. Other Control Data equipment simulates the controlling computer in digital servo loops.

PROGRAMMING DICUSSED AT G-20 MEETING

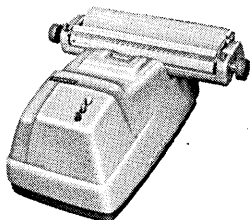
At the third Bendix G-20 Users Conference held in Beverly Hills in December, planned applications were discussed and programming information was presented. A series of talks describing SPACE, the G-20 programming system, was featured. Included in the programming package are



DATA RECORDING WITH MONROE DATA/LOG PRINTERS

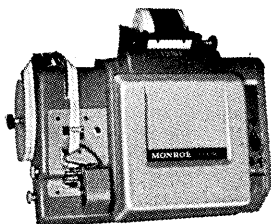
MONROE DATA/LOG PRINTER MC-215

Serial entry • Programmable or narrow fixed carriages • One or two accumulators, or print only • 18 digits per second • 142 print cycles per minute • Black and red print • 11 digits per print cycle • 12 digit totals • Motor driven carriage, 82 digits per line • Vertical space on command • Symbol type bars • Pin feed platens • Automatic Line Finder carriage



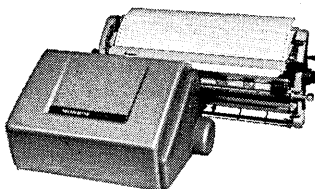
MONROE DATA/LOG PRINTER MC-205

Parallel input • 5, 6, 7 or 8 channel tape output, any code • 13 or 4¾ inch fixed carriage • One or two accumulators or print punch only • Print and punch 64 cycles per minute • 10 digit maximum plus functional codes punched automatically • IBM card punch output optional • Cabled manual electrical keyboard



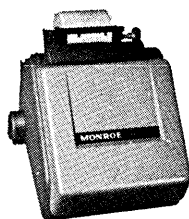
MONROE DATA/LOG PRINTER MC-203

Parallel input • Programmable carriage • 3 to 14 digits per print cycle • Up to 4 accumulators with 14 digits each, or print only • Vertical space on command • Carriage return on command • Red print, black print • 2½ print cycles per second • Cabled manual electrical keyboard • Pin feed platens • Symbol type bars



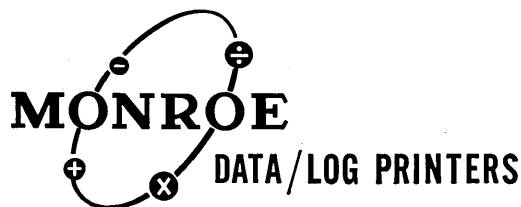
MONROE DATA/LOG PRINTER MC-202

Parallel input • 13 or 4¾ inch fixed carriage • Front feed carriage or around platen carriage • One or two accumulators or print only • Symbol type bars • Cabled manual electrical keyboard • 10 digit maximum • One or two accumulators • 11 digit total • Pin feed platens



DATA/LOG PRINTER WARRANTY. Each Monroe DATA/LOG printer carries a first year's warranty and maintenance guaranty. Following the first year, each unit can be placed on yearly maintenance contract by any of the more than 350 established Monroe service offices in the United States, or by Monroe offices abroad.

Technical specifications and wiring diagrams are available on request.



Call your local Monroe Office or write to:
MONROE Calculating Machine Company, Inc.
Electronics Components Division
60 Main Street,
San Francisco, Calif.

CIRCLE 22 ON READER CARD

NEWS BRIEFS . . .

SPAR, the gp programming routine; ALCOM, designed for scientific applications; COBOL, for business data processing; and the EXECUTIVE routine, which directs the operations of the entire SPACE system.

RYAN TRANSDATA FORMED; ACTIVE IN DATA HANDLING

Ryan Transdata, Inc., has been formed as a subsidiary of Ryan Aeronautical Company, San Diego, to specialize in design and development of data handling equipment. In the first phase of Transdata's operations, engineers and technicians have begun studies of specialized input-output equipment to be used in offices. Similar equipment will also be available for the military.

GE PLANS LABORATORY

Plans for the establishment of a new Advanced Computer Development and Research Laboratory at Sunnyvale, Calif., 39 miles south of San Francisco, at a cost of some \$1.5 million were disclosed by General Electric recently.

The new 49,000 sq. ft. laboratory will be headed by Dr. C. F. Spitzer. The present staff of 85 will be almost doubled initially, a GE official stated.

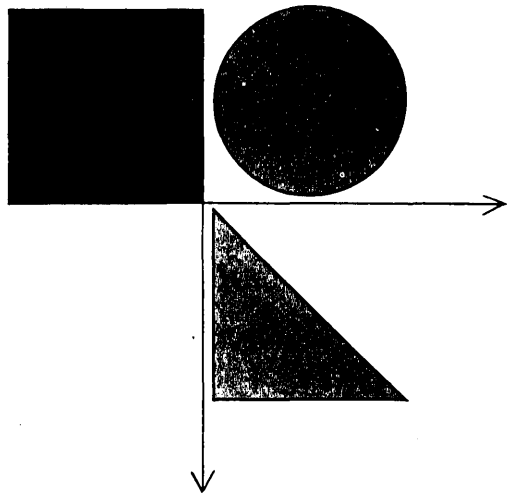
FILE-COMPUTER USERS MEET

The possibility of Univac File-Computer users setting up a formal organization, possibly within the framework of the Univac Users Association, was discussed at the first meeting of the Univac File-Computer Users Conference in New York City, on January 26 and 27. Edward C. Marzo of the William Carter Company, Needham Heights, Massachusetts, is secretary of the steering committee for the File-Computer group.

✓ The Atlantic City Electric Company has begun operation of its new Accounting and Electronic Data Processing Center near Pleasantville, N.J. The center is equipped with an RCA 501.

✓ The first base-level computer program for the Air Force was initiated recently with a 7070 installation at Charleston AFB, S.C. The IBM system will be used for a wide variety of functions including accounting, air operations planning, supply inventory and aircraft maintenance control for this MATS base.

✓ An integrated system for testing magnetic memory cores has been de-



ADR

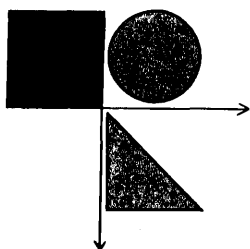
FOR THE DIGITAL COMPUTER

USER
MANUFACTURER
DESIGNER

ADR provides the services of highly qualified programmers, system analysts, and consultants for the digital computing field.

The twenty-two members of ADR's technical staff have an average of seven years experience in digital computer applications. Their background includes proficiency in the programming of more than twenty-five different computing systems.

ADR's assignments from manufacturers include computer simulations, COBOL, assembly systems, and sort and merge generators. For users, ADR is participating in installation organization, mathematical model building, and numerous programs in scientific, industrial, and commercial data processing.



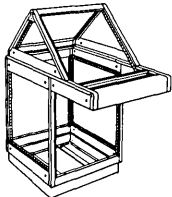
APPLIED DATA RESEARCH, INC.
759 STATE ROAD • PRINCETON, NEW JERSEY • WALNUT 1-8550

Descriptive material on Corporate Facilities and Services is available on request.

A record in precision and reliability with 6 and 8 channel recording systems housed in...



**EMCOR[®]
CABINETS**



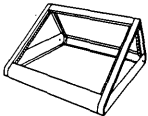
Sloped-Front Console-mounted 6 & 8 Channel Recording System



Console-mounted recording systems manufactured by BRUSH INSTRUMENTS, Cleveland, Ohio, and housed in EMCOR Cabinets serve as readout stations for telemetry, testing, computer, ground control and other data processing systems.



EMCOR Cabinets offer a compact, versatile and functional housing for industrial or military recording systems. A combination of "human engineering" in cabinet design by EMCOR and instrumentation by Brush Instruments affords simplicity of operation. All controls are within easy reach and visibility of the operator. The flexibility, versatility and structural capabilities of over 600 basic frames in the EMCOR MODULAR ENCLOSURE SYSTEM bring advanced engineering and "imagineering" to meet your packaging requirements. Write for details.



CHOOSE FROM OVER 600 BASIC FRAME ARRANGEMENTS

Condensed Version of Catalog 106 available upon request.



Originators of the Modular Enclosure System
INGERSOLL PRODUCTS
Division of Borg-Warner Corporation
630 CONGDON • DEPT. 1248 • ELGIN, ILLINOIS

CIRCLE 24 ON READER CARD

NEWS BRIEFS . . .

livered by Digital Equipment Corp. to RCA's Semiconductor & Materials Div., Needham, Mass. The 2102 memory core tester generates four different programs of current driving pulses variable in timing and amplitude.

✓A 16,000-word magnetic memory drum for the RW-300 Digital Control Computer was announced last month by TRW Computers Company, Beverly Hills, Calif. A news release stated that the 300 "is being used in more process control installations than all other computers combined and to date has logged over 200,000 hours of operation with a reliability record of better than 99%."

✓Two of Minneapolis-Honeywell's first 800 systems have been shipped to Associated Hospital Service, N.Y., and American Mutual Liability Insurance Co., Boston. These are forerunners of more than 50 Honeywell computers scheduled for delivery in '61.

✓Computer Control's Universal Tape-To-Tape Converter has successfully passed all acceptance tests and is now in operation at the army's White Sands Missile Range. The UTTC can convert any BCD number to its equivalent binary number and conversely translate any binary number to its BCD equivalent.

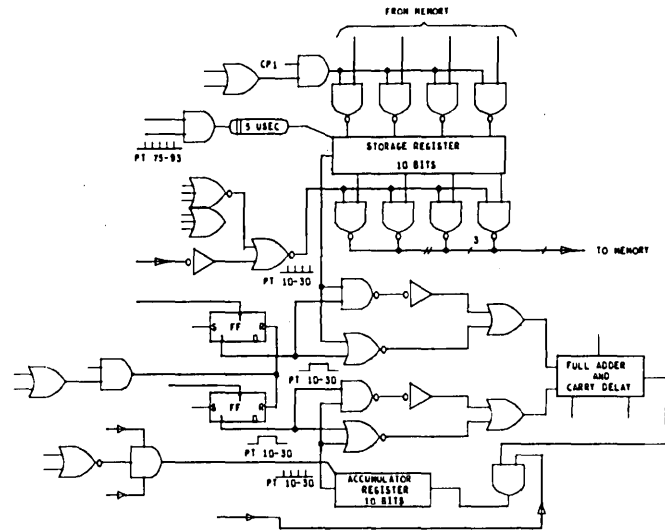
✓The new Univac 490 Real-Time system and the 1107 Thin-Film Memory computer will be produced in RemRand's new Roseville, Minn. facility. Target date for the start of production is the spring of '61.

✓Extending the capabilities of its Re-comp II computer, the Industrial Products organization of Autonetics has shipped two specially-developed magnetic tape transports to Offutt AFB, Omaha, Neb. Each of the tape units increases memory storage to one million words; input speeds 4.5 times and output 100 times.

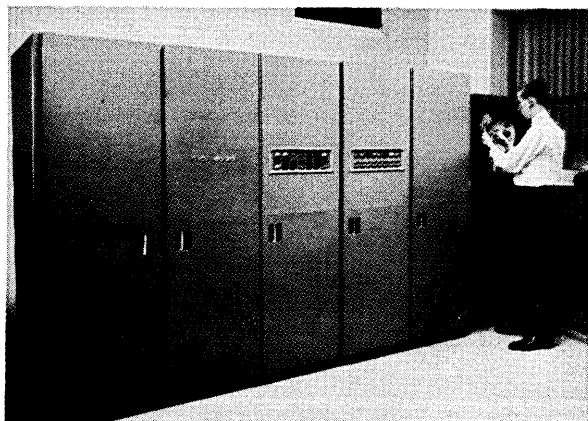
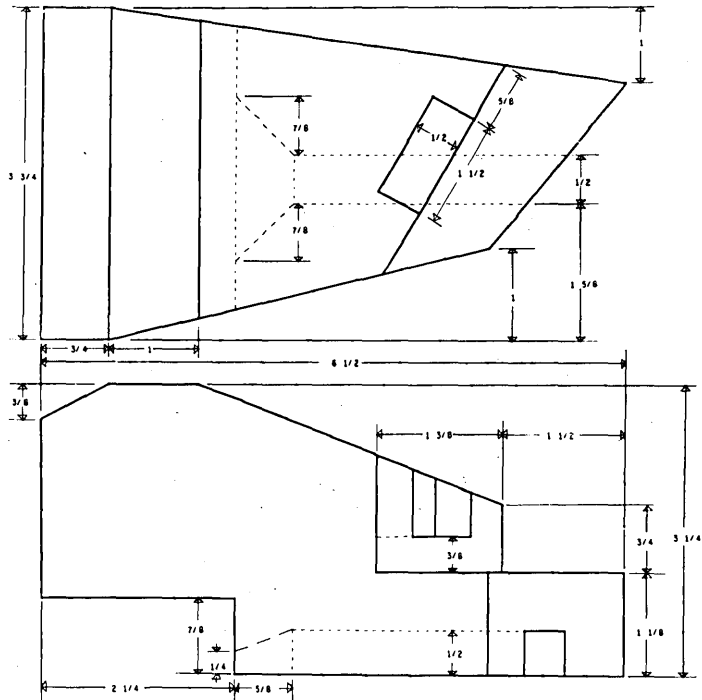
✓DataTape and Electro Mechanical Instrument Divisions of Consolidated Electrodynamics Corp., subsidiary of Bell & Howell, have been combined into the Data Recorders Division. Henry S. Black will be general manager.

✓Two GE-210 computer systems will be installed this month at Marine Trust Co. of Western New York in Buffalo, to handle the sorting and posting for 200,000 accounts.

NOW!
Automatic
drafting
like this
from your
computer
in less than
1 second!



*Actual drawings produced by the
 S-C 4020 High-Speed Microfilm Recorder*



The S-C 4020

Instantaneous mechanical drawing is now a reality, with the Stromberg-Carlson S-C 4020 High-Speed Microfilm Recorder. Automatic drafting can cut weeks from design time, saving invaluable engineering man-hours. Here's how it works:

A computer is programmed with the contours and specifications of the part to be designed, using APT (Automatically Programmed Tool) language. The computer operates the S-C 4020 Recorder which makes multi-view mechanical drawings of the part in a fraction of a second. After the drawings have been checked, output of the computer can be used to operate a numerical control tool and produce the part. Capabilities of the S-C 4020 include recording data on microfilm at 17,500 points per second, plotting graphs on microfilm at 12,500 points per second, recording complex logic circuit drawings, tabular printing and forms projection. Write for more details to Stromberg-Carlson-San Diego, Dept. B-15, P. O. Box 2449, San Diego 12, California.

STROMBERG-CARLSON-SAN DIEGO
 A DIVISION OF **GENERAL DYNAMICS CORPORATION**

Now you can mount CLARE BILLION- OPERATION RELAYS

on your own
printed circuit
board

Typical Clare mercury-wetted relay steel-enclosed modules for circuit-board mounting. From top: HGSM Relay Module, HGM Relay Module, HGPM Relay Module. Epoxy molded Relay Modules are also available.



Mercury-wetted contact relays, steel-enclosed and ready for mounting on your own assembly line, give you Clare reliability in operation, combined with new ease of application and handling. Clare HG and HGS relays have test records of over 10 billion operations, without maintenance or change in characteristics. In these new modular cases, they're sturdy, magnetically shielded, easily replaceable.

Choose either the standard Clare HG relay, or the HGS—super-fast and super-sensitive. You'll gain extra convenience and increased component-density with these Clare Relay modules.

Each relay contains one or more of these magnetic switches. Mercury-wetted contact surfaces are continually wetted by capillary action; they never bounce, never get dirty, never weld, and never wear out.

Get Bulletin CPC-8 for detailed specifications, characteristics, dimensions: Ask your Clare representative, or address C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Illinois. In Canada: C. P. Clare Canada Ltd., 840 Caledonia Road, Toronto 19, Ontario. Cable address: CLARELAY.



CIRCLE 26 ON READER CARD

Chairman Of NJCC Comments On AFIPS

NEW YORK CITY, DEC. 15, 1960—This report was originally scheduled to be presented by Prof. Harry H. Goode, the late chairman of the National Joint Computer Committee. As you read in the Proceedings, Harry Goode was fatally injured in an automobile accident on the morning of October 30, 1960. His passing is a serious loss not only to his family and his many friends but also to the professional societies which he served so tirelessly and so well. The NJCC has continued in the direction of the program he set out to accomplish and I am pleased to report that substantial progress has been made.

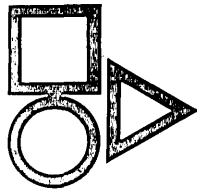
The most important activity to occupy Harry's attention was in connection with the replacement of NJCC by an American Federation of Information Processing Societies with a more flexible charter and a broader scope. The progress of this activity has been reported to you periodically through journals and other media and with your permission I will use the few minutes allotted to me primarily to report on this activity.

From recent NJCC meetings, a proposed Constitution for an American Federation of Information Processing Societies has been prepared and has been approved in principle by the executive bodies of the three sponsoring societies. Formal approval by IRE and AIEE has been assured and should be obtained within the next 30 to 60 days. The proposed Constitution will be mailed to the ACM membership for ratification at the earliest possible opportunity, hopefully also within the next 30 to 60 days. Needless to say, the Constitution is a result of literally hundreds of man-hours of deliberation and hard work by the representatives of the IRE, AIEE and ACM over the past two years and has taken into account the requirements of the Charters of the parent Societies as well as the need for a smooth transition.

The goals of the Federation as they appear in Article II of the proposed Constitution read: "The purposes of this Federation shall be the advancement and diffusion of knowledge of the information processing sciences. These sciences include, but are by no means restricted to, the computer sciences and their applications to society. To this end it is part of the purpose of this Federation, among other measures, to serve the public by making available to journals, newspapers, and other channels of public information reliable communications as to information processing and its progress; to cooperate with local, national and international organizations or agencies on matters pertaining to information processing; to serve as representative of the United States of America in international organizations with like interests; to promote unity and effectiveness of effort among all those who are devoting themselves to information processing by research, by application of its principles, by teaching or by study; and to foster the relations of the sciences of Information Processing to the other sciences and to the arts and industries. In pursuing these purposes, the Federation shall do nothing that is in direct competition with activities of its member societies."

Other activities of NJCC include the appointment of Dr. Jack Moshman as Chairman for the 1961 EJC Conference in Washington, D.C., Dr. Morris Rubinhoff and Mr. J. D. Madden as Chairman and Vice-Chairman of NJCC for 1961, respectively, and cooperation in certain appointments to the International Federation.

— Morris Rubinhoff
Chairman, NJCC



new products in **DATAMATION**

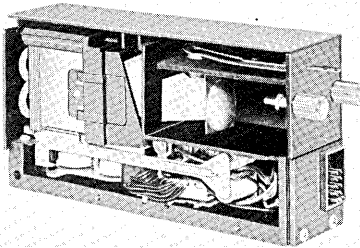
magnetic core tester

Model 1300 magnetic core tester, a high speed, multiple output pulse generator that provides programmed, high amplitude current or voltage pulses for laboratory research and development, and full-scale production testing of high speed magnetic materials, solid state digital devices and computer circuits and systems, is now available. The 1300 has a 40 nanosecond rise time, 200 kilocycle stepping rates and 2½ ampere current pulses. Power requirements are 105 to 125 VAC, 60 cycles. Fifty cycle units are also available. RESE ENGINEERING, INC., A and Courtland Sts., Philadelphia 20, Penna. For information:

CIRCLE 200 ON READER CARD

alpha-numeric readout

A new self-decoding alpha-numeric readout accepts any BCD code up to six bits. It does its own translating, and displays the proper character. It may be connected directly into computers, instruments, display boards, numerical controls, and other electronic equipment. There are no auxiliary trans-



lators, relays, or diodes required. It uses low power and may be operated with as little as ten milliwatts per bit of signal power. Featuring electromagnetic operation, it will display up to 20 characters per second. INDUSTRIAL ELECTRONIC ENGINEERS, INC., 5528 Vineland Ave., North Hollywood, Calif. For information:

CIRCLE 201 ON READER CARD

digital arithmetic center

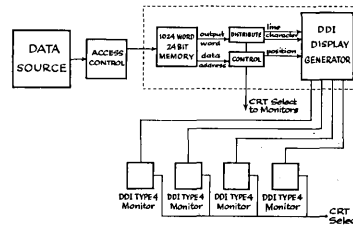
The model DAC-2500 digital arithmetic center, now available as an off-the-shelf unit, is a solid state component for computing, process control, instrumentation and test systems. Flexible input and output control circuits allow a full range of peripheral equipment to be easily connected with the center. These include punched card and punched tape units, analog-to-digital converters, digital voltmeters, x-y plotters and printers. Following

are some of the specifications of the unit: Number system: decimal; word length: 18 decimal digits and sign; storage: magnetic drum; storage capacity: 16 words per channel; access time: average 8:5 milliseconds; instructions: multiple address and multiple operations. CLARY CORP., 408 Junipero St., San Gabriel, Calif. For information:

CIRCLE 202 ON READER CARD

general display system

A general purpose alpha-numeric display system is useful for real-time monitoring, computer maintenance testing, computer program debugging, and rapid display of alpha-numeric information. Heart of the system is a

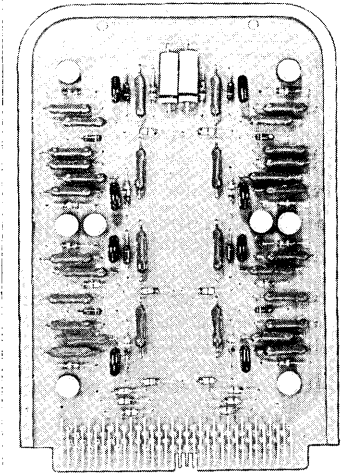


console containing stored memory and character generator. This is a functional link between a computer and any number of dd scopes. Number of scopes is limited only by the total character output — 125,000 per second. Magnetic stored memory with full random access, 8 microsecond cycle time; a capacity 1,024 bit words. Optional added features include a data entry key set allowing the operator to talk from display through the keyboard back to the computer without intermediate card punching, and a paper tape reader that reads back to the computer. DATA DISPLAY, INC., 1820 Como Ave., St. Paul, Minn. For information:

CIRCLE 203 ON READER CARD

flip-flops

Basic flip-flop, model FF-30 is one of a series of one megacycle plug-in digital modules. It contains 4 identical, independent bistable elements for use as input-output registers, or for any logical application in which complementing, shifting, etc. is not required. One set and two reset inputs are provided and each of these is expandable to 10 inputs per side. The set and reset outputs are each capable of driving 6 S-PAC standard loads



plus stray capacitance. COMPUTER CONTROL COMPANY, INC., 983 Concord St., Framingham, Mass. For information:

CIRCLE 204 ON READER CARD

console card reader

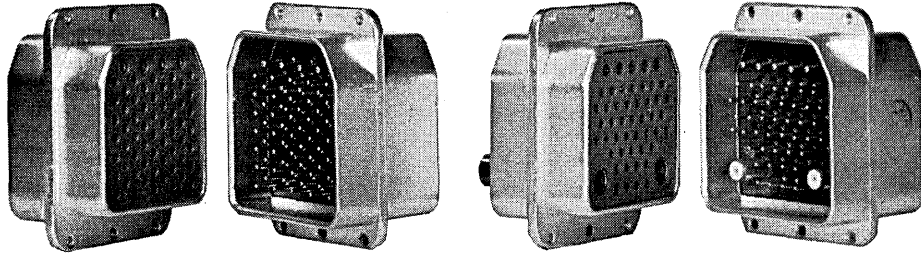
The new 7502 provides direct card input to the 7080 data processing system. It is designed as a communications link between the operator and the tape-oriented 7080 system, to handle small-volume card input at moderate cost. The 7502 may be used to read cards at speeds up to 60 a minute at a single read station where the punched data is sensed photo-electrically. Cards may be punched in any arrangement of digits, letters of the alphabet, or special characters acceptable to the 7080. The record is read into memory. Each card column is translated automatically into one corresponding binary coded decimal character. Translation and card registration are checked and unacceptable punching or coding are treated as error conditions. Check lights on the 7502 display the type of error encountered. INTERNATIONAL BUSINESS MACHINES CORP., 112 E. Post Rd., White Plains, N.Y. For information:

CIRCLE 205 ON READER CARD

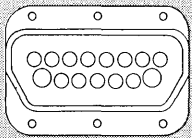
storage core

A new ferrite storage core for wide temperature range operation has been designated the XCWT 508-10. This core will operate without current or temperature compensation over a temperature range of -55 to +100°C. Designed for coincident current memory operation this .050 in. core is now

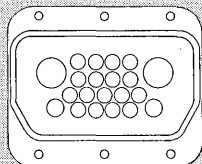
NEW FROM CEC...RACK AND PANEL CONNECTORS WITH MIL-SPEC CONTACTS



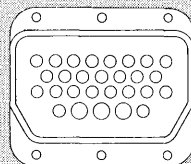
NOW FOR THE FIRST TIME you can have a rack and panel connector with contacts made in accordance with MIL-C-26636...an exclusive CEC feature. And they are available in six configurations... Die-cast aluminum shells in accordance with MIL-QQ-A-591A and insulator blocks of high-strength glass-filled diallyl phthalate per MIL-M-19833. Check these configurations with your requirements:



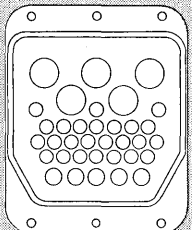
500L-15:
13 size 20 contacts,
2 size 16 contacts.



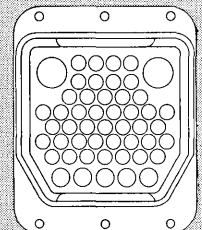
500L-19:
17 size 20 contacts,
2 size 16 contacts,
2 standard RG58/U
coaxial contacts.



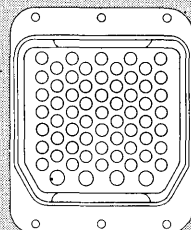
500L-28:
25 size 20 contacts,
3 size 16 contacts.



500L-30:
25 size 20 contacts,
5 size 16 contacts,
5 standard RG58/U
coaxial contacts.



500L-48:
43 size 20 contacts,
5 size 16 contacts,
2 standard RG58/U
coaxial contacts.



500L-63:
59 size 20 contacts,
4 size 16 contacts.

CIRCLE 27 ON READER CARD

For more information, write for Bulletin CEC 4006-X8.

Electro Mechanical Instrument Division

CEC

CONSOLIDATED ELECTRODYNAMICS / pasadena, california

A SUBSIDIARY OF Bell & Howell • FINER PRODUCTS THROUGH IMAGINATION

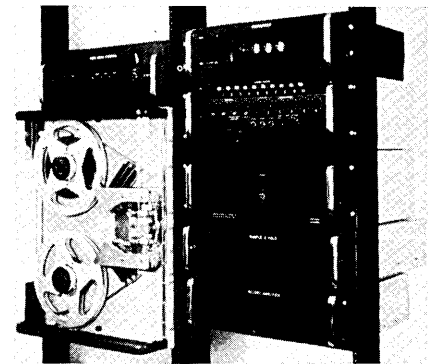
NEW PRODUCTS . . .

available in experimental quantities. AMPEX COMPUTER PRODUCTS CO., Advanced Memory Div., P. O. Box 329, Culver City, Calif. (Formerly Telemeter Magnetics, Inc.) For information:

CIRCLE 206 ON READER CARD

digital data system

A newly developed digital data system, the 1610, is designed to acquire data at high speed and accuracy with maximal reliability. Only solid state elements such as transistors and diodes are utilized. The output tape is directly compatible with many types of computing equipment and is placed directly on the computing machine tape reader. All necessary codes and

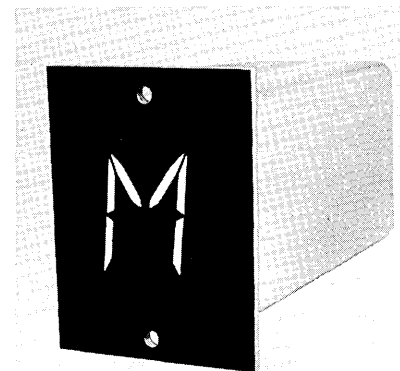


gaps are inserted as the data is recorded. A unit capable of handling up to 100 output data channels occupies only a single five foot high rack. The user can select several operating speeds and lengths of the run as well as identification constants. COMMUNICATIONS & CONTROLS CORP., 14707 Keswick St., Van Nuys, Calif. For information:

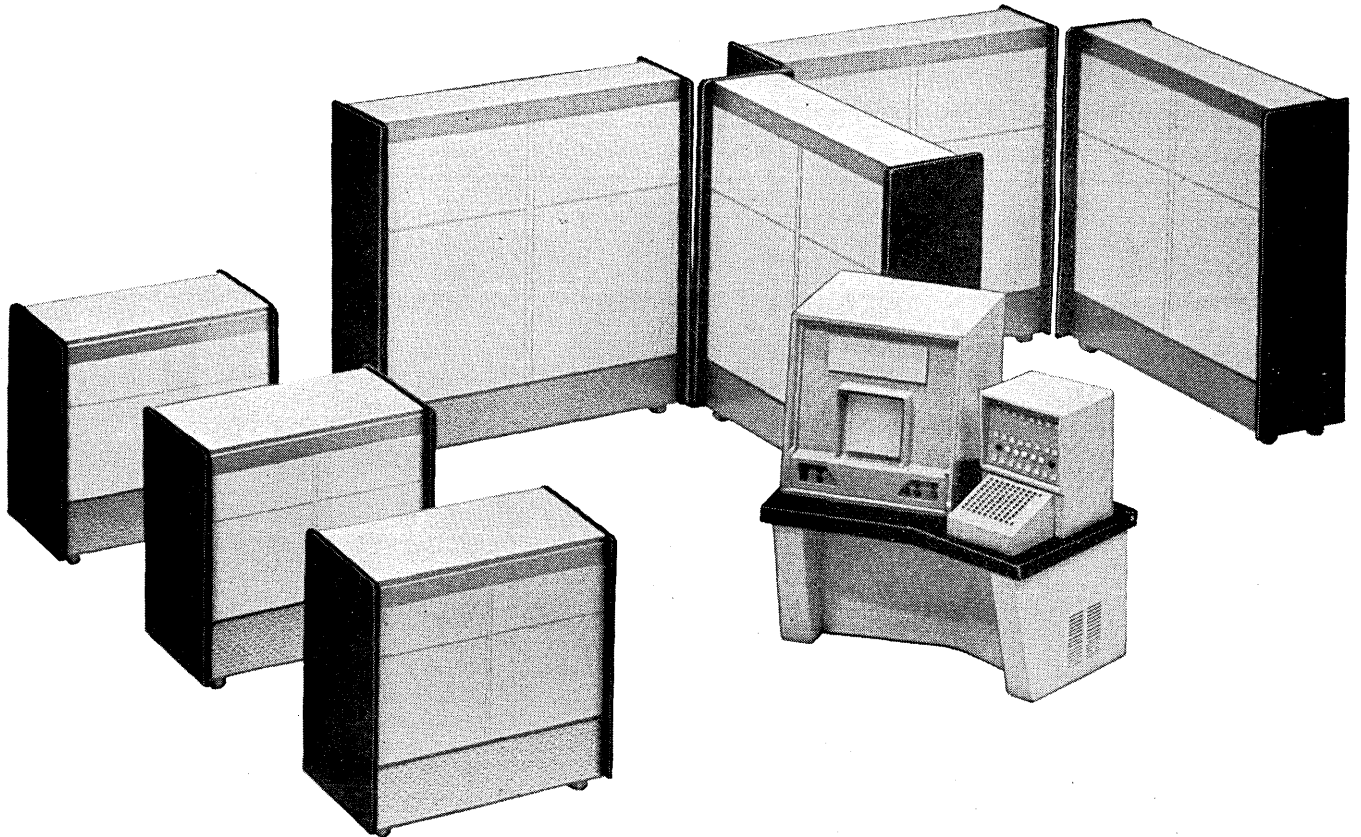
CIRCLE 207 ON READER CARD

alpha-numeric display

Alpha-numeric model F2001 displays bright 2 in. high single letters A through Z or numbers 0 through 9. Completely transistorized with built-in memory, the unit employs 16 input control lines requiring -10 volt pulse for display presentation and memorization. It has electric reset that erases display, and control line that permits



LFE's new RD-900 system --



... provides a random access file of up to 495 million bits with access to information in less than 3/10 of a second.

... may be operated with all standard general purpose digital computers, or as an independent storage, access and display system.

The RD-900 Random Access Storage and Display System, consists of from 1 to 33 high density, magnetic, file drums, each with a storage capacity of 15 million bits. A Symbol Generator converts coded characters

into a visual message as fast as they are read from the file. One Symbol Generator is used to drive any number of output display devices. These include 21" console displays and large screen projection displays ... each capable of displaying up to 12,800 characters, symbols or a composite of both. In addition to alphanumeric characters the system can display arbitrary or abstract symbols, schematic or logical drawings, graphs, charts, and maps. Applications include military and industrial systems where information retrieval and display must be simultaneous for instant decision making. For a complete description and specifications write Dept. 101.

LFE
COMPUTER PRODUCTS
DIVISION

LABORATORY FOR ELECTRONICS, INC.

1079 COMMONWEALTH AVE. • BOSTON 15, MASSACHUSETTS

Senior Methods Analysts, Scientific Applications Specialists, and Sales Representatives

**GIVE YOUR CAPABILITIES
FULL EXPRESSION — AT A
LOCATION OF YOUR CHOICE
—WITH RCA'S EDP DIVISION**

There's an atmosphere of achievement at RCA. You become associated with other highly capable people working on important projects. You are stimulated to contribute your best... and your accomplishments are recognized and rewarded.

You're a vital member of a company whose equipment is universally accepted and respected... a company that's growing... expanding its EDP offices and facilities throughout the country. Because of this, you're able to choose your own location.

The qualifications required: for *Senior Methods Analysts*, an extensive background in EDP systems analysis and a knowledge of programming methods and planning. For *Scientific Applications Specialists*, a minimum of three years' experience in scientific computations on EDP tape equipment, *plus* systems experience.

For *Sales Representatives*, a background that includes at least one year of on-quota EDP sales experience with either government or commercial clients, and a thorough EDP systems knowledge.

Call or send your résumé to the nearest RCA Electronic Data Processing Division office for confidential consideration of your qualifications:

Mr. R. W. Baumann, Pers. Mgr.,
Northeastern Reg.
45 Wall Street
New York, 5, New York
HANover 2-1811

Mr. R. C. Mercer, Pers. Mgr.,
Cent. & Southeastern Reg.
RCA Cherry Hill, Bldg. 204-1
Camden, 8, New Jersey
WOODlawn 3-8000,
Ext. PY 5444

Mr. R. W. Stephens, Pers. Mgr.,
Western Reg.
11819 W. Olympic Blvd.
Los Angeles, 64, Calif.
BRadshaw 2-8842

Mr. M. G. Young, Pers. Mgr.,
Fed. Gov't Sales
1725 K Street, N.W.
Washington, 6, D.C.
FEderal 7-8500



The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA



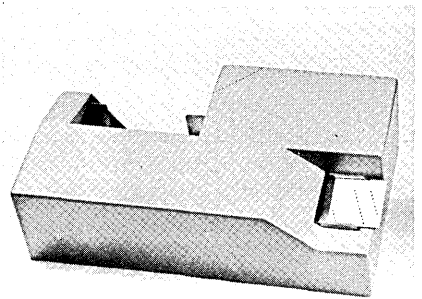
CIRCLE 72 ON READER CARD

NEW PRODUCTS . . .

sequencing adjacent characters. It operates at a rate of more than 100 characters per second. It is suitable for side by side stacking on approximately 3 in. centers for complete word and message presentation. ROBOTOMICS, INC., 2422 E. Indian School, Phoenix, Ari. For information: CIRCLE 208 ON READER CARD

tab card reader

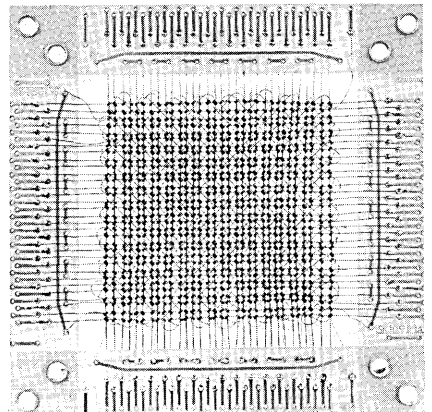
A compact serial tabulating card reader is available in two models, which can be used for input or output for computer systems, for use in conjunction with accounting machines, as a direct hook-up with subsets for direct



telephone line transmission of data, etc. Ease of maintenance, flexibility of programming, small 9 by 6 by 11 in. size, and economy are a few of the features of this unit. SYSTRONICS, 3673 Newton St., Torrance, Calif. For information: CIRCLE 209 ON READER CARD

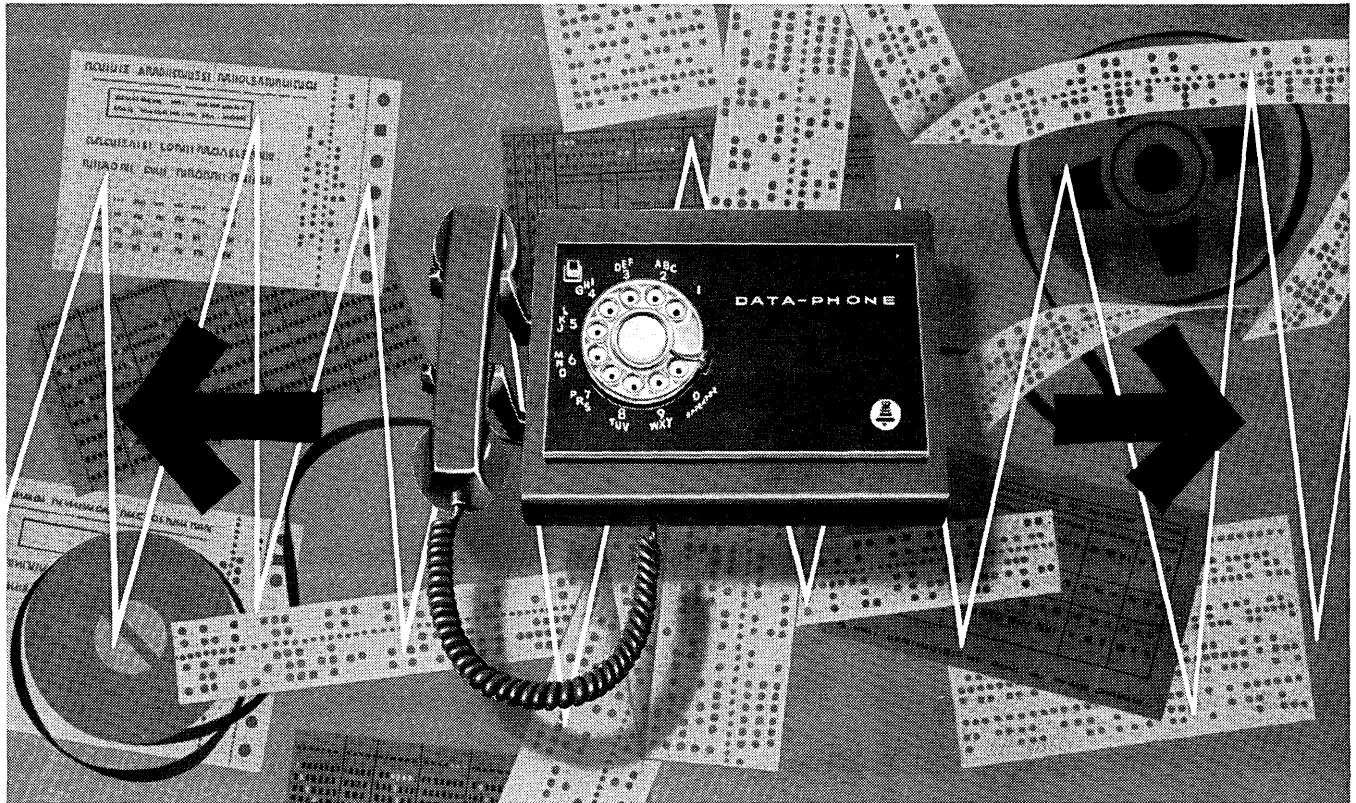
memory frames

A new line of memory frames is tailored to meet requirements for low-cost memory systems specified for business computers. Four sizes of printed circuit strips are manufactured, allowing ten different frame configurations to be assembled. The four standard sizes are 32-wire, 48-wire, 64-wire and 96-wire strips. Any of several types of 50 mil and 80 mil ferrite cores may be used in these frames. Base material can be glass epoxy, paper phenolic, or other suitable ma-



Have you heard about the new Bell System service that lets modern business machines talk with each other over regular telephone lines? Its name is

DATA·phone



Something new has been added to the art of data processing. Business machine data can now be sent in a new "machine language"—automatically, from machine to machine—by telephone.

A new kind of telephone service—Data-Phone—is the connecting link.

You can send any kind of data—from punched cards, paper tape or magnetic tape—at Super-Phonic speeds. And you pay for your data transmission just as you do for regular telephone calls. You simply place a phone call to the distant machine location, switch on your Data-Phone at both ends, and the machines start "talking." The Data-Phone unit takes

little more space than a typewriter, and the monthly rental charge is small.

Data-Phone can speed the handling of accounting and billing information, inventories, payrolls, invoices, sales orders and numerous other forms of business data. And it is compatible with an ever-increasing number of data-processing machines in use today. Many business firms already have it.

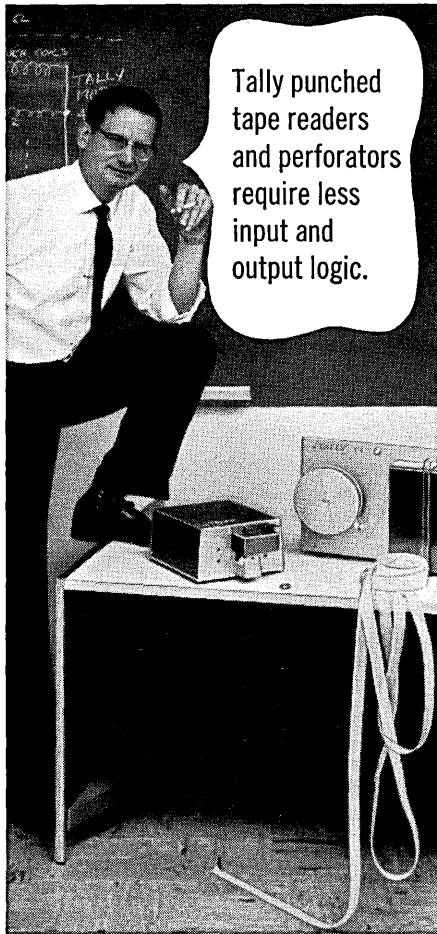
Call your Bell Telephone Business Office and ask for a Communications Consultant. He'll show you how new, versatile Data-Phone service can streamline your data processing and improve your profit picture.



BELL TELEPHONE SYSTEM

THE ONE SOURCE FOR ALL BUSINESS COMMUNICATIONS

CIRCLE 29 ON READER CARD



Tally punched tape readers and perforators require less input and output logic.

THEY CUT COSTS IN ANY PUNCHED TAPE SYSTEM

On only one asynchronous command, your Tally reader will static read, advance without reading in either direction, or simultaneously read and advance. It will read 5, 6, 7 or 8 channels without modification.

Perforators operate asynchronously up to 60 characters per second. Oil mist lubrication cuts noise. Standard equipment includes remote controlled tape back-up.

Tally engineers specialize in punched tape processing equipment offering the most complete line available. Special tape readers, perforators, reader perforator combinations, tape consoles, and associated equipment are available from one source.

WRITE FOR COMPLETE TECHNICAL DATA. Full information on Tally readers and perforators is yours for the asking. Please address Dept. 23.

TALLY
REGISTER CORPORATION
1310 Mercer Street Seattle, Washington
"Integrity in Tape"
CIRCLE 30 ON READER CARD

NEW PRODUCTS . . .

terial. Solder-plated circuitry is incorporated in all the standard strips. Other types of plating material are available. LOCKHEED ELECTRONICS CO., 6201 E. Randolph St., Los Angeles 22, Calif. For information: CIRCLE 210 ON READER CARD

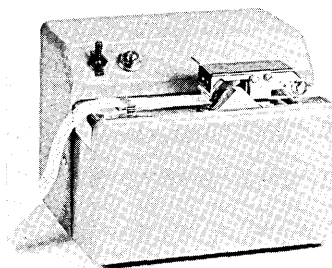
photo resist stripper

A non-flammable liquid rapidly removes Kodak photo resist and other acid resists from printed circuit boards. Called stripper "K", the products remove most photo resists in less than one minute. Pressure rinsing is usually all that is required to remove residual resist after immersion in stripper "K" thus eliminating laborious scrubbing of the boards. It is used full strength at room temperature. After etching away of exposed copper, printed circuit boards are simply immersed in the stripper until the photo is wrinkled or softened sufficiently so that it can be flushed away in a subsequent cold water rinse. There is no attack of most printed circuit boards. ENTHONE INC., 442 Elm St., New Haven 8, Conn. For information: CIRCLE 211 ON READER CARD

paper tape reader

A small paper tape reader for input

to tape to card converter, typewriter, digital to analog converter, data processing systems, digital computers, controls for automating machine tools, for

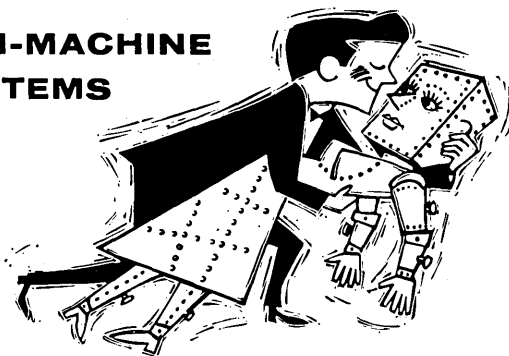


direct telephone line transmission of data, and many other systems uses, is now available. The machine can read 5, 6, 7, or 8 channels via bifurcated contacts operated by star wheels. SYSTRONICS, 3673 Newton St., Torrance, Calif. For information: CIRCLE 212 ON READER CARD

cathode ray tube

A new cathode ray tube type has been developed for direct electronic printing at high speed on non-sensitized dielectric material. The tube is tradenamed "Printapix." Two models of the new tube, in a 2 3/4" printing head width, are available for immediate delivery. Tubes with up to 12"

MAN-MACHINE SYSTEMS



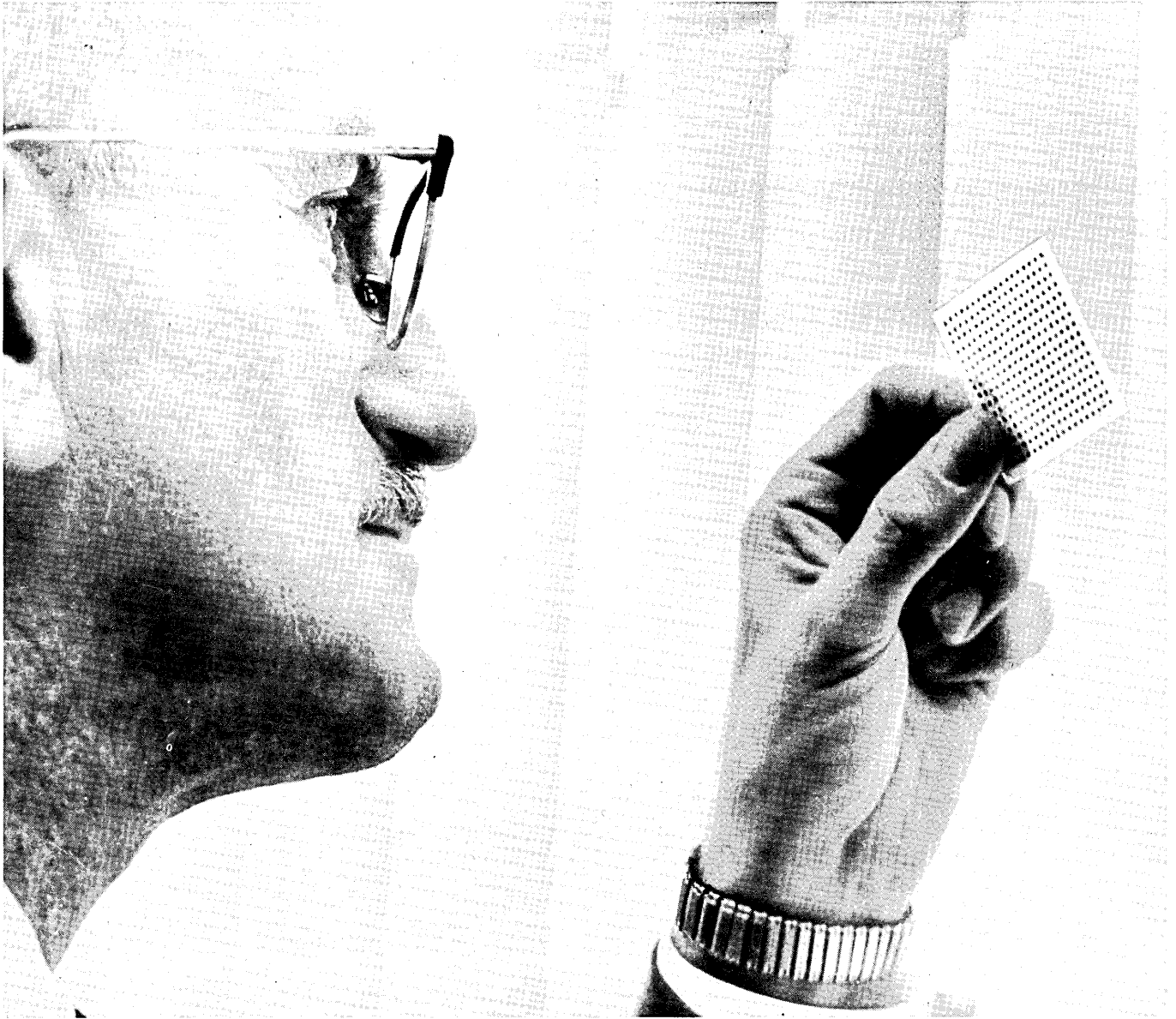
The Litton Marine Tactical Data System (AN/ASA-27) is a digital computer-centered system using CRT and numerical displays, and advanced read-in/read-out equipment. Unique interface components integrate the system with sensing and communications equipment. It is designed to aid Marine assault forces in combatting any air threat the enemy can mount. If your discipline can contribute to further advancement in this area, write to Mr. S. L. Hirsch.



LITTON SYSTEMS, INC. Tactical Systems Laboratory
Canoga Park, California

When responding, a mention of DATAMATION would be appreciated.

DR. S. M. RUBENS, Director of Physical Research, Remington Rand Univac at St. Paul, holds a substrate of thin magnetic film. The ferro-magnetic vapor deposit is only 1500 Angstroms thick. Dr. Rubens and his group are credited with developing this remarkable new film memory.



This new thin magnetic film reduces computer memory access time to nanoseconds

Remington Rand Univac scientists have perfected a ferro-magnetic film which is the fastest and most advanced form of computer memory ever developed. This revolutionary technique has more than halved internal referencing time—a speed rated in nanoseconds, or billionths of a second. It may ultimately permit a thousand-fold reduction!

In addition to the high speed switching time, thin magnetic film provides other advantages in computer design. It will appreciably reduce the size of computers and at the same time increase their capabilities. Reliability will be increased. And it should permit computers to be produced more economically.

This new development is typical of the many “firsts”

which the Univac Division has contributed to the data processing industry. Univac, producer of a complete line of data processing computers and punched card systems, has its headquarters at 315 Park Avenue, South, New York City, and Engineering Centers at St. Paul, Minnesota; Philadelphia, Pennsylvania; and Norwalk, Conn.

RE M I N G T O N R A N D
UNIVAC
DIVISION OF SPERRY RAND CORPORATION

printing head width can be produced to specific order.

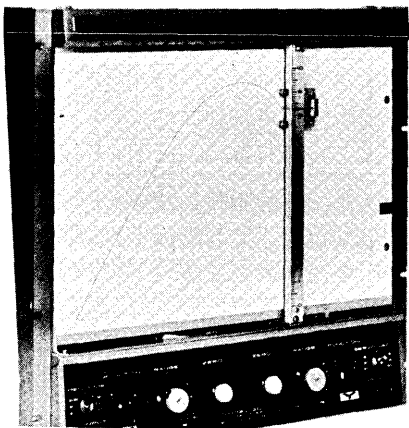
Operating circuitry and components of the new Litton Printapix tubes are similar to those normally used for display, readout or oscillographic applications. Ordinary television components and techniques are quite satisfactory in many instances. For operating convenience, the tube is frequently run with the printing head at ground potential.

Used with the new Printapix direct writing tube, ordinary paper provides a low cost base material for image rendition. Paper with a glossy surface, commonly used in many printing applications, will provide excellent results. Printing quality can be improved by rendering the opposite side of the paper slightly conductive. Various transparent media, such as glass and thin transparent plastic or commercial sheet polyesters, may be used with Printapix. Dielectric material transport requirements depend on the proposed application. For information write LITTON INDUSTRIES, Electron Tube Division, 960 Industrial Rd., San Carlos, California.

CIRCLE 213 ON READER CARD

x-y recorder

A rack-mounted, precision X-Y recorder draws cartesian coordinate curves automatically from two related sources of dc electrical information. It also plots one variable against time, accepts ac inputs data on either or both axes, and operates directly from many accessories, including punched tape and card translators, keyboards and



logarithmic converters. The recorder's dc input voltage ranges are in 16 calibrated steps from 0.5 millivolts/inch to 50 volts/inch on each axis. AC input ranges are from 0.1 volt/inch

NEW PRODUCTS . . .

to 20 volts/inch in eight calibrated steps, each axis. Model 2DR features a built-in vacuum paper hold-down and has a pen speed of 20 in./second for each axis. High speeds are available on special order. F. L. MOSELEY CO., 409 N. Fair Oaks Ave., Pasadena, Calif. For information:

CIRCLE 214 ON READER CARD

digital modules

The development of a new family of compatible transistorized digital modules used to assemble digital systems without designing circuits has been

announced. Features of this new line include neon indicators of flip flops and shift registers and allowance for use of a remote indicator. They are economically priced and completely compatible. The modules are designed for operation within a temperature range of -45°C . to $+65^{\circ}\text{C}$. They have an overall size of $3\text{-}1/16''$ x $3\text{-}3/8''$, with an approximate weight of 1.5 oz. A wide variety of types are available, including flip flops, shift registers, multivibrators, one-shots, dc logic, and many others. For information write CONTROL EQUIPMENT CORP., 19 Kearney Road, Needham Heights 94, Mass., or use reader card.

CIRCLE 215 ON READER CARD

APPLIED MATHEMATICIANS



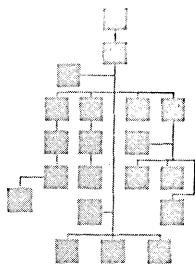
APPLIED MATHEMATICIANS

The applied mathematics group provides consulting services to our entire engineering staff. Salary and professional growth are given corresponding emphasis. Desirable qualifications would include strong analytical ability, extensive knowledge of advanced techniques in numerical analysis for computers, and experience in mathematical investigations applied to advanced engineering programs. MS or PhD degree in either Mathematics or Theoretical Physics is required.



$\infty \Delta \sqrt{-1} \int \int \pi e^x \theta \alpha \in \Sigma \beta \zeta + (x) \phi$

Forward replies in complete confidence to 



people moving up in **DATAMATION**

★ Dennis D. Willard has been named manager of the Advanced Computer Laboratory for Ampex Data Products Co., Redwood City. Formerly manager of advanced technical planning, advanced systems development division at IBM, San Jose, he will manage both advanced development and systems work for the Computer Products Division.

★ John W. Haanstra has been promoted to vice president of the General Products Division of International Business Machines Corp. He was formerly assistant general manager for new products in the division. He joined IBM in July 1950, as a technical engineer.

★ Thomas R. Bitterly has been named

manager of NCR's 304 EDP Centers in New York City, Dayton, and Los Angeles. His former sales responsibilities will be assumed by Harry R. Wise, manager of data processing machine sales and support.

★ Dr. G. M. Amdahl has rejoined International Business Machines Corp. as special assistant to Dr. E. R. Piore, vice president of research and engineering. In his previous assignment with IBM, he was instrumental in the development of the 704 computer. After stints at Ramo Wooldridge and Aeronutronic, Amdahl had announced that he would enter the consulting arena (DATAMATION, Sept./Oct., 1960) but he subsequently accepted an IBM offer.

★ Nicholas F. Pensiero has been appointed manager of marketing administration for Philco Corporation's computer Division, Government and Industrial Group. He was formerly with the Oxy-Catalyst Co. and Dibrell & Company.

★ Charles K. Titus has been appointed manager of the scientific analysis and programming department of the Communications and Data Processing Division of the Collins Radio Company. He was formerly director of the digital computer laboratory at the Air Arm Division of Westinghouse Electric in Baltimore.

★ The board of directors of National Data Processing Corp. in Dallas has elected Dr. G. M. Monroe as president and chief executive officer and Herman L. Philipson, Jr. as chairman of the board.

★ Control Data Corporation, Minneapolis, has promoted R. S. Erickson to director of the company's Polaris computer program. Other promotions announced at the same time were E. D. Zimmer as manager of the Polaris engineering department. Four newly appointed supervisors will be reporting to Zimmer. They are C. E. Pallas, supervisor, digital design section; T. A. Hauge supervisor, analog design section; A. O. Hoistad, Supervisor, mechanical design section; and P. J. Codute, supervisor, specifications and standard sections.

COMPUTER PROGRAMMERS

To participate in Advanced Space Programs

The Missile & Space Vehicle Department of General Electric — a recognized leader in the development of instrumented re-entry vehicles — is now pursuing a number of even more advanced space programs. Basic to progress in these programs is the solution of a diversity of interesting mathematical problems. These include trajectory and navigation studies and analysis of flight telemetry data and space communications.

Diversified Positions for:

SENIOR DIGITAL COMPUTER PROGRAMMERS

As Senior Programmers at the Missile and Space Vehicle Department you will have all the advantages of an extensive computer facility which centers around an IBM 7090. The work covers analysis and programming for technical data systems, flight test data systems and advanced space programs. Requirements include ability to direct junior programmers, a BS or advanced degree, minimum of 2 years experience on a large scale, binary computer.

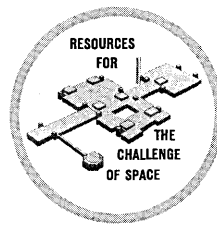
ANALOG APPLICATIONS SPECIALISTS

Several positions in a growing analog facility which includes Electronic Associates and Reeves analog equipment, a combined analog-digital facility and a passive element analog computer. You will formulate the mathematical description of engineering problems, choose the most efficient method of analog solution and follow the programs to completion. BSEE, Physics or Math degree with minimum of 2 years analog computer experience required.

Apply by sending a brief summary of your background to: Mr. D. G. Curley, Div. 56-MN
MISSILE AND SPACE VEHICLE DEPARTMENT

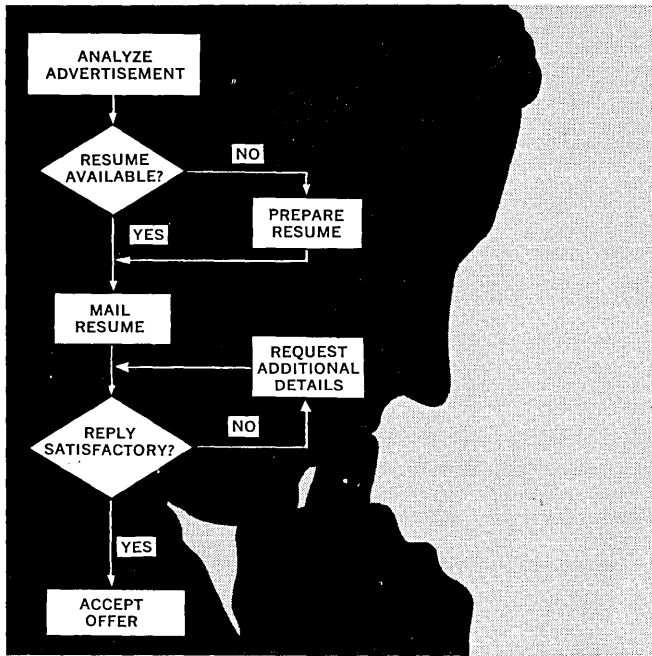
GENERAL  ELECTRIC

3198 Chestnut St., Philadelphia 4, Pa.



New Multi-Million-Dollar Space Technology Center now under construction near Valley Forge Park.

CIRCLE 74 ON READER CARD



EDP ANALYSTS AND PROGRAMMERS

APPLICATION: CAREER OPPORTUNITIES

DATA DESCRIPTION

- Expansion of data processing activities has created opportunities for progressive individuals with systems and programming experience.
- Responsibilities include the planning, programming, and implementation of accounting, manufacturing and inventory control applications.
- Excellent opportunities for utility programmers with 704/709 experience.

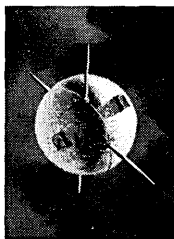
ENVIRONMENT

- Convair's data processing facilities currently consist of IBM 650 and 705 computers. Soon to be added are IBM 7090 and 1401 tape systems.
- Location is in San Diego, California, a community with ample cultural, educational and recreational facilities.

PROCEDURE

- Positions require at least one year of experience with large scale computer systems, and a degree in business administration, industrial engineering or equivalent background.

*For additional information, please send resume to:
Mr. H. E. Pasek, Employment Manager
Convair-San Diego
The Convair Division of General Dynamics Corp.
Box 1950, San Diego 12, California*



CONVAIR/SAN DIEGO

CONVAIR DIVISION OF

GENERAL DYNAMICS

CIRCLE 75 ON READER CARD

DP Service Firms Form Association

LEADING American and Canadian companies in the computer and punched-card service field announced in New York last month formation of the Association of Data Processing Service Organizations (ADAPSO) to maintain high performance standards and thus further improve service to business and science.

The new association is made up of companies which service clients through data processing centers, as distinct from companies which manufacture and rent or sell equipment. Data processing service centers or bureaus perform various tasks on their own premises, for a fee, based on the type of work done and the time required to complete it. They serve firms which do not have sufficient work to justify investing in their own computers or punched-card machines, or who lack the specialized know-how required for data-processing systems.

"The widespread utilization of both computer and punched-card methods has led to an equally widespread interest in service center organizations," stated newly-elected association president Romuald Slimak. "There is a need, therefore, for an organization devoted to maintenance of high service center performance and ethical standards, with an increased awareness of the public service aspects involved. ADAPSO was formed to fill that need."

officers appointed

In addition to Slimak, who is Manager of Remington Rand Univac Service Centers, Association officers include: vice president—Z. V. Zakarian, Manager, New York Electronic Systems Center, Radio Corporation of America; treasurer—C. G. Green, President, Statistical Reporting & Tabulating Ltd., Toronto, Canada; director—G. M. Witherspoon, Manager, Data Processing Centers, National Cash Register Company, Dayton, Ohio; director—H. W. Robinson, President, Corporation for Economic & Industrial Research, Arlington, Va.; director—R. C. May, Vice President, May & Speh, Chicago, Ill.; director—J. H. McDonald, Vice President, Recording & Statistical Company, New York, New York.

Other members include: W. A. Lynch, The Service Bureau Corporation; A. M. Lount, Enelco Ltd., Toronto; T. Yamashita, Bendix Corporation; Walter Camenisch, Walter Camenisch, Inc.; G. W. L. Davis, Ferranti-Packard Electric Ltd; William Levy, Nationwide Tabulating Corp.

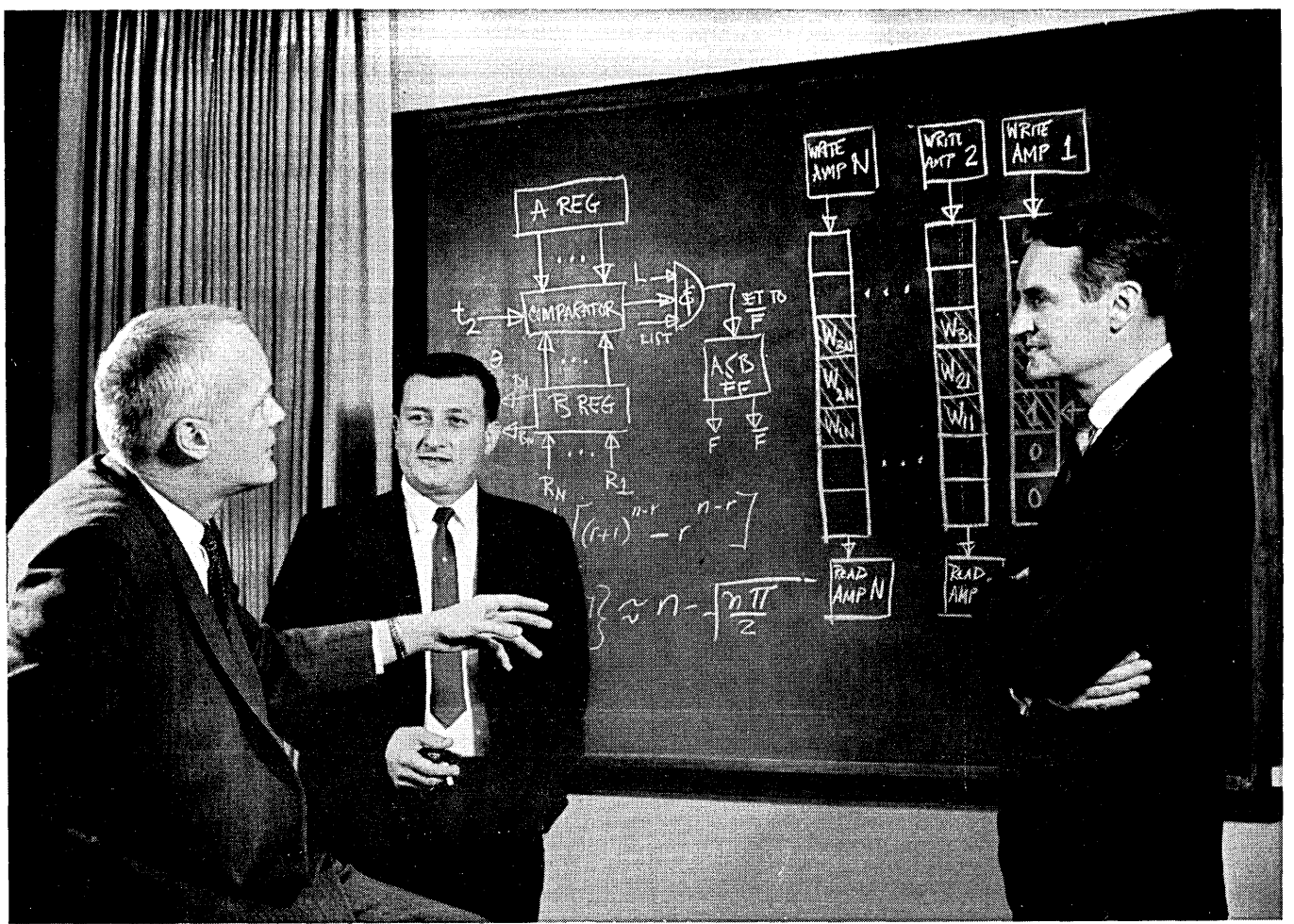
Other leading organizations in the field, which include a great number of independents, have expressed interest in ADAPSO and are expected to join soon.

The Association is a cross-section of this new and rapidly growing business service. Thus, independents (small and large), chains and manufacturers' centers are equally active. A one-day symposium was scheduled in New York on January 20 and the first directory of all American and Canadian centers is in the making.

Membership is limited to those companies which perform on their own premises work which requires the utilization of such equipment as punched-cards, punched and magnetic tapes, optical readers and computers.

In addition to working towards higher public service awareness, the new Association will also concern itself with improvement of management methods within the service center itself.

Officers of organizations interested in the Symposium, in being listed in the Directory, or in membership, should communicate with W. H. Evans, Executive Vice-President, Association of Data Processing Service Organizations, 1000 Highland Ave., Abington, Pa.



Mr. R. J. Shank, President (right), with Dr. R. E. Fagen (center) and Dr. R. B. Dawson (left) of the Information Sciences Division.

A Report from American Systems Incorporated...

A New Organization for Advanced Systems Technology

American Systems Incorporated was launched a year ago for research and development in the electronic systems field. With an across-the-board interest in systems technology, the Corporation has formed five Divisions:

ELECTROMAGNETIC SYSTEMS

Electromagnetic physics; electronic and mechanical scanning antenna systems; development and manufacturing of special microwave components; design, development, and manufacturing of complete sensor systems.

COMMAND AND CONTROL SYSTEMS

Logic of command and control complexes; systems design and development; data acquisition, processing and display; communications.

COMPONENT DEVELOPMENT

Advanced component technology; materials and processes; computer component development; chemical deposition of magnetic materials on drums, disks, rods, tapes.

INFORMATION SCIENCES

Mathematical and statistical research; computer programming, and development of advanced programming systems; computation services; digital system studies; logical design of military and industrial systems; advanced systems analysis.

RESEARCH LABORATORIES

Solid state physics and systems; thin-film research and subsystems; components for information processing.

We are gratified that the past year has been one of significant growth. Operations were started in a leased 10,000-square-foot building. Recently, we moved into our own 27,000-square-foot plant, on a 13-acre site in Hawthorne, California. This plant, which is the first unit in a long-range building program, has custom technical and scientific facilities, including an ultraclean laboratory for thin-film developments and advanced devices research projects.

We are proud that we have been able to attract an outstanding staff of technical people. We believe that scientists and engineers are our primary resource, and it is to utilize this resource that we have founded this corporation. Our operating concept has been to establish an organization which both sought new ideas and provided the facilities in which the creative mind could also be a builder, seeing his ideas through to a practical product.

Qualified scientists and engineers who are interested and experienced in our fields of activity are encouraged to investigate career opportunities with American Systems.



AMERICAN SYSTEMS *Incorporated*

1625 East 126th Street, Hawthorne, California

CIRCLE 31 ON READER CARD

simplicity stressed

UPTIME DISPLAYS SPEEDREADER AT EJCC

reads

400 to 3,000

cards per minute



ATTRACTING considerable attention among peripheral equipment shown at the recent Eastern Joint Computer Conference, Uptime Corp.'s new Speedreader 2000 demonstrated exceptionally high speeds from a basically simple mechanical design.

The Speedreader performed its card reading function at speeds ranging from 400 to 3,000 cards per minute while moving either Remington Rand or IBM cards. Hopper capacities are 4,000 cards.

As a basic part of its design, the Speed reader is the only commercially available card reader to use the card itself for timing signals. In operation, the Speedreader utilizes a silicon photo-diode developed by the Texas Instruments Co. Eighty photo-diodes are placed horizontally in the read head and 26 are placed 90 degrees to the horizontal to time the reading cycle and provide a constant series of checks.

The 80 horizontal diodes are incorporated in a circuit to supply an output whenever a change from dark to light is detected and the vertical diodes for changes from light to dark.

The Speedreader can be obtained with or without electronics for use on-line with a computer or off-line for card-to-tape conversion. Miscellaneous electronics supplied with the unit include feed hopper empty detection, stacker full detection, stacker tray not-positioned detection.

Mechanically, the machine is greatly simplified with the majority of the principles used encountered in basic rotating machinery design.

how it looks

Structurally, the nucleus of the machine is a 6' x 9" x 1' beam. All components are directly or indirectly fastened to this member which is canted longitudinally at 12 degrees. It serves the dual purpose of supporting the entire machine, and provides a suitable track for the trolley and card drawer to travel upon.

The aluminum frame to which all of the mechanical components of the machine are attached consists of two side plates and three spacing plates forming a rectangular "box." Mounted in the frame on parallel shafts are six pairs

of rollers. This rotates with a small interference-friction drive against a driven stainless steel roller. These are the rollers which pull the card through the machine.

Power is supplied by a $\frac{1}{8}$ horsepower single phase motor and is transmitted through a series of timing belts and pulleys to assure zero slippage and eliminate mechanical timing problems. The entire shafting of the machine is $\frac{3}{8}$ " stainless steel mounted at a preload with sealed lubricated ball bearings which are standardized throughout the unit.

how it works

The actual mechanics of card reading occur as follows: The card slides into the throat where it is picked. On a signal from the computer or operator a relay is actuated on the picker assembly causing a mechanical stop to interrupt a camming surface on the picker shaft. The picker wheel is pivoted about a point below the lower edge of the card and this forces the rotating picker wheel into the face of the card pushing it through the throat into the first set of rollers.

The card is then gripped and accelerated by the rollers to their own speed. The card edge then passes the reading line of photo-diodes on the reading head and enters a second set of rollers which force it past the timing photo-diodes on the read head. A final set of rollers then provide the necessary momentum for the stacking operation.

Stacking is accomplished by the momentum of the card pivoting a flapper through a small angle as the card enters the drawer. This force is transmitted through linkage to a mechanical amplifier or wrap spring clutch. This force and the torque caused by the inclined trolley and card drawer which are geared to it by a rack-gear combination, allows the card just entering the drawer to advance with the drawer approximately one card thickness, making way for the next card to follow.

Optional electronics available with the Speedreader include translators, complete circuit checking, double punch and blank column detection; picker drive, "jam" detection, "light source failure" detection, "skew" detection, "photo-diode failure" detection, "feed check" detection. All Uptime circuitry is completely solid state.

CIRCLE 131 ON READER CARD

National*

Presents opportunities
for personnel qualified for
the following openings
located at Dayton, Ohio

RESEARCH & DEVELOPMENT

DATA TRANSMISSION ENGINEER: For advanced planning in ON-LINE REAL TIME SYSTEMS. Applications would generally be focused on large-scale business and finance operations. Appropriate engineering degree and 6-10 years of experience necessary.

SEMI-CONDUCTOR RESEARCH PHYSICIST: Ph.D. Physicist with 2-3 years' minimum experience in semiconductor R & D.

ELECTRONIC ENGINEER: Openings in commercial or military R & D up to staff or project level. Circuit and logical design utilizing advanced concepts. B.S. Degree plus experience necessary, M.S. preferred.

MAGNETICS: Ph.D. Physicist with primary interest in magnetics research, experience beyond doctoral work required.

SYSTEMS ENGINEER: B.S. or M.S. in Electrical Engineering with interest in development of business

machine systems with 3-6 years of experience which should include some advanced circuit design preferably for Computer Development, but other may suffice.

DIGITAL COMMUNICATIONS PROJECT LEADER: 6-10 years' experience in military R & D projects related to Digital Communications. Background in circuits or systems desirable as well as some supervision.

OPERATIONS RESEARCH SPECIALIST: With interest or experience in Business Systems Research. Must have utilized advanced OR techniques, prefer Ph.D. or equivalent. Position entails research group guidance involving interrelated complex business functions.

APPLIED MECHANICS: Mechanical Engineer with M.S. Degree and specialization in applied mechanics and vibrations of high-speed mechanisms. Man selected must be able to provide self-guidance, even though competent leadership is available to assist in further professional growth.

ELECTRONIC DATA PROCESSING

PROGRAMMERS

The NATIONAL line of EDP systems including the 304, 315 and 310 provides the basis for interesting and effective work in any operation wherever money or merchandise is handled. Stability and growing responsibility are characteristic of the climate at NATIONAL whether your work is in one of our Data Processing Centers or with our Data Processing Systems and Sales group in support operations. General qualifications for present openings are a college degree and experience with a tape system applied to business or financial functions.

SALES SUPPORT: At least two years of programming experience plus B.S. or M.S. in Business Administration or Mathematics will qualify for challenging work with EDP sales organization. Opportunities are varied and include:

- Programming
- Manual Writing
- Systems Analysis
- Programming Research
- Programming Instructor

CUSTOMER SITE REPRESENTATIVE: Locations will vary. Qualifications require broad experience in programming, operation and systems analysis. Must have worked with tape systems and be familiar with computer-user problems. Training given at Dayton prior to installation assignment.

For these and other professional level opportunities in challenging areas of work, write to:

T. F. Wade, Technical Placement G-14
The National Cash Register Company
Main & K Streets
Dayton 9, Ohio

THE NATIONAL CASH REGISTER COMPANY, DAYTON 9, OHIO

ONE OF THE WORLD'S MOST SUCCESSFUL CORPORATIONS

77 YEARS OF HELPING BUSINESS SAVE MONEY

* TRADEMARK REG. U.S. PAT. OFF.

National*

ELECTRONIC DATA PROCESSING
DIVERSIFIED CHEMICAL PRODUCTS
ADDING MACHINES • CASH REGISTERS
ACCOUNTING MACHINES • NCR PAPER

CIRCLE 77 ON READER CARD



new **DATAMATION** literature

DIGITAL RECORDING SYSTEMS: Applications for digital tape recording techniques are described in a new 20-page brochure. Among applications described are communications, filing, media conversation, acquisition and reduction and high and low speed sampling. Functional and block diagrams are included. **MINNEAPOLIS-HONEYWELL**, Industrial Systems Division, 10721 Hanna St., Beltsville, Md. For copy:

CIRCLE 260 ON READER CARD

COMPUTER BOOKLET: This eight-page booklet describes the 9000 computer. It is a fully transistorized system in which all numerical data are entered in decimal form, and processed internally in coded decimal form. Data are stored and processed according to content, not location. It is a modular system with a variety of optional input and output units. Eight separate records may be searched for simultaneously. No special site preparation is necessary for the installation of the 9000. The system requires 150 sq. ft. of floor space, and a standard electrical "house-current" wall-outlet. Photos and specifications are included. **ROYAL MCBEE**, Port Chester, N.Y. For copy:

CIRCLE 261 ON READER CARD

SOLID STATE COMPUTER: A sixteen-page booklet describes the specifications and applications of the 160 computer. All-transistorized, the 160 computes in terms of microseconds, and can execute 60,000 instructions in one second. It handles data transmissions to and from input-output equipment at speeds of up to 160,000 characters per second. The unit is enclosed in a cabinet no larger than a desk. Sections of the publication include typical applications, satellite computer system, functional characteristics, description of registers, addressing modes, repertoire of instructions, input-output, and finally, projection display. **CONTROL DATA CORP.**, 501 Park Ave., Minneapolis 15, Minn. For copy:

CIRCLE 262 ON READER CARD

BIT MEMORY: A new bulletin describes the utility model C-105 bit memory. The unit has a speed of 3600 rpm, an access time of 16.7 milliseconds, and packs 3000 bits per track. It is available with up to 50 tracks, with the 50 track capacity pro-

viding 150,000 bits. Its operating temperature is +32°F to +125°F. It has a drum axis vertical mounting with commercial type vibration isolators. **BRYANT COMPUTER PRODUCTS**, 852 Ladd Rd., Walled Lake, Mich. For copy:

CIRCLE 263 ON READER CARD

MAGNETIC TAPE HANDLER: The model 905 digital magnetic tape handler is described in a four-page brochure. Included in the brochure are detailed specifications, applications and photographs. The model 905 is designed for standard 19 in. rack mounting. Automatic locking arrangement holds tension arms in place if power fails or line voltage drops below selected minimum value. All mechanical and control portions of the machine are mounted on a hinged front panel which provides immediate access to all mechanical parts and plug-in electronic components. **POTTER INSTRUMENT CO., INC.**, Sunnyside Blvd., Plainview, N.Y. For copy:

CIRCLE 264 ON READER CARD

MAGNETIC TAPE: A new four-page, three-color brochure describes computer tape, numerical control tape, telemetering tape and general purpose tape. The brochure presents a comparison of major properties of instrumentation tapes. A chart is included which gives the physical and magnetic characteristics of the four types of tapes listed above. **REEVES SOUNDCRAFT CORP.**, 342 N. La Brea Blvd., Los Angeles, Calif. For copy:

CIRCLE 265 ON READER CARD

XY PLOTTING BOARDS: A new 5-page technical data sheet describes transistorized XY plotting boards, both single and dual arm, with electroluminescent panels for backlighting. Detailed features and specifications are given for the 30 in. x 30 in. units which are designed for plotting data from digital and analog computers and for plotting tracking data from missile-range instrumentation systems. **COMPUTER SYSTEMS, INC.**, Culver Rd., Monmouth Junction, N.J. For copy:

CIRCLE 266 ON READER CARD

SEMICONDUCTORS AND COMPUTERS: A 24-page booklet covers such topics as light to audio conversion, output printer solenoid drive, power supply,

photo-diode circuit, diode matrix, relay driver, four-transistor flip-flop, transistor-diode flip-flop, semiconductor networks, etc. Each section of the brochure is illustrated with a line drawing and a chart. The publication also includes a summary of the history of the organization plus a description of some of their facilities. **TEXAS INSTRUMENTS INC.**, 13500 N. Central Expressway, Dallas, Texas. For copy:

CIRCLE 267 ON READER CARD

ANALOG COMPUTER: Application of a new dynamic storage analog computer to determination of complex chemical equilibrium conditions and composition is described in a recently-published report. At a given pressure, the report shows, system equilibrium is dictated by heat input to the reactor. At equilibrium, the summation of the heat of reaction and system total enthalpy equals the heat input. It describes how the computer uses this criterion to establish equilibrium conditions as a function of temperature. The report lists instrumentation required; diagrams complete equipment interconnection for "reactions," "heat balance," and "equilibrium composition;" indicates mathematical derivations and equations; and describes installation and operation of the equipment. **COMPUTER SYSTEMS, INC.**, Culver Rd., Monmouth Junction, N.J. For copy:

CIRCLE 268 ON READER CARD

TRANSISTORIZED SYSTEMS MODULES: A new six-page brochure describes the series 300 transistorized systems modules. The modules are 5 in. x 6 in. glass epoxy printed circuit cards. All modules will operate over a frequency range from dc to 300KC. Only one voltage is required, and the low impedance outputs allow simple unit interconnections. The brochure contains a photograph of each module with specifications and line drawings. **NAVIGATION COMPUTER CORP.**, 1621 Snyder Ave., Philadelphia 45, Penn. For copy:

CIRCLE 269 ON READER CARD

DIGITAL PLOTTING SYSTEM: A four-page bulletin on a new digital plotting system is now available. The series 3100 consists of a number of functional units which may be combined in building block fashion to perform a

AT THE OUTER EDGE OF COMPUTER SCIENCE...

PIONEERING OPPORTUNITIES FOR MATHEMATICIANS ENGINEERS PHYSICISTS

The General Motors Research Laboratories has just launched several long-term projects involving the research and development of novel high-speed computer applications. If you are interested in working at the outer edge of computer science—where initiative and individuality count—we invite you to explore the possibility of joining our growing digital computer group.

Immediate openings now exist for a select number of mathematicians, engineers, and physicists having proven capability of doing original work in these computer areas:

NUMERICAL ANALYSIS—A typical application will be the use of numerical analysis to aid in formulating new techniques for numerical control of machine tools. Experience or training in the following areas is desired: functional approximation, solution of ordinary differential equations, solution of iterative problems and solution of problems in differential geometry.

PATTERN AND CHARACTER RECOGNITION—Basic work will be concerned with the recognition of hand-formed alphabetic and numeric characters. In addition, work will be carried out in the recognition of arbitrary patterns.

Emphasis will be in developing techniques programmable on the 7090 computer.

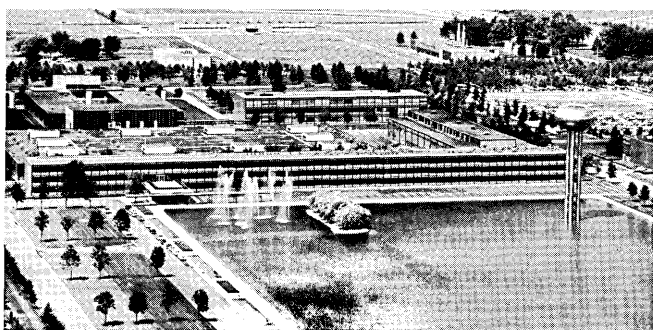
DEVELOPMENT OF PROGRAMMING SYSTEMS—Several major activities are to be undertaken in the field of programming systems. One is the multiprogramming of the 7090 computer for real-time applications. Included will be the writing of compilers, assemblers and loading programs to permit dynamic storage allocation during the multiprogramming operation.

DEVELOPMENT OF ENGINEERING ORIENTED LANGUAGES—The aim here is to give computers the ability to perform not only automatic programming and coding but also problem formulation and mathematical analysis. Experience with formula translation languages, numerical control languages and other problem-oriented languages is highly desirable.

Among the well-known General Motors benefits you enjoy at the Laboratories are the stability of a large corporation with primarily company-sponsored research projects, tuition-paid graduate work at four nearby universities, a liberal publication policy and advancement based on individual achievement.

For further information, send your résumé in confidence to: **Mr. J. B. Sparhawk,**
Personnel Staff

General Motors Research Laboratories
WARREN, MICHIGAN



Home of the General Motors Research Laboratories consists of these eight buildings making up part of the 330-acre GM Technical Center. This modern campus of technology is located in suburban Warren, 13 miles north of downtown Detroit and within easy driving distance of top Michigan and Canadian recreational areas.

Laboratory For Electronics, Inc.

Announces

the establishment of its Monterey Laboratory at Monterey, California for

Operations Research Systems Analysis Computer Programming Computer Applications

Located 2¼ hours from San Francisco in the heart of the Monterey Peninsula, excellent living and working conditions are combined with challenging professional opportunities.

An unusual opportunity is now available for a mathematician-programmer to expand his horizons in mathematical analysis and computer programming. A BS degree with 3 to 5 years programming experience on larger scale digital equipment is required.

For information concerning professional appointments write:

Mr. Harold E. Kren
305 Webster Street
Monterey, California



**LABORATORY FOR
ELECTRONICS, INC.**

Boston 15, Massachusetts

Systems, Equipment & Components for
Airborne Navigation
Radar and Surveillance
Electronic Data Processing
Automatic Controls • Ground Support
Air Traffic Control

CIRCLE 79 ON READER CARD

NEW LITERATURE . . .

wide variety of plotting operations. The series 3100 may be expanded to plot data from IBM cards by the addition of an IBM card modification accessory kit and a decoder card to be plugged into the digital-analog translator. The resulting system will automatically plot digital information entered by keyboard, read from punched paper tape, or read from IBM cards as inked point plots or as coded symbol plots on a 10 in. x 15 in. plotting surface. The bulletin includes photos and specifications. ELECTRONIC ASSOCIATES, INC., Long Branch, N.J. For copy:

CIRCLE 270 ON READER CARD

BERNOULLI DISK: A four-page brochure describes the bernoulli disk BD-40. The functional parts of the BD-40 consist of a motor driven, completely flexible, magnetic membrane disk and the associated read-write heads. To complement the storage device, subminiature, silicon semiconductor circuits can be provided as an integral part of an hermetically sealed package. The unit is constructed to meet and exceed military satellite requirements. The brochure includes specifications, photographs and cut-

away drawings. LABORATORY FOR ELECTRONICS, INC., 1079 Commonwealth Ave., Boston 15, Mass. For copy:

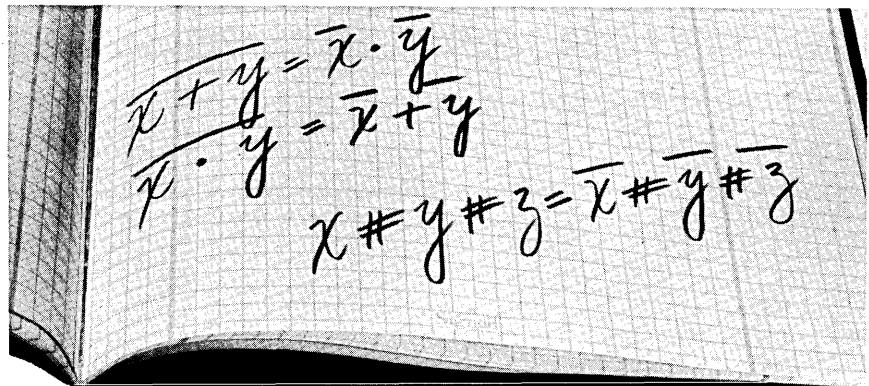
CIRCLE 271 ON READER CARD

COMPUTER BULLETIN: An eight-page publication gives information on the general characteristics, storage, operational speed, magnetic tape, time sharing and peripheral equipment of the Atlas computer. Other topics covered include fixed store, overlapping operations, indexing and modifications, autonomous drum and magnetic tape transfers, time-sharing and parallel programming, the one-level store concept, the monitor program, the compiler of compilers, and internal checking. FERRANTI ELECTRIC, INC., Electronics Division, Plainview, L.I., N.Y. For copy:

CIRCLE 272 ON READER CARD

DISPLAY AND ANALYSIS CONSOLE: A 4-page bulletin describes a new display and analysis console. By pushing the proper buttons, the person at the console asks a question or makes a request. The computer responds on a cathode-ray tube. RAMO-WOOLDRIDGE, a division of Thompson Ramo Wooldridge Inc., 8433 Fallbrook Ave., Canoga Park, Calif. For copy:

CIRCLE 273 ON READER CARD



These two familiar Boolean equations (known as DeMorgan's Laws) reduce to a single statement in a new logical algebra, called Majority Decision Logic. This new threshold type

algebra has been discovered and formulated in the Mathematic and Logic Research Department at Remington Rand Univac.

Univac now has a number of opportunities for participation in exceptionally interesting projects which offer both professional and personal reward. These positions are significant in their potential for advancement. The following are among those openings immediately available to experienced, capable people:

**COMPUTER APPLICATIONS ANALYSTS
MILITARY SYSTEMS ANALYSTS
BUSINESS SYSTEMS ANALYSTS**

**COMPUTER PROGRAMMERS
COMPUTER LOGICAL DESIGNERS
ENGINEER WRITERS**

Send resume of education and experience to:

R. K. PATTERSON, Dept. I-1

Remington Rand Univac

Division of Sperry Rand Corporation • 2750 West Seventh St. • St. Paul 16, Minn.

There are also immediate openings in all areas of digital computer development at our other laboratories. Inquiries should be addressed to:

F. E. NAGLE, Dept. I-1
REMINGTON RAND UNIVAC
1900 West Allegheny
Philadelphia 29, Pennsylvania

D. CLAVELOUX, Dept. I-1
REMINGTON RAND UNIVAC
Wilson Avenue
South Norwalk, Connecticut

When responding, a mention of DATAMATION would be appreciated.



* Above systems, modified and improved to meet our requirements, are in use at the Research Laboratories Computation Laboratory.

Here's challenge and opportunity for a **DIGITAL ANALYST**

This is an ideal position for an analyst who likes to set up highly sophisticated computer problems but wants to follow each project from start to finish. Work includes initial discussions with engineers and scientists, formulation, preparation of flow charts, debugging and final checkout.

Projects are unusually diversified and include weather analysis and prediction, determination of space vehicle orbits, numerical control of machine tools, aircraft performance and simulation studies, development of compilers and monitor systems. Computing facilities are extensive and of the most advanced design: transistorized Philco 2000's, IBM 704's, a magnetic tape/perforated tape convertor of our own design plus a wide variety of auxiliary equipment.

Minimum Requirements: BS or Master's Degree with major in mathematics and experience in systems and/or engineering applications.

Please write to Mr. W. S. Walsh, Personnel Department:

RESEARCH LABORATORIES
UNITED AIRCRAFT CORPORATION

400 Main Street, East Hartford 8, Conn.



CIRCLE 80 ON READER CARD

ADVERTISERS' INDEX

Adage, Inc. 8
 Aeronutronic, A Division of
 Ford Motor Co. 40, 41
 Aircraft Armaments, Inc. 64
 American Systems Incorporated 57
 American Telephone & Telegraph Co.,
 Business Equipment Sales 51
 Ampex Computer Products Inc. Cover 2
 Ampex Data Products Company . . . 35
 Applied Data Research 43

Baird Atomic, Inc. 64
 Bendix Computer Division 1
 Brush Instruments 2
 Bryant Computer Products Div. . . . 22

C. P. Clare & Co. 46
 Computer Usage Company, Inc. . . . 21
 Consolidated Electrodynamics Corp. 48
 Convair San Diego, Convair
 Division of General Dynamics . . . 56

Data Display, Inc. 13
 Digitronics Corp. 20

E. I. du Pont de Nemours
 & Co. (Inc.) 9
 Emcor Ingersoll Products Division
 Borg-Warner Corporation 44

Farrington Electronics, Inc. 19
 Friden, Inc. 6

General Ceramics 15
 General Electric, Missile and
 Space Vehicle Dept. 54, 55
 General Electric,
 Semiconductor Div. 14
 General Motors
 Research Laboratory 61

S. Himmelstein and Company 38

IBM Data Processing 4, 5

Laboratory for Electronics, Inc. . . 49, 62
 Litton Industries, Electronic
 Equipment Division 52

Michael Flynn
 Manufacturing Company 10, 11
 Monroe Calculating
 Machine Co., Inc. 42

National Cash Register 7, 59

Packard-Bell Computer Division Cover 3
 Philco Computer Division 16
 Philco Government &
 Industrial Group Cover 4

Radio Corporation of America,
 Electronic Data Processing 50
 Remington Rand Univac 53, 62
 Research Laboratories
 United Aircraft Corporation 63

Stromberg-Carlson-San Diego 45
 System Development Corp. 37

Tally Register Corp. 52

Uptime Corporation 12

PROGRAMMERS

Experienced in programming large scale scientific computers, such as CDC 1604

- AERO CHARACTERISTICS
- BALLISTICS TRAJECTORY
- DYNAMICS OF MOTION
- SYSTEMS ANALYSIS
- FEASIBILITY STUDIES

For further information write

WILLIAM A. SCANGA
 MANAGER, Systems Engineering Dept.



COCKEYSVILLE, MARYLAND

IN SUBURBAN BALTIMORE

NOrmandy 6-1400

CIRCLE 81 ON READER CARD

- Training Systems
- Vehicles
- Electronic & Electro-mechanical Systems
- Test Equipment
- Explosive Devices
- Mechanical Systems & Equipment
- Systems Studies
- Publications

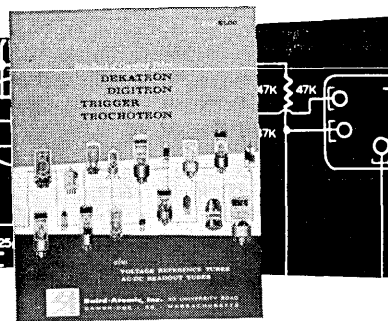
Application data on

counting tubes

and counting tube circuits



DEKATRON GC10D
 Cold cathode glow tube for totalizing, sorting, programming, special computing and control circuits. One of four general tube types, in 25 models.



The only handbook of counting tube applications, circuitry and specifications. Top source for circuit and system designers in all electronic, computer and contract engineering fields.

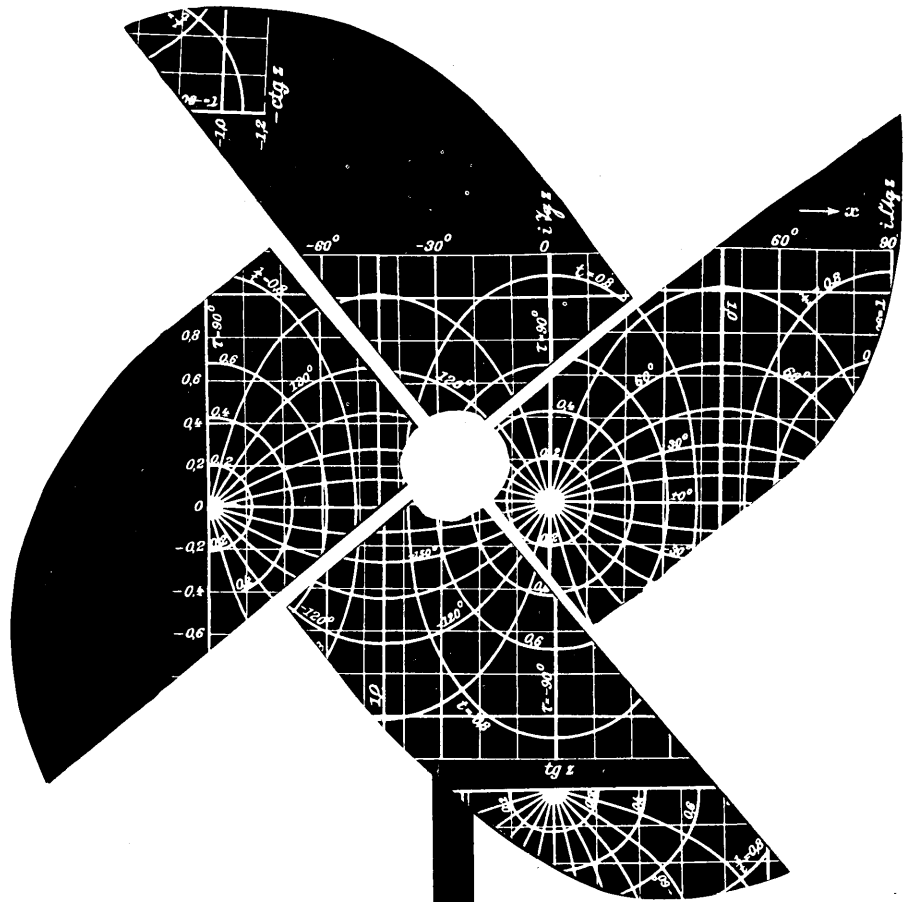
Write for your copy today.



BAIRD-ATOMIC, INC.

33 university road • cambridge 38, mass.

CIRCLE 33 ON READER CARD



ONE EXPENSIVE...

...with high speed performance...

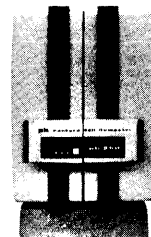
...the powerful 80,000 computer...microsecond
operation...an expandable plug-in memory...the
CINCH interpreter...a full complement of peripheral
equipment...for systems or scientific use.

pb Packard Bell Computer

A Subsidiary of Packard Bell Electronics

1905 Armacost Avenue, Los Angeles 25, California

Circle 2 on Reader Service Card.



World's fastest sorting system



PHILCO 2000 Data Processing System

■ The majority of all data processing involves sorting. Time saved on this operation is always significant—the answers you need become available more quickly; the equipment itself is freed for other use.

The inherent speed and capacity of the Philco 2000 are your assurance of highest possible sorting speed—faster than any other sorting system! For example, the Philco 2000 has sorted 100,000 80-character records, having a 16-character key, in 18 minutes!

Such high sorting speed can be obtained on any Philco 2000, regardless of size, without additional sub-systems.

Call or write to arrange a test run of one of your sort problems on the Philco 2000.

These Philco 2000 Features Assure Fast Sorting:

- A powerful SORT Generator Program—one of the many programming aids provided by Philco.
- High transfer rate on tapes—90,000 alphanumeric characters per second on each tape.
- Simultaneous reading and writing—with up to four tapes operating at the same time.
- Ability to read backward while writing forward—eliminating costly rewind time.
- Tremendous logical flexibility—plus eight or more index registers in an ultra high-speed system.

Philco Corporation • Government and Industrial Group
Computer Division, 3900 Welsh Road, Willow Grove, Pa.

PHILCO®

Famous for Quality the World Over

CIRCLE 3 ON READER CARD

MEMO •

Any Philco 2000 can do this in 18 minutes. ←
Larger Philco 2000 Systems
now operating in the field
can do this job in
LESS THAN 10 MINUTES!