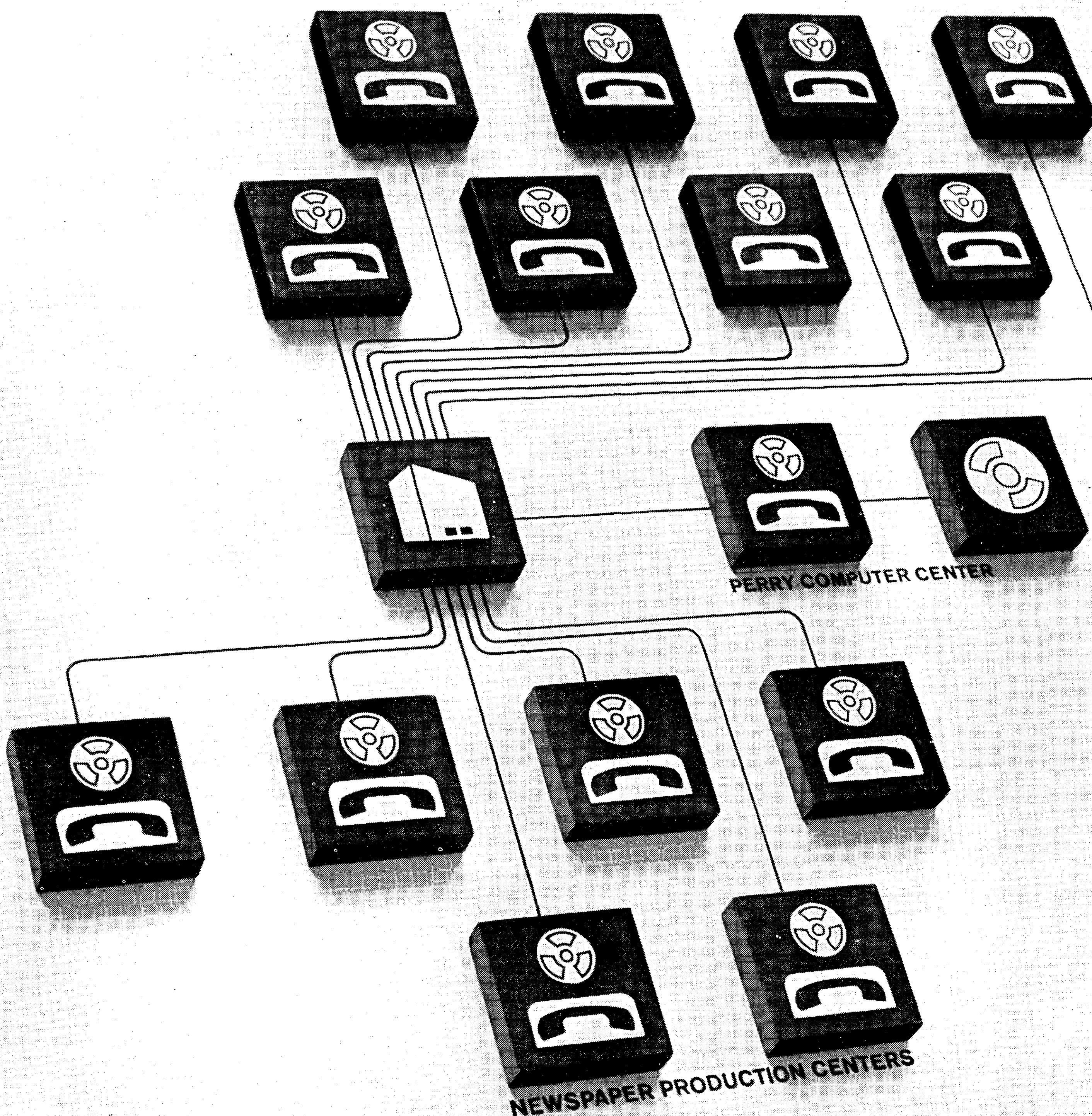
December, 1967

computers and automation

Annual Pictorial Review



Perry Publications is making headlines with this system

The system was designed so Perry's 26 daily Florida newpapers could use one computer center in West Palm Beach.

Every day the Perry papers send their display advertising and editorial matter to the center to be prepared for typesetting machines.

Since speed is essential, Perry set up 14 transmitting-receiving centers where newspaper copy is put on paper tape. The tapes are sent via Type 2 Dataspeed* Service (at 1050 words per minute) to West Palm Beach.

At the center, tapes are read into the computers at 1000 characters per second, using photoelectric readers. The computers have a 50,000 word dictionary programmed into them, so that copy can be prepared in newspaper column widths and words hyphenated, where necessary.

The output of the computer is a new tape which is returned by Dataspeed service and fed directly into typesetting machines.

If moving information in a hurry will help you make more efficient use of your computer installation, talk with our Communications Consultant. He'll help you plan a system to beat any deadline.

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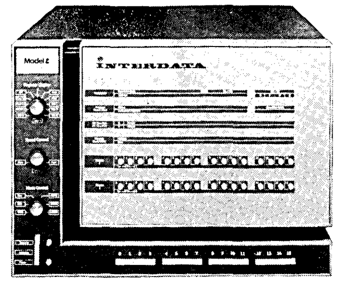
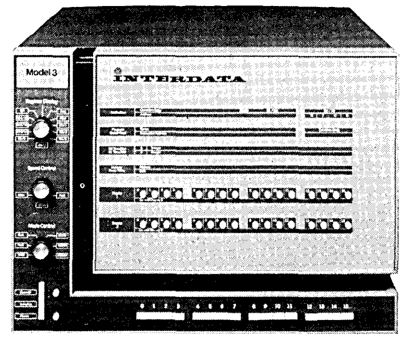


- 1,024 or 2,048 byte memory
- 45 μs add time
- 3.μs memory cycle time

$4,700

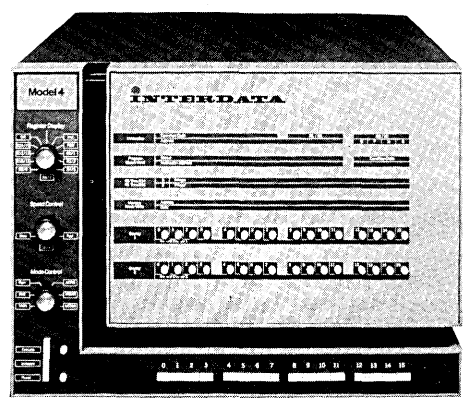
MODEL 3



- FORTRAN
- Hardware multiply, divide, and block input/output
- High speed memory access channels
- 4,096 to 65,536 byte memory
- 34 μs add time
- 1.8 μs memory cycle time

$7,000

MODEL 4 NEW!



- Hardware floating point
- FORTRAN
- Hardware multiply, divide, and block input/output
- High speed memory access channels
- 4,096 to 65,536 byte memory
- 3.9 μs add time
- 1.5 μs memory cycle time

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■ The **INTERDATA** family features a basic repertoire of 77 instructions, modular memory expansion plus standard peripheral devices and system components. ■ 16 General Registers used as accumulators or index registers. ■ All memory directly addressable to the byte level by the primary instruction word. ■ Priority interrupt facility provides for interface of 256 devices.

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On the front cover, scale models of antique and present-day computers fascinate Stephanie and Michael Tames, at the Smithsonian Institution animated exhibit on the history of computers. The 33-foot display, developed by IBM, traces the technological innovations of 13 major tabulating, calculating and computer systems, from Hollerith's 1890 machine to a modern airlines' reservation system. Pushbuttons on the exhibit animate and explain the inner workings of the 13 machines. This display is part of a special exhibit on computer history which will be at the Smithsonian's Museum of History and Technology through February, 1968.

computers and automation

DECEMBER, 1967 Vol. 16, No. 12

Special Feature:

1967 Pictorial Report on the Computer Field

In This Issue

In Every Issue

COMPUTERS AND AUTOMATION IS PUBLISHED MONTHLY AT 815 WASHINGTON ST., NEWTONVILLE, MASS. 02160, BY BERKELEY ENTERPRISES, INC. PRINTED IN U.S.A. SUBSCRIPTION RATES: UNITED STATES, $15.00 FOR 1 YEAR, $29.00 FOR 2 YEARS, INCLUDING THE JUNE DIRECTORY ISSUE; CANADA, ADD 50c A YEAR FOR POSTAGE; FOREIGN, ADD $3.50 A YEAR FOR POSTAGE. ADDRESS ALL EDITORIAL AND SUBSCRIPTION MAIL TO BERKELEY ENTERPRISES, INC., 815 WASHINGTON ST., NEWTONVILLE, MASS., 02160. SECOND CLASS POSTAGE PAID AT BOSTON, MASS.

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ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

c.a

EDITORIAL

New Ideas That Organize Information

We begin a new department in *Computers and Automation* in this issue: "Ideas: Spotlight". Printed there this time is a report by William J. Fripp, staff reporter of the *Boston Globe,* entitled "Computer-Run Satellite May Guide Ships to Fish". The report expresses a novel and interesting idea put forward by Dr. Robert E. Stevenson, assistant director of the Biological Laboratory of the U.S. Bureau of Commercial Fisheries, Galveston, Texas:

> Ninety percent of commercial fishing is hunting. If we could cut down the hunting time by 60 percent, we'd be giving a great boost to industry production.

This idea would be implemented by information:

> High-resolution films taken 400 miles up by the 1966 Gemini 12 flight clearly revealed conditions in sedimentation, tides, and currents marking fish populations and conditions . . . Certain types of fish are restricted to specific water conditions . . . discernible only by high altitude photography. . . . A captain who was out for tuna in the Caribbean would inquire, giving his location and what he was hunting . . . and the satellite-computer system would tell him right where to find it.

Is this a realistic possibility? Hardly now, but maybe soon.

What do we mean by an idea?

Webster's Third New International Dictionary, published by Merriam-Webster, Springfield, Mass., 1961, 2662 pp., gives these definitions and comments (among others):

> the central or key meaning of a particular action or situation . . . ; an image or formulation of something seen or known, of something imagined or visualized, of something vaguely assumed or guessed at or sensed.

For example:

- Success with the steamboat inspired Colonel John Stevens to work on the idea of a steam railroad.
- During the Middle Ages the idea developed that the Kingdom of France had natural frontiers which it was her right, even her duty, to attain.

In our new department, we use the word idea especially to refer to a hypothesis, a concept, an estimate, a guess, which leads to, or may lead to, useful and fruitful results.

Many measurements of right-angled triangles (i.e., information) led some ancient mathematicians to guess (the idea that organized the information) that:

> The sum of the squares on the sides of a right-angled triangle equals the square of the hypothenuse.

Thus the idea named the Pythagorean Theorem came into human culture. Most certainly the idea was first guessed from measurements in the real world. Some centuries later is was "proved" by Greek mathematicians, in terms of much simpler statements and axioms that seemed "self-evident" to millions of human beings for at least a thousand years. The idea has been used in countless ways.

Another idea — and this one famous in the computer field — was the idea of Charles Babbage, of an "engine" for the automatic calculation of mathematical tables, which would have a "store" (for numbers) and a "mill" for operating on them. But it took about a hundred years for this idea to become a reality.

Computers and activities with them are nowadays flooding human beings with information. But only here and there in the flood are ideas of great interest and value, such as:

- — the idea of time-sharing a large powerful computer, which now has probably more than 2000 implementations; or
- — the idea of a machine-independent problem-oriented computer-programming language, which now has more than 60 realizations in the real world.

Sometimes a new instrument provides new ideas, as when Anton van Leeuwenhoek (1632-1723), a Dutch town official, whose hobby was grinding lenses, made a microscope and for the first time in history looked through it at stagnant water. For the first time a man saw bacteria, drew their general shapes, and traced the paths along which they moved.

Sometimes a new way of observing the real world provides new ideas, as when Konrad Lorentz, naturalist, director of Max Planck Institut for Behavioral Psychology in Bavaria, and author of "On Aggression", uses a new technique called "motivation analysis". For example, if applied to dogs, motivation analysis may mean measuring the positions of updrawn lips and the inclination of sloping ears, to determine the degree of fear and hate, and to make possible objective description of degree of aggressive behavior.

Amid the floods of information going into computers and coming out from them, we should organize a small band of enthusiastic specialists, to look for, pick out, clarify and expand ideas. We might call them "idea engineers", and assign them a place of importance along with systems analysts, operations research specialists, and data processing managers.

Computer scientists might pay more attention than they do to the differences between information — of which they have great quantities — and ideas — which occur only rarely.

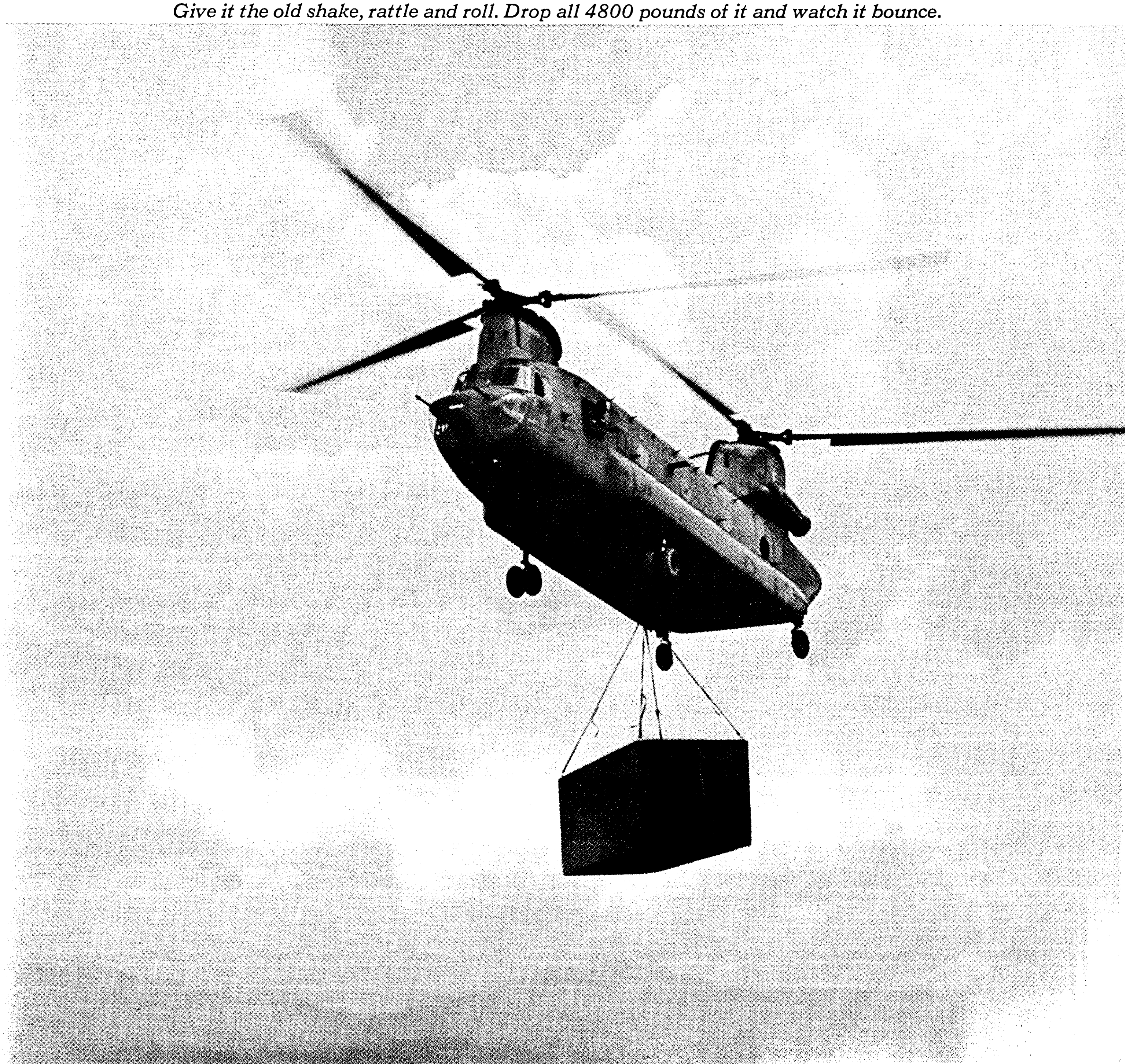
One great class of new ideas consists of ideas for improving a known situation. For example, people may say, "When we do Y, if we try method Z instead of the present method, we may get better results." Another great class of new ideas consists of ideas found from observing an unknown situation, something not observed before. People say, "I wonder what I will observe if I try X."

Already, computerized instruments are programmed to observe what man cannot — like the high-altitude satellite camera coupled with a computer to analyze the picture. And it seems likely that some day an ambitious and energetic university research group will put together a suitable program for a computer, so that it will mass-produce new ideas, with their evaluations.

But in the meantime human beings still have a frontier, thinking up new ideas.

Edmund C. Berkeley

Editor



MULTI-ACCESS FORUM

ANIMAL, MACHINE, HUMAN, ANGEL — EQUALS MAN?

L. Mezei
University of Toronto
Toronto, Ontario, Canada

Peter Warburton's observations on the nature of man and machine (*Computers and Automation,* Oct. 1967, p. 12) prompted me to set down some of my own speculations. I also sense that part of the reason that computers appear as a threat to most human beings stems from our traditional image of ourselves.

Whether or not a complex system (such as man) is in fact a unified whole, it is quite legitimate and useful to think of its different parts or of the different aspects it exhibits. Thus to think of man as partly angel and partly animal served a useful purpose in the past in considering his nature. This dichotomy was also expressed as body-soul and body-mind. The uniqueness of man was defined by those attributes which he did not share with the other animals. Of these attributes, intellect came to be valued most.

When a new model with which man could compare himself — the computer — came along, it was exactly this attribute, the intellect, about which man's uniqueness came into question. There is no doubt that the computer can perform tasks which require intellect, and play those games, such as chess, that we admire most. Whether this is to be called thinking or not does not concern me here.

The real question for me here is: "What, if anything, is there in the nature of man which he shares neither with animal nor machine?" I view man as part animal, part machine, part human; but I would rather put it this way: "Man exhibits attributes which he shares with animals, other attributes which he shares with machines (particularly computers), and some attributes which perhaps are unique to him."

What are these residual uniquely human qualities? We need to know them for our own self-esteem, so we can cherish, preserve and nurture them. Some of the candidates would be: (1) our nobler emotions such as love, compassion, aesthetic and spiritual feelings; (2) our superior pattern recognition, heuristic, and inductive generalizing abilities; and (3) our ability to establish values, goals, and purposes. Whether we can endow our computers with these qualities therefore becomes important. Research in artificial intelligence is aimed at the second group of human qualities. Cyberneticists wish to create self-organizing machines which incorporate the last group.

For those who believe that man has a share in the supernatural, "the idea that man's mind and consciousness is not a part of Nature, but a part of Nature's creator" we must add another part: the angelic, god-like attribute. For them, even if the third part, the "human" is found not to be unique in us, there would remain this last part.

The model I am proposing then is:

man = animal + machine + human (+ angel)

I do not for a moment suggest that this is a model of reality, but only a way of thinking of man's various attributes, manifestations and activities in comparison with other complex species in nature.

PROFESSIONAL CONDUCT IN THE COMPUTER FIELD — COMMENTS

I. From Donn B. Parker
Chairman, Professional Standards and Practices Committee
Association for Computing Machinery
c/o Control Data Corp.
3145 Porter Ave.
Palo Alto, Calif. 94022

I am replying to your editorial in *Computers and Automation* for September 1967 entitled "Professional Conduct in the Computer Field". I am writing to you in my capacity as chairman of the ACM Professional Standards and Practices Committee, and as author of the ACM Guidelines.

Your comment about it hardly being reasonable that a computer person should restrict himself to encouraging professional development among only those with whom he comes in contact is a good point. I will attempt to remove that restriction in the next revision of the Guidelines.

You are concerned that the word "society" nowhere appears in the Guidelines. I feel that the words "public" and "society" are sufficiently close in definition. For the purposes of the Guidelines, either word could be used.

I have divided the world into just a few categories in the Guidelines to keep it as general, short, and simple as possible in its initial form. The world consists of ACM members as professional people, ACM authorities (including the Council), employers, clients, other professionals and the public (society). This is a broad division. You state that broader parties would be countries and nations. You comment that what I would call more specific parts of the public (society) should be explicitly included.

I think of the Guidelines as one would think of a survey of crime mentioning homicide but not the specific types of homicide, or a description of the planet earth mentioning the oceans but not naming them, or a summary of geometry mentioning the circle but not its parts. The guidelines could be criticized for being too general and too broad, but narrow, never. Antiseptic it is. Ivory-towerish it is.

The Guidelines is meant to be a foundation for a body of specifics based on the real experience of professional people in our field anywhere they may be. It is expected that the Guidelines will encourage ACM members to be more aware of their ethical responsibilities and to communicate ethical problems to the Professional Standards and Practices Committee. It is a first step toward establishing a common base for ethical discourse.

In the short life of the Guidelines it has been successful on all three counts.

Your fine editorial and constructive criticism are most helpful.

Several invitations to speak on the subject have been accepted, including the 1967 DPMA International Conference, the 1967 ACM Southwest Region Symposium and the Seattle, Washington ACM Chapter. An evening discussion session was held at the 1967 ACM National Conference which was attended by about fifty people and resulted in a frank airing of ethical problems and some suggestions for improving the Guidelines.

I hope to sponsor a meeting of representatives of all IFIPS member societies at the 1968 Congress in Edinburgh, Scotland, to consider ethical practices on an international scale. Hopefully this might lead the Guidelines into being more specific concerning *mores* of other countries where, as you say, we also have ACM members.

Thank you again for your interest and suggestions.

II. From the Editor

We invite all our readers to consider and comment on the "Guidelines for Professional Conduct in the Computer Field" published on page 8 of our September issue, and to send their comments to Mr. Parker, with a carbon copy to us.

III. Noticed on a Bulletin Board in the U.S. Navy Department, Washington, D.C.:

**CODE OF ETHICS
FOR GOVERNMENT SERVICE**

Any Person In Government Service Should:

Put loyalty to the highest moral principles and to country above loyalty to persons, party, or Government department.

Uphold the Constitution, laws, and legal regulations of the United States and all governments therein and never be a party to their evasion.

Give a full day's labor for a full day's pay; giving to the performance of his duties his earnest effort and best thought.

Seek to find and employ more efficient and economical ways of getting tasks accomplished.

Never discriminate unfairly by the dispensing of special favors or privileges to anyone, whether for remuneration or not; and never accept, for himself or his family, favors or benefits under circumstances which might be construed by reasonable persons as influencing the performance of his governmental duties.

Make no private promises of any kind binding upon the duties of office, since a Government employee has no private word which can be binding on public duty.

Engage in no business with the Government, either directly, or indirectly, which is inconsistent with the conscientious performance of his governmental duties.

Never use any information coming to him confidentially in the performance of governmental duties as a means for making private profit.

Expose corruption wherever discovered.

Uphold these principles, ever conscious that public office is a public trust.

(This Code of Ethics was agreed to by the House of Representatives and the Senate as House Concurrent Resolution 175 in the Second Session of the 85th Congress. The Code applies to all Government Employees and Office Holders.)
NAVEXOS P-1991

ARE COMPANIES WASTING MONEY ON FALSE PROJECTS?

**William F. Breitmayer, Pres.
Executive Register, Inc.
New York, N.Y. 10020**

I thought you might be interested in the following letter which we received in response to my article in your September issue ("Career Building: From EDP Specialist to Top Management").

> "I have read your article in the September issue of *Computers and Automation,* and I do think it was very well written. The EDP manager you describe also has a tendency to create projects not related to the company's interest, to maintain his tenure in his position. The common tactic is to frequently change vendors of computing equipment so that reprogramming and resystems design must be implemented. Many companies are at the mercy of these men and are wasting countless millions of dollars per year on false projects.
>
> Through the frequent use of consulting firms to detect these false projects, the consulting firms very often create new false projects to perpetuate their role in the mess, and additional millions are wasted. The computer vendors, of course, end up selling more equipment and everybody benefits except the poor company that started out with your EDP manager."

An additional point of interest is that this letter was from a man who is Vice President, Sales and Marketing, of one of the major equipment manufacturers! It seems to me to suggest an interesting, if controversial, subject for further comment.

TEXTBOOK ON DESIGN OF REAL-TIME SYSTEMS

I. From Larry L. Constantine, Pres.
Information and Systems Institute, Inc.
Cambridge, Mass. 02138

It seems *Computers and Automation* has become a prime source of good articles. Our Institute is planning a textbook to be published in conjunction with a course in real-time systems design. The editor would like to add two articles from *C & A:* "Supervisory Systems for the Dartmouth Time-Sharing System", by Thomas E. Kurtz and Kenneth M. Lochner, Jr., and "Real Time Systems: A Complexity Check List", by Robert V. Head.

Could we have permission to reprint these articles? We will include your standard acknowledgement line, of course.

Please accept our thanks for the assistance and cooperation you have given in the past.

II. From the Editor

We are glad to give you permission to reprint in your textbook the articles which you request.

The following reprint clause should appear twice, once next to each article:

> Reprinted with permission from *Computers and Automation,* copyright (date) by and published by Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160.

CORRECTION — THE AUTHORS OF "WHAT IS COMPUTER SCIENCE?"

I. From Eric A. Weiss
Coordinator of Corporate Computer Planning
Sun Oil Company
Philadelphia, Pa. 19103

The definition and defense of computer science by Allen Newell, Alan J. Perlis, and Herbert A. Simon, in a published letter in the September 22 issue of *Science* is worth your attention.

You should be particularly pleased by their answer to Objection 3 wherein they refer to the choice of society name by the founders of the Association for Computing Machinery.

II. From the Editor

We printed the Newell-Perlis-Simon "What is Computer Science?" on page 9 of our September issue, after we had seen it in the form of an unsigned memorandum.

We are glad to credit authorship to these three computer scientists.

"MONTHLY COMPUTER CENSUS" — COMMENT

Edward Webster
Roxbury, Mass. 02119

I would like to register my approval on your new format for the "Monthly Computer Census" in *Computers and Automation.*

It reflects the sources of information and relative accuracy of the estimated figures, and I believe this is helpful.

"WHO'S WHO IN THE COMPUTER FIELD" — FIFTH EDITION, 1968

The Fifth Edition of *Who's Who in the Computer Field* will be published by *Computers and Automation* during 1968.

The Fourth Edition, 253 pages, with about 5000 capsule biographies, was published in 1963. The Third Edition, 199 pages, was published in 1957.

In this edition, we hope to include upwards of 10,000 capsule biographies, including as many persons as possible who have distinguished themselves in the field of computers and data processing. If you know of people who should be included, please tell us their names and addresses.

If you wish to be considered for inclusion in this "Who's Who", please complete the following form (which may be copied on any piece of paper) or provide us with the equivalent information:

1. Name? (Please print) ____________
2. Home Address? ____________
3. Organization? ____________
4. Its Address? ____________
5. Your Title? ____________
6. Your Main Interests?

Applications	( )	Mathematics	( )
Business	( )	Programming	( )
Construction	( )	Sales	( )
Design	( )	Systems	( )
Logic	( )	Other	( )
Management	( )	(Please specify) ____________	

7. Year of Birth? ____________
8. Education and degrees? ____________
9. Year Entered Computer Field? ____________
10. Occupation ____________
11. Publications, Honors, Memberships, and Other Information? ____________

(attach paper if needed)

12. Associates or friends who should be sent "Who's Who" entry forms?

Name

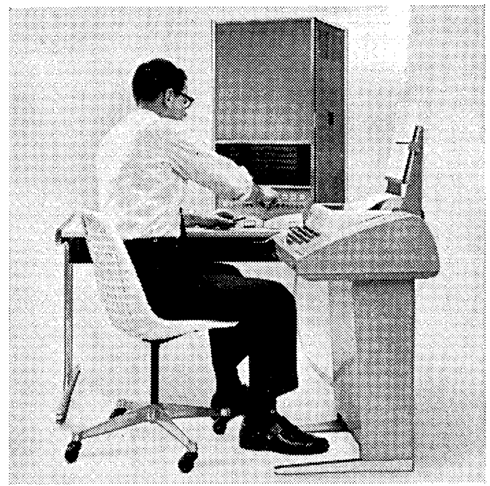
____

Address

____

When completed, please send to:
Who's Who Editor, Computers and Automation,
815 Washington St., Newtonville, Mass. 02160

Computers and Automation invites ideas and comments for "Multi-Access Forum" from all readers, so as to help broaden the horizons of people concerned with the computer and information sciences. We also welcome letters concerning articles or items appearing in this magazine.



To the computer specialist who figures he'd show 'em how, if he ever got the chance:

You've got the chance.

Now Hewlett-Packard's in the computer business... with a series of versatile, small, high-speed digital computers, so flexible, so well packaged that they're begging to go to work on the applications that only you can find... and sell. We've got the products. We invite you to apply your computer engineering expertise either to advancing our line of computers and software or to marketing them. The choice is yours.

Hewlett-Packard computers have been developed to give the working engineer a direct problem-solving interface with the electronic instruments manufactured by HP, letting him assemble his own computer-controlled instrumentation systems. They're designed to be equally effective as free-standing general-purpose problem solvers. And there's a wealth of experience behind these computers—developed and manufactured by a dynamic company that's spent 25 successful years in the measurement and data-handling business.

As Hewlett-Packard computers open whole new avenues of measurement capability, so they open new opportunities for the computer engineer whose education and experience are best rewarded by advancement in the field of computer technology. Choose your own course: in R&D, application engineering, software, marketing.

We think our computer is going to revolutionize the measurement and data-handling business. Sound interesting? Write Ray L. Wilbur, 1501 Page Mill Road, Palo Alto, California 94304. An equal opportunity employer.

HEWLETT hp PACKARD

MANAGEMENT OBJECTIVE:

J. R. Callahan
Financial Analyst, Marine Division
Westinghouse Electric Corporation
Sunnyvale, Calif.

During the past few years the business world has undergone a computerized transformation. The speed of accumulation of data and accuracy of computation made possible by the computer has been a boon to management by providing information more quickly and in a wider variety of combinations than was ever before possible. The quick and accurate presentation of data provided by the computer is designed to provide management with a broader, more up-to-date data bank upon which decisions can be based than was ever before possible. The increased information will lessen the areas of uncertainty, reduce the degree of risk-taking inherent in managerial decisions, and provide the basis for a higher degree of operational management than could even be imagined under the previous systems of data accumulation and presentation. This is the purpose of the computer in the business world.

The Problem

How well has the computer fulfilled these lavish expectations?

The answer is problematical and highly variable. Because of its newness, expense, and great potential, the computer has been used and misused at a frantic pace throughout the business world. Programs have been pushed through on a rush basis without adequate forethought and coordination. The result has been the use of a great deal of business computer time for turning out duplicate, incomplete, or useless reports. If we reflect on the high cost and great potential of the computer to the business world, it is obvious that the waste occasioned by first-come-first-served or random programming is intolerable. A definite procedure for determining necessity of use, priority of program, and the effectiveness of the computer section as a whole, must be implemented to permit effective management and utilization of this most sizable investment.

A major factor in preventing business from obtaining full value from computer investments is lack of familiarity with computer potentials, and limitations of personnel, who are or should be trying to make use of the computer's abilities. It would be most difficult to estimate the time and expense used in formulating and attempting to implement unworkable, meaningless, or duplicate information systems on the computer. And we do not even consider the computer information potential lost through failure to realize and make use of its full potential, and potential lost due to faulty scheduling and faulty priority establishment.

Personnel Familiarization

Virtually all computer information requirements and priorities are determined outside of the computer area. The Programming and Data Processing functions are of a staff nature and are responsible for implementing the wishes of management in the computer area and furnishing as much advice as is possible or permissible in this area. Of necessity, most of the advice furnished by computer personnel can only be in regard to already proposed programs or information systems, since outside departments are responsible for presenting their needs to the computer department.

Inasmuch as basic program requirements are not, for the most part, developed in the computer section, it is necessary that selected personnel in outside departments be aware of basic computer procedures and capabilities so that time and effort will not be wasted on impractical projects. This basic knowledge will enable non-computer personnel to better realize and make use of computer potential in their fields and will materially reduce the time and difficulty inherent in translating the desires of outside departments into language understandable by computer personnel.

A basic familiarity of computer capabilities in non-computer-oriented personnel could be instilled through informal classroom sessions, dissemination of selected articles and books, or mixed discussion groups with computer personnel. Of the three alternatives, the last seems the most attractive; it would afford the computer people an opportunity to become familiar with the operating problems the computer will be expected to help solve. Such a cross-fertilization of ideas and concepts could lead to suggestions by the computer personnel regarding programs and information groupings beneficial to the operating people. This is an area that has been remarkably dormant in most computerized companies and could be very beneficial if tapped to its full potential.

This problem could also be solved by assigning computer personnel to operating departments. However, this solution often leads to extreme specialization of the computer personnel so assigned, pirating of the computer personnel to perform other functions of the department to which they are

ECONOMICAL USE OF COMPUTERS

"Many companies have invested a sizable amount of money in computer operations, but very few of them have any concrete idea of the benefits they have derived from their investment . . . nor do they have a method for determining these benefits."

assigned, and a general reluctance on the part of most computer personnel to undertake such an assignment, since it reduces their chances of gaining overall programming and computer experience.

To promote the more extensive use of the programming knowledge and talents of computer personnel, a suggestion system for improvements in present programs and proposals for new information gathering systems could be implemented. It may also be desirable to assign selected computer-oriented personnel to periodically review certain areas of operation and determine the adequacy of the information being received by personnel in these areas of operation.

Determining Computer Requirements

One of the chief areas of waste in the computer area is time spent on faulty, duplicate, or meaningless programs. There are numerous cases where time and effort has been and is still being expended on reports which duplicate information available through other sources, and on reports whose basic data is in such a state of disrepair as to render the information programmed from it meaningless.

To eliminate the possibility of programming waste and duplication, each proposed new program or information gathering system should be reviewed prior to the commencement of any work on it. This review should consider:

1. the purpose of the program;
2. the need for the information it will provide;
3. cost and time required to set up and maintain the program;
4. degree of accuracy possible in obtaining the desired program results; and
5. computer/machine usage factors.

This review should also, wherever possible, contain a financial summary of the proposal. The summary should show the estimated cost of implementing it and an estimate of the financial benefits accruing from its implementation. It is true that some of the most desirable programs will not provide any direct financial benefit, but a financial summation would provide a most useful tool for judging the desirability of the bulk of programming proposals.

In addition to the monitoring of new program proposals, maintenance of an efficient information-gathering system demands that all existing programs be reviewed periodically to redetermine their completeness, accuracy, and value. This review would be directed toward uncovering more efficient ways of accumulating and presenting existing information systems, revealing areas of duplication in existing information systems, and reassessing the value of all existing information systems.

Requirement Review Procedure

Since the review of programs will have to rule on program requests and alleged requirements of departments possessing varying degrees of influence in the corporate hierarchy, it is imperative that top management give full backing to the program review decisions if there is to be any noticeable degree of coordination and cohesiveness in the computer reporting system of the company.

To preclude arbitrariness, the program should be conducted by a small committee. Committee members should be thoroughly familiar with computer capabilities and should possess the ability and background knowledge to make decisions in accordance with overall company goals. This would indicate that the committee should be comprised of personnel well experienced in company procedures and having a significant degree of corporate responsibility in their regular jobs. It is not necessary that committee members possess a detailed familiarity with all areas of corporate activity, since all program proposals would be expected to include a detailed statement of their purpose and the benefits anticipated from their implementation.

An alternative procedure would be to have a detailed review of each program and program proposal assigned to an individual who is oriented both financially and to computers. This individual would be responsible for checking out the proposal and making a thorough investigation of its purpose, usefulness, feasibility, and cost, and he would submit a written report of the investigation. A committee consisting of representatives from all major corporate departments under chairmanship of the Computer/Systems representative would meet as required (not more frequently than once a month) to review the program writeups and steer the computer effort in accordance with overall company objectives.

The success of the program review technique depends on interdepartmental cooperation to achieve the overall company goals. Basic familiarity of the programs to be discussed in each meeting could be provided by giving committee members copies of the program writeups before the meeting. But the manifest attitude of top management and effective chairmanship of the committee by the Computer/Systems representative controls the spirit of cooperation and willingness to sacrifice departmental desires for the overall company benefit, which is so vital to the effective functioning of the committee.

Dissemination Reports

Another major area of trouble in computer reporting in business is the problem of timing of reports: getting the right information to the right people at the right time. The problem of what to report, when, and to whom is one of the most perplexing problems in the computer field, but one that must be solved if the information system is to function effectively.

The basic input to the question of who should get what information is provided by outside requests for new programs or modifications to existing programs. The question of "what" is then solved through the aforementioned review of program proposals prior to their requirement, and programming feasibility will be determinants of "when" information will be disseminated.

Distribution of Reports

The distribution of computer reports presents a problem which should be reviewed constantly. Distribution lists have a remarkable tendency to add names without undergoing any corresponding reduction. Personnel involved in a specific area are not necessarily interested in all reports pertaining to that area. There are altogether too many cases of extremely detailed computer reports being sent to those at a managerial level where they cannot spare the time to be concerned with anything but a broad brush analysis of the area. Extremely detailed reports should have very limited distribution, since they will have to be analyzed and summarized before they will be of use to the bulk of the interested parties.

Efficient distribution demands that distribution lists be revised with any organizational change and be reviewed generally every quarter. Additional steps should be taken to preclude the maintenance of identical files of reports by different departments. Generally, reports of over a certain age are infrequently referred to and should be retained only at one central source. Promulgation of a centralized filing procedure for infrequently used reports and the maintenance of ease of accessibility to these reports at the designated location, will materially reduce the duplication of filing systems throughout the plant and provide a central source for all personnel to obtain certain information.

Priority of Effort

The most pressing problem in the computer field is when the information can or should be provided. Generally the requestor implies that the sole acceptable answer to the question of "when" is "now!" This results in unreasonably heavy workloads, impossible schedules, and a great deal of wasted time spent correcting and rerunning programs that were insufficiently developed and tested due to an unreasonable schedule.

It is hoped that the initial problem of priority of computer effort will be decided without an undue amount of bloodshed by a management-backed group such as the committees previously suggested before the proposal programs are presented to the computer group. However, the computer timing problem is far from being solved with the assignment of program priorities. There are still three basic categories of delay to be overcome before the problem is solved. These categories are programming delay, report delay, and scheduling delay.

Sources of Delay

Programming delay is that which is inherent in constructing and activating the program and includes the following factors:

1) Implementation time — the time it takes to translate the requestor's desires into a workable computer program.
2) Testing time — delays caused by preliminary and final testing and revamping of the program to receive the desired output.
3) Programmer work load — availability of the properly trained personnel to construct and administer the program.
4) Machine availability — the availability of computers for personnel to construct and test programs.
5) Computer capability — both computer "hardware" and "software" limitations can cause significant programming delays.

Report delay is inherent in the accumulation and processing of data to obtain the desired output, and includes the following factors:

1) Accumulation of information
2) Machine time to run the program
3) Analysis time to determine the meaning and implications of the information derived from the program
4) Information lag effect

Scheduling delay is the problem of program priority, due dates, and dependency on other programs for information input.

Scheduling of Delay

To accurately gauge the effects of program delay, estimates must be made of the time required to develop each proposal into a workable program. The individual proposals then have to be ranked in order of importance and combined into an overall departmental schedule which can be used as a basis for personnel and machine manning levels. If a detailed analysis is desirable, proposal steps could be divided into milestones and time phased using the PERT system. Briefly, the PERT system consists of estimating the length of time needed to accomplish each step, scheduling each step and the time required for its accomplishment according to earliest opportunity to commence work into an overall web for the task. The line of accomplishment to the desired completion of the task involving the greatest amount of time is designated the "critical path", and becomes the guiding factor in scheduling task effort to completion.

Pert networks could be constructed for individual programs and combined into a network of the overall computer effort to better schedule and measure progress on the achievement of programming objectives.

This type of information would permit realistic assessment of the potential of the computer section and would provide the basis for scheduling proposed programs and revisions to existing programs. It could also be used to assess the performance of individual computer personnel by recording the volume and complexity of effort inherent in each person's workload and their individual accomplishments against this workload.

Program testing time would be directly related to program complexity, dependence on outside input, and level of ability of the person or persons assigned to implement the program. A prime consideration here would be the rental of computer service facilities for testing programs to alleviate a situation where company-owned machine time is at a premium due to use on existing programs.

The Effect of Outside Computer Services

It should be mentioned that the use of outside computer services often changes the cost consideration basis of the program sponsor, since his budget will be charged directly for the outside services, whereas inside computer services are apparently provided him at no cost or a very nominal cost. The possibility of employing outside services with the accompanying charges provides the computer manager with an excellent means of assessing the true value of the proposed program to the sponsor.

Programmer availability and ability would also be a factor in determining whether outside computer services should be used. If a continuous over-workload is anticipated, the company should consider investing in additional machines and personnel. The fee of outside agencies, the time involved in traveling to and from the agency, and the added difficulty of transmitting company objectives and desires to personnel not familiar with the company make the use of company facilities desirable whenever feasible. Additionally, the use of outside computer services prohibits company personnel from gaining programming experience in the systems they will be expected to monitor.

Report lag must be scheduled in arriving at an accurate program implementation date. The effect the required time lag will have on the value of the report should be considered in determining whether a program is desirable. Since most programs are dependent on other systems for input, accuracy of the required outside input, scheduled accumulation of the outside input and time required to implement it in the proposed program must be considered.

Level of Effort Problems

Scheduling delay is one field where there has been very little progress. Information requirements too often are not coordinated, and this results in extreme fluctuations in degree of computer activity during a given month. These activity fluctuations result in maintaining an increased manning level to handle the areas of peak activity, interference with normal programming activities due to the erratic demands for machine time, increased overtime expense during the activity peak periods, and not enough work to keep employes busy during the slack periods.

One of the main causes of peak-slack activity periods in modern business usage of the computer is the over rigid adherence to the concept of the "accounting month". All reports and summations of previous month's activity are due out during the first week of the following month. Some of this information must be analyzed, revised, resubmitted, and turned out in the form of forecasts also during this first week. Coincidentally, payrolls are also due out on the first of the month, suppliers invoices are rushed through just prior to the end of the month, and there is a final grand rush to accumulate costs and send out our own invoices to be able to report billing in the current month's activity. All this activity results in a massive volume of work during a certain period of every month, with a comparatively light load carried for the balance of the month, and the possibility of a computer breakdown during the period of heavy activity looms threatening enough to be of serious concern to the most carefree systems man.

Business computerized reports have different purposes and would seem to have varying degrees and areas of time requirements, so there would seem to be no reason for the extreme peaks in demand for computer activity. Some reports comprise regular day to day activities such as paying invoices, recording costs, and handling intraplant financial transactions. Some information is required on set dates such as meeting the payroll, and reporting operational results in accordance with corporate time dictates; probably it would not be possible to eliminate or alleviate the traditional end of the month rush for additional billings.

Forecasting Future Activity — Scheduling

There is, however, one major area of computerized reporting that could reasonably and profitably be rescheduled to a less active period of the month. This is the area of forecasting and reports compiled, combined, and otherwise massaged to be used as a basis for forecasting future activity. Job shop activities, because of the erraticness of their production and delivery, are not amenable to report scheduling for any but the entire financial reporting period. However, continuous production operations could have some of its data scheduled for other than established financial month periods without incurring significant distortion. Is there any binding reason why all of this data must be processed at the time when other computer activity is at its highest pitch? Data used for forecasting purposes is not required for maintenance of the regular business activities, so there is no set time requirement on its issuance. Typically forecasts of future activities are required at the same time as reports of previous months activities, so there is a certain time requirement to be considered. But it would seem that a summary of actual expenses combined and massaged in whatever manner desired for a one month period extending from the third week of one month to the third week of the following month would be every bit as valid for forecasting purposes as data extending from the first to the thirtieth of the month. This is true for forecasts of continuous level expenses such as manpower, engineering expense, etc. which are used in compiling forecasts. Forecasts based on specific published figures and non-recurring items such as forecasts of sales billed and orders entered would have to wait for the official close of the accounting month, but much forecasting is based on level of activity, the indicators of which would be just as valid if compiled from third week to third week statistics.

Additionally, all internal reports such as summaries of factory and engineering time expended by cost center, forecasted contract overrun/underrun status, and summaries of charges to accounts and shop orders could be rescheduled to be third week items without impairing their usefulness. Many other areas of possible rescheduling exist, such as having an employe expense report cutoff date on the tenth of each month, issuing target versus recorded cost reports on jobs as of the middle of the month, and possibly even rescheduling salary payroll to the 5th and 20th of the month. Profit and loss statements would not be affected by the implementation of such scheduling since each monthly period would cover the same number of days and periods of activity as were included in reports under the previous system. Actual expense would be shown on all financial statements reflecting monthly totals as is now done, the only difference being that some areas of forecasting and internal reporting would be based on data which is comparable to, but covers a slightly different period than, the actual reported monthly financial data.

Implementation of this type of schedule could actually increase forecasting accuracy by permitting a more thorough analysis of data and forecasts than is now possible under the last minute combined rush forecast and analysis of previous month activity due dates. The benefits derived from a more thorough analysis of existing data would seem to outweigh those of having slightly more up-to-date data which can be only perfunctorily reviewed. When these advantages are combined with the desirability of spreading out the computer workload throughout the month, a revision of existing procedures in this area certainly merits consideration.

In determining a more balanced computer workload schedule, all existing programs should be reviewed in light of their necessity, use, and timing requirements. The non-time essential programs (those which do not absolutely have to be issued at a given time) would then be reviewed with their sponsors and rescheduled wherever possible to facilitate a more even spread of the computer workload. It would be desirable to leave some computer time available for testing programs each day to aid the continuity and speed up the results of the new/revised program development function. Program scheduling would be initiated and coordinated by the Computer Systems Manager.

Other Scheduling Problems

Many other scheduling problems are the responsibility of and would have to be solved by the computer group. These problems include:

- scheduling programs so the correct input is available when the program is due to be run;
- standardizing computer input forms and scheduling their submission so they will be used immediately, thus reducing the chance of loss;
- scheduling repetitious or proven programs for night runs whenever necessary so that the bulk of the trained computer force will be present when the more difficult programs are being run; and
- developing as much as possible an alternative computer source for emergency use in case of a machine breakdown.

In the long run the scheduling function is one of the most important to the computer organization, because a late report is often worse than no report at all.

Measurement of Efficiency

Companies have invested a sizable amount of money into computer operations, but very few of them have any concrete idea of the benefits they have derived from their investment, or any method for determining these benefits. In short, in most companies today there exists no method of measuring the performance of computer equipment and the computer section as a whole. It seems quite incongruous for a company to emphasize the value of cost consciousness and profitability requirements to its employes and then invest a large sum in a computer system with no firm idea of the marginal return on the computer and no method of measuring its contribution or the efficiency with which it is used after it has been purchased. Some method of determining return on such a sizable investment should definitely be developed.

There are two basic measurements of the contribution of the computer and the computer section once they are in operation. These areas are performance and financial return.

It is necessary that prior to the purchase of any computer system an exhaustive survey be made of company needs, computers available, cost, service available, and the abilities of company personnel in relation to the computer systems they will be asked to handle. The analysis should further include marginal return on investment if an addition to the existing computer system or a change of systems is contemplated. Marginal return on investment will be determined through the use of the same tools as will now be discussed for measuring existing computer performance.

Financial Measurement

In the financial area of measurement there must be developed, in effect, a profit and loss statement for the computer operation. Certain difficulties are to be encountered in translating computer benefits into dollars and cents, but this must be accomplished if a firm basis with which to measure the contribution of the computer is to be obtained.

The basis for measuring gross computer contribution to operations is to estimate the amount of labor or cost of outside help to perform the jobs now handled on the computer. In the case of labor, the estimate would be made in terms of hours and would then be extended by the appropriate costing rate for the type of labor involved. Care must be taken to estimate hours for only that portion of work actually done by the computer. For instance, the labor estimate for a program in which the computer only compiles already processed data should include only that labor necessary to compile the information in the form presented by the computer.

The figures derived from this calculation would be extended by a predetermined factor per hour of computer time savings over the duration of the job if accomplished by other means. This factor would represent the value to the company of the speed of information made possible by the computer. In making this calculation, existing computer work schedules must be considered to preclude making the assumption that all programs can be run off on the computer at the same time. By the same token, realistic scheduling must be applied to the labor estimate if a reasonable replacement cost basis is to be determined. This information should be developed at the time any new program proposal is submitted to determine the relative merits of the proposed program. The information would therefore be readily obtainable and would require only occasional revision to reconcile estimates with actual experience or to reflect new techniques or program improvements.

The cost of computer operations on a particular program would include the direct cost of personnel required to set up and handle the program such as keypunch operators, programmers, etc., a prorated share of computer section managerial and administrative expense, a prorated share of machine depreciation expense, and a direct allocation of overtime bonus where such expense is caused by the need to meet a due date for a specific program, or a prorated absorption of all overtime bonus caused by general workload problems, but not the result of a specific program.

The estimated dollar value of computer services provided by the maker would then be added in the form of profits and the amount paid to outside computer service bureaus would be subtracted from the profits. This calculation would reflect the benefits derived from the free services of computer specialists employed by the maker of the system, and would provide a measure of their contribution to overall computer efficiency to the company. The second part of this calculation would reflect the extra cost incurred where the existing computer system did not possess sufficient capabilities to present all the information desired. This area would also provide a good measure of the sufficiency of the present computer system for the tasks desired.

The total of computer contribution to operations plus computer services provided by the maker less the cost of computer operations and the amount paid to outside computer service bureaus would provide the end result of the computer profit and loss statement. By accumulating financial data in the manner suggested a company could rate the contribution of its computer section to company operations in concrete terms, giving effect to all pertinent factors. A forecasted calculation based on the same procedures would be very useful in contemplating the purchase of new or additional computer systems and assessing the financial implications of such a move to the company.

Performance Measurement

The area of computer performance measurement is far less concrete than the financial area of measurement. Performance rating must be based on top management assessment of the overall computer contribution to operations after an objective assessment of all related data and pertinent areas of comparison has been made.

There are numerous items to be considered in thoroughly assessing the contribution of the computer operation to company activities. Machine usage factor is a prime consideration indicating how necessary the amount of equipment presently on hand is to the operation and whether additional equipment might be desirable. The number, quality, and successfulness of programs implemented measures the effectiveness of computer personnel in employing their equipment to contribute to company goals. Timeliness and completeness of reports provide a further indication of the quality level of computer work. Excessive reliance on outside computer service organizations either by the computer organization or by other departments who have elected to bypass the company organization in attempting to satisfy their information requirements would be indicative of a serious discrepancy in the computer organization. Personnel policies, turnover, level of skills, training, and attempts to use company personnel on difficult programs and subcontract out only the more repetitious programs wherever feasible indicates the existing and future level of individual knowledge and competence that can be expected in the computer organization.

While the performance measurements are quite general in nature and subject to differences of opinion in their assessment, they do provide a broader picture of the overall effort than that available through an exclusively financial measurement. For this reason it is felt that both the performance and financial measuring basis should be used in arriving at a determination of the level of computer contribution to the accomplishment of company objectives which are so vital to the proper administration and planning of the computer effort.

Increasing Computer Scope

Many companies have plant-wide highly-emphasized employee suggestion programs. A limited program of this nature among computer people and other responsible operating personnel could result in the development of useful computer systems and programs not yet even under consideration. Computers are becoming more and more sophisticated. As personnel become increasingly familiar with their operation, their possible areas of use increase manyfold. Any forward-looking company should employ all available channels to gain concepts giving it further benefits from its large investment in computer equipment.

Conclusion

Complexities of the modern business world have provided many invaluable uses for the computer. On the other hand, the presence of many and varied computer uses greatly enhances the possibility of waste or misuse. Rigid regulation and careful assessment of existing and proposed computer use, and even of the need for a full-time computer, is an absolute requirement, for the achievement of any efficient use of computer facilities. Financial measuring data is employed to determine the advisability of other investment decisions, and an assessment of their current contribution to profitability. In the same way, it provides the common ground for relating computer contribution to overall operations.

Continued review of existing computer output and its value and usage, plus a sustained effort to develop additional uses for the computer, plus the implementation of financial systems of measurement to assess benefits derived from current and proposed computer programs — these together will enable any business to attain its full share of benefits from the dynamic field of computer applications.

THE AMERICAN SOCIETY FOR CYBERNETICS FIRST ANNUAL SYMPOSIUM — A REPORT

Senter Stuart

Cybernetics, that elusive word bandied about in press, books, and papers from the computing society, came into prominence again in Washington on October 26. The American Society for Cybernetics held its first annual symposium at the National Bureau of Standards in Gaithersburg, Maryland.

The array of communicators and communicants was impressive, and speakers came from famous and lesser institutions all over the world. They communicated, one and all. The range of topics dazzled laymen and computer scientists attending who are interested in "circular causal and feedback mechanisms phenomena", an official definition of cybernetics. This definition, as broad as some universal constants, is probably necessary to cover the wide range of subjects discussed. They included specialties and subspecialties from philosophy, anthropology, psychiatry, sociology, neurophysiology, behavioural psychology, electronics, microbiology, etc.

The meeting's title, "Purposive Systems: The Edge of Knowledge," probably gave the organizers some trouble. Webster's says purposive means either: (1) Serving a useful function, though not as a result of design; or (2) Having or tending to fulfill a conscious purpose or design. Apparently, then, cyberneticists may think of themselves as working toward objectives, or alternatively, being involved with useful processes having effects which cannot be anticipated.

Presentations ranged from the interesting and informative, to the almost unintelligible. One paper was delivered from prepared text so rapidly, that the possibility of comprehension seemed a remote possibility. Dr. Nicolai M. Amosov, from the Ukrainian SSR Institute of Cybernetics, failed to tell the audience whether he was talking about a computer system, a series of programs, a theoretical model, or psychocybernetic findings from actual experimentation. Unfortunately, he used the word "models" without defining it, and diagrammed systems of "feelings" and "emotions" generating feedback. We suspect that translation difficulties were at fault. Indeed, these difficulties were discussed. One speaker said that a good translation machine would need all the knowledge in the Universe, but could never have it since knowledge is "pregnantly infinite" or "infinitely pregnant", whichever term one wishes to use.

Why Machines Can't Think

Fortunately, in the midst of semantic confusion, centrifugal cybernetic maelstroms, and technical translation problems, Dr. Seymour Papert of MIT spoke. He delivered a most humorous and erudite talk on "Why Machines Can't Think." He was understood, was entertaining, subtle, and he told us how it is. "Machines can't think," said he, "because stupid humans don't know how to *teach* them to think. We try and teach them as we think *machines* should be taught, and it doesn't work."

He stressed the fact that humans use knowledge acquired from literally millions of sources to do what we call thinking, but that we do not yet understand the relative values of tradeoffs between logic and knowledge. Until we have investigated *that* a bit further, our machines will not "think" well. Also, because of egotistical postulation that superhuman humans can exist, we expect the machine to respond perfectly and logically. But we do not know if it is possible for the "superhuman human" to exist or to come into being. Why, therefore, should we expect the machine to be perfect? The answer is that we build it in our own image (insisting that perfection is attainable), while failing to realize that the superhuman human is probably myth.

What is important, said Papert, is to increase the amount of interaction between machine and the machine's teacher at the console. To experiment with, and understand, the machine as an intelligent entity, rather than as a machine. Until we do this, he insists, we are viewing the machine in much the same way we view pigs. We take an animal which is clean and tidy in its native habitat, throw it into a filthy pigsty, and call it dirty. As for future thinking machines, Papert sees us providing our beasts with vast amounts of knowledge. He says this because the best chess players usually have a larger store of *general* knowledge than the losers. They win, he says, even though we don't really understand why non-chess knowledge is important. To make it even more complicated, we don't really understand all we should about chess either, since, like knowledge, chess theory may be almost infinite.

Winning the hearts as well as the minds of the participants was Dr. Margaret Mead. She chided the conferees and organizers of the Society to use a bit of their system theory and apply it to their own activities. "Better find out *now* what your Society's objective is," said she. "If you can't formulate an objective, decide who should be brought into the group to get you there, and actually get going, then you should shut up shop now. Otherwise, you will go the way of all organizations, grow old, stagnate, refuse admission to the young with radical and perceptive ideas, and wither away."

She also supported the ideas of Ed Bacon of Philadelphia, who has proposed that general systems theory (cybernetics if you wish to call it that) be taught in every University in the world. That this general theory become the base of communication and the common language between different political systems and all of the disciplines. She noted the decline of interest in cybernetics between the early 1940's and the early 1960's, but praised those who now see in it the possibility of decreasing tension and increasing feedback between nations.

The Human Components of Large Systems

Many of the suspicions of the general populace toward automation are caused by improper introduction into existing systems, ill-designed connecting links, and overlooked psychological effect on humans, according to Dr. Mead. "We have an order of confusion with which we have not been blessed before." We also overlook the *human* components of large systems, and are not teaching the young precision, which is increasingly needed to operate the complex systems of the modern world. "Human imprecision can generate disaster where large systems are in use," said Dr. Mead.

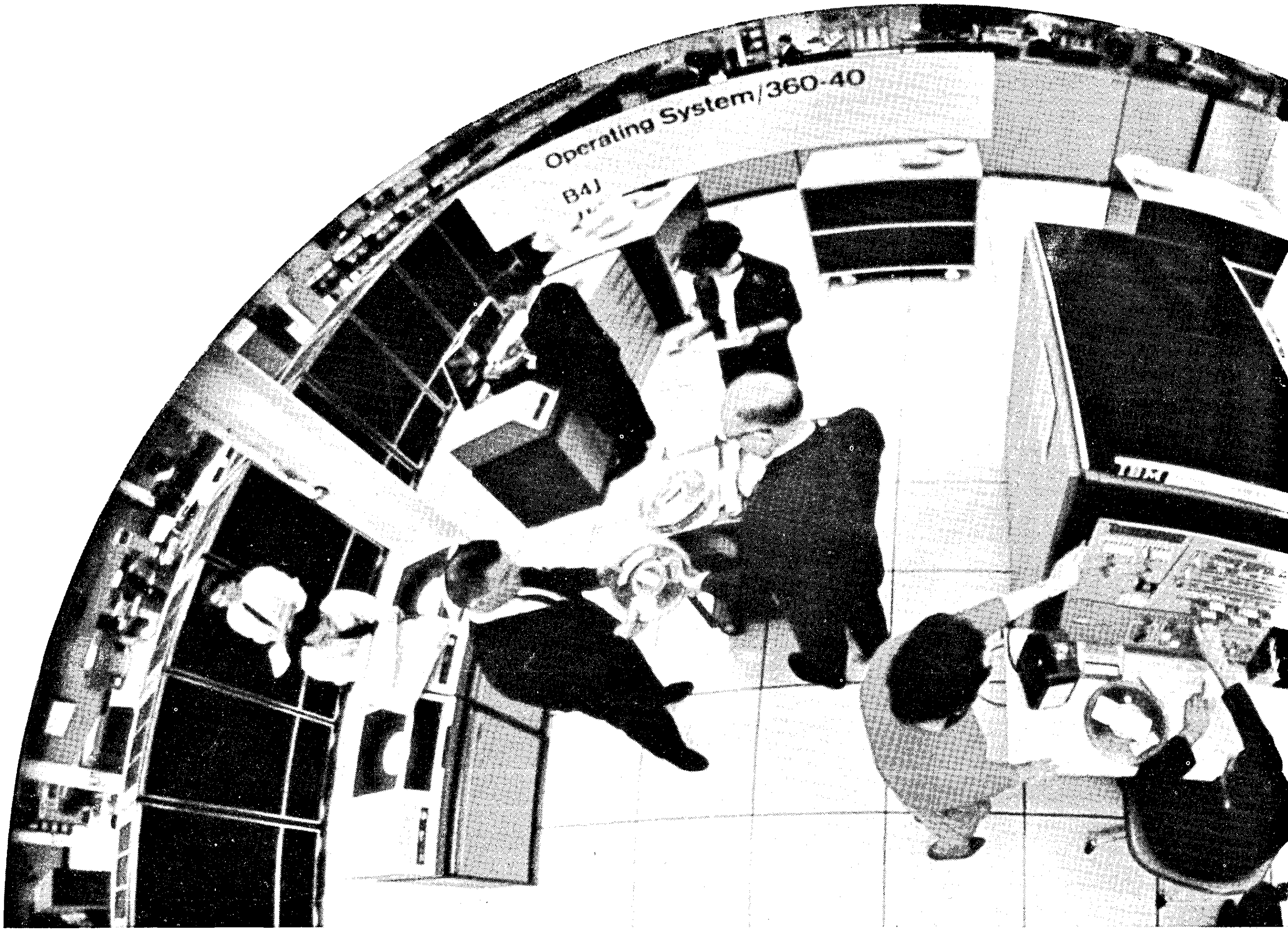
Taken together, the universal mix of subjects covered by the speakers was impressive. The Society's founders and those who organized this conference have undertaken a mammoth task: That of bringing together some of the most brilliant minds in the world to discuss cybernetics, general systems theory, feedback, cause/effect relationships, or any of the many definitions used to describe their common interest. Two-thirds of the speakers were from the universities: MIT, Cincinnati, California, Ukrainian SSR Institute of Cybernetics, Harvard, Illinois, Israel's Hebrew University, and Colorado. The remainder represented UNIVAC, the National Academy of Sciences, IBM, RCA, the West German Government, the American Museum of Natural History, and the American Academy of Arts and Sciences. The roster of speakers and organizers was a veritable Who's Who In Science and The Humanities.

Amidst the august listeners, speakers, and proceedings, there was also a good deal of humor. Dr. Papert said that when he posed a theory to an audience and many responded with identical questions, he sometimes countered with, "And who programmed all of you to ask *that*?" Dr. Mead, talking informally at the banquet to an interested group, described her chagrin at never having been told who would meet her where or when at Washington airport. Knowing vaguely that the meet was to be held in Gaithersburg, she planned to have dinner in, "Gaithersburg. . . . if you can imagine that . . . . and sleep at the airport." She arrived at NBS just in the nick of time for her beautifully compassionate talk, and was duly escorted after to the Mayflower for dinner. "A call from London, a call from California. . . . but not a single piece of paper to tell me anything. . . . I could have been at least properly dressed. . . . I suppose you *could* call it a breakdown in communications," she said good naturedly.

Another founding father of the Society preferred to remain anonymous. According to Dr. Mead, he holds, "the blessing of apostolic succession," from the original Macy Foundation meetings in 1944. He said that he came to the meeting because he is an anthropologist, and "Anthropologists attend cybernetic meetings. What sort of people attend cybernetic symposia? Well, they are nasty, laggard, obsolete. . . . but I suppose that *my* real reason is that I published, in the mid-thirties, a book just on the edge of cybernetics. Then I met Warren McCulloch and became a founding father of feedback." He towered six-feet-six and surveyed the banquet crowd with a twinkling, merry, but disdainful look while sipping his cocktail.

Barbara Raisbeck was asked how it felt to be Norbert Weiner's daughter at a cybernetics symposium. She replied . . . . "Well, if you can imagine being the daughter of Jesus Christ. . . ."

Plans are already underway for the next meet. It is rumored that "*Applications* of Purposive Systems" will be the topic, and the participants will, of necessity, have to come somewhat closer to planet Earth in preparing their papers.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JOBS AND CAREERS IN DATA PROCESSING

Private EDP Training Schools

Swen A. Larsen, President
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To say that there are conflicting and confused opinions about non-college EDP training is a gross understatement. I should like to make it clear at the start that I believe that the proprietary EDP schools are serving a very useful purpose in supplying trained people for the computer industry. But there is a great deal of misinformation abroad about these private schools, and it certainly is our responsibility to examine them carefully.

What are the capabilities of proprietary EDP training schools? And what can they hope to do — and actually do — for beginning and intermediate level workers in the EDP field?

A recent article in *Data Processing Magazine* asked this question: "Do Private Data Processing Schools Need Regulations?" The author, C. B. S. Grant, suggests that they do not. It is his thesis that the private schools are serving a useful purpose in providing people for entry-level jobs in the industry, even though these people are not college graduates. He goes on to suggest that it is rather presumptuous for us to "look down" on this man or that woman who seeks training so that he or she may get a "foot in the door" of the computer industry.

This business of looking down our noses at the graduates of these private schools, reminds me of the advice we received from the President of ACM at the recent Annual Conference, when Professor Oettinger spoke out vigorously concerning the need of the profession to recognize credentials other than purely academic. I sometimes wonder if we are not indulging in a little intellectual snobbery when we suggest that to be a successful programmer one must be a college graduate.

In an article entitled "Private EDP Schools — An Appraisal (*Journal of Data Management,* July, 1967), the Data Processing Management Association had this to say about private EDP schools:

> Reliance on private data processing schools to produce programmers and operators is widespread among data processing managers. Many depend on these schools to provide them with selected, well-trained, qualified people to enter the beginning-level data processing jobs.
>
> The problem of over-sell and under-train, does not lie with the established, well-equipped, and well-staffed private schools. These schools — and there are many of them — have made solid reputations by producing highly trained individuals over a number of years.

In this same article, DPMA took a strong stand against the unethical operators of some private schools, who will admit any student who has sufficient funds to pay his tuition. This type of school offers no entrance exam, nor does it operate with any other means of selection criteria to exclude those who lack an acceptable degree of aptitude. But even though such schools do exist, we should not make the mistake of throwing the baby out with the bath water. Not only as members of ACM, but also as citizens, it should be our purpose to support the good schools and condemn those whose ethics are questionable.

One of the great strengths of our economic system is that it reacts to fill the requirements which are brought on by advances in our technology. Such a requirement is the shortage of trained people which results from the continuing expansion of the computer industry. If the private schools had not reacted to fill this requirement, a void would have developed which would have seriously impaired the growth of the computer industry. There are those who tell us that this training function should rest with our high schools and colleges. I agree that we should encourage our high schools and colleges to expand their training in this field. Some of the courses taught by these proprietary schools, however, do compare favorably with college courses.

John Diebold addressed himself to this problem in a speech at Dartmouth College. He places much of the blame for the sad plight of EDP training directly in the lap of this country's businessmen:

> There is no hope, in the immediate future, that the buck can be passed along to the colleges and high schools. In time, if business understands what its needs truly are and makes these needs known, the educational system will begin to produce young men and women trained not just to use automation equipment, but to understand the potentials of automation.

I should like to emphasize Diebold's point that it is clearly up to you in business to define your requirements and make these needs known to all of the schools — both

Based on a presentation made at the October Meeting of the Washington, D.C. Chapter of the Association for Computing Machinery.

public and private. If you do this, I feel sure that many of the good EDP schools would revise or upgrade their curricula to meet your requirements. We, in the training business, are keenly aware that no good school can prosper unless it can satisfactorily place its graduates.

There is another approach to the solution of the problem caused by the shortage of programmers. This solution was described in the Editorial of the September issue of *Business Automation.*

> To our mind, management holds the key to a more immediate solution. It should train more of its present help to become programmers. Unfortunately, many management people have accepted, by ignorance or persuasion, the fact that programming is an expertise to be grasped only by those with very special educational talents . . . This thinking is really a holdover from the first generation period of computers, when manufacturers convinced the customers that programming required a strong mathematical mind and a university degree. This later proved to be a myth, but with the encouragement of many members of the programming profession, the myth has perpetuated itself through succeeding generations of computers.

The problem, as I see it, is that we are now in a situation where there are an estimated 50,000 programmer jobs going begging in the country, and there is not enough training going on to fill these jobs. *Time* magazine, on August 18, suggested that our problems will become smaller in the years ahead. They put it this way:

> Some time in the 70's, most computer men predict, today's software knot should be untangled, partly by a vast expansion of computer schools and partly by more automation.

If *Time* is right, and if we are going to see a vast expansion of computer schools, I would strongly urge you people in the computer field to give these schools a few suggestions regarding the type of training the students should receive. Perhaps a model curriculum should be drafted for these schools to use as a guide. Another alternative is to determine if the Certificate in Data Processing is a good measure of the type of programmer that is needed. If so, courses could be oriented to prepare students along those lines.

Creative and constructive communication is needed between the professionals in the computer industry, and those who operate schools. I am pleased that some steps are being taken in this direction. On October 3rd, just a couple of weeks ago, I was privileged to attend the first meeting of the ACM-DPMA Joint Committee on Education and Training. This meeting was chaired by Mr. George Nagel, President of the Washington, D.C. Chapter of DPMA, and Mr. John Salerno, Chairman of the ACM Special Interest Group on Standards. The purpose of this initial meeting was to start a discussion between area Commercial Schools and the ADP community on the problems of personnel needs, training, training tools, and methods. The announcement of this meeting carried this statement:

> We must face up to the realities of Commercial ADP training establishments and personnel shortages. The Committee believes that our professional know-how should be used to insure good training wherever training is offered.

I offer some suggestions for your consideration:

1. As members of ACM, as persons working in the computer field, and as citizens, you should actively encourage state legislatures to pass legislation which will make it difficult, if not impossible, for unethical computer schools to operate. California and Illinois have taken this step already.
2. You should encourage local news media to make an in-depth report on computer schools in the area. There is nothing that frightens the unethical operator more than close and incisive scrutiny.
3. You should encourage the efforts of accrediting agencies such as the National Association of Trade and Technical Schools. Our Control Data Institutes have applied to this body for accreditation. I assure you that they do not leave a stone unturned in their examination of a school, before they grant accreditation.
4. You should invite the Directors of the local computer schools to attend meetings such as this one. Ask them to describe for you in detail what and how they are teaching. These Directors and their staffs will welcome constructive criticism and comments from you. You may also be pleasantly surprised with the high caliber of some of these people.
5. When you find a school that engages in unethical practices, call it to the attention of the Better Business Bureau or the Federal Trade Commission. We are just as anxious as you are to get rid of those few that are taking advantage of the public.
6. Send a letter to all of the high school counselors in the area in which you point out what a young man or woman should look for when selecting a computer school. You might also advise these counselors how much salary the graduates of computer schools are getting when you hire them.
7. You should actively encourage the local high schools, junior colleges, and universities to expand their training capability in computing.
8. Finally, encourage the dialogue started by the ACM-DPMA Joint Committee on Education and Training. This will foster a healthy working relationship between the proprietary computer training schools and the computing profession.

CALENDAR OF COMING EVENTS

Jan. 18-19, 1968: First Annual Simulation Symposium, Sheraton-Tampa Motor Inn, Tampa, Fla.; contact Ira M. Kay, P.O. Box 1155, Tampa, Fla. 33601

Jan. 22-23, 1968: The "IV League," Sportsmen's Lodge, N. Hollywood, Calif.; contact Robert Steel, Informatics Inc., 5430 Van Nuys Blvd., Sherman Oaks, Calif.

Feb. 22-23, 1968: Management Conference, the Association of Data Processing Service Organizations (ADAPSO), Jung Hotel, New Orleans, La.; contact W. H. Evans, 947 Old York Rd., Abington, Pa. 19001

March 14-16, 1968: Sixth Annual Symposium on Biomathematics and Computer Science in the Life Sciences, Shamrock Hilton Hotel, Houston, Texas; contact Office of the Dean, The University of Texas Graduate School of Biomedical Sciences at Houston, Div. of Continuing Education, P. O. Box 20367, Houston, Texas 77025

March 18-21, 1968: IEEE International Convention & Exhibition, Coliseum & New York Hilton Hotel, New York, N.Y.; contact J. M. Kinn, IEEE, 345 E. 47th St., New York, N.Y. 10017

Apr. 30-May 2, 1968: Spring Joint Computer Conference, Atlantic City Convention Hall, Atlantic City, N.J.; contact American Federation for Information Processing, 211 East 43rd St., New York, N.Y. 10017

May 1-3, 1968: Joint National ORSA/American TIMS Meeting, St. Francis Hotel, San Francisco, Calif.; contact Miss Joan T. Sullivan, Computer Usage Co., Inc., 3181 Porter Drive, Palo Alto, Calif.

May 3-4, 1968: Fifth Annual National Colloquium on Information Retrieval, University of Pennsylvania, Philadelphia, Pa.; contact Dr. David Lefkowitz, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa. 19104

May 8-10, 1968: Electronic Components Technical Conference, Marriott Twin Bridges Motor Hotel, Washington, D.C.; contact F. M. Collins, Speer Res. Lab., Packard Rd. & 47th St., Niagara Falls, N.Y. 14302

June, 1968: Sixth Annual Conference of The Special Interest Group on Computer Personnel Research of the Association for Computing Machinery; contact A. J. Biamonte, Program Chairman, West Virginia Pulp and Paper Company, 299 Park Ave., New York, N.Y. 10017

June 12-14, 1968: Annual Meeting, The Association of Data Processing Service Organizations (ADAPSO), Waldorf-Astoria, New York, N.Y.; contact W. H. Evans, 947 Old York Rd., Abington, Pa. 19001

June 25-28, 1968: DPMA International Data Processing Conference and Business Exposition, Statler Hilton Hotel, Washington, D.C.; contact Mrs. Margaret Rafferty, DPMA, 505 Busse Hgwy., Park Ridge, Ill. 60068

June 25-27, 1968: Second Annual IEEE Computer Conference, International Hotel, Los Angeles, Calif.; contact John L. Kirkley, 9660 Casaba Ave., Chatsworth, Calif. 91311

July 8-11, 1968: SHARE-ACM-IEEE Fifth Annual Design Automation Workshop; Washington, D.C.; contact H. Freitag, Program Chairman, IBM Thomas J. Watson Research Center, P.O. Box 218, Yorktown Heights, New York, 10598

Aug. 5-10, 1968: IFIP (International Federation for Information Processing) Congress 68, Edinburgh, Scotland; contact John Fowlers & Partners, Ltd., Grand Buildings, Trafalgar Square, London, W.C.2, England

Oct. 29-31, 1968: Fall Joint Computer Conference, San Francisco, Calif.; contact AFIPS Headquarters, 345 E. 47th St., New York, N.Y. 10017

WORLD REPORT – GREAT BRITAIN

Burroughs Is Winning Another Bank

Burroughs is winning National Provincial Bank, with its 1,630 branches all over Britain. The Bank had previously potential orders worth up to $35 m with IBM. It had some $18 m worth of the latter's equipment from the 360 range installed, had a 360/65 on order, and was contemplating a second 360/65, with the hope that it could put the majority of its branches on-line to the two machines.

Now "Nat Pro" (as we call the bank) is considering a Burroughs 8500, and an array of TC500 machines linked over Post Office lines.

This is the second crushing defeat for a manufacturer in the UK banking world — Barclays did exactly the same thing in March last year. At the same time, two other banks of the Big Five group — which have a total of about 8,000 branches — ordered Burroughs terminals. Out of a total $115 m value of orders for new equipment in the past two years — orders designed to set up huge data networks for these big banks — Burroughs has now won something like $90 m.

The Midlands Bank is committed to English Electric for its data network, with 6 to 8 of the largest ($1.4 m) machines. The other two banks, Westminster and Lloyds, are IBM oriented, but, one wonders, for how long.

ICT to Build Biggest British Computer

The other big news in Britain is the decision by International Computers and Tabulators (ICT) not to wait any longer with hand outstretched for Government money, but to go ahead and build the biggest computer ever designed in Britain — more powerful, ICT asserts, than the 1108 or the late lamented 360/90 series.

Borrowing from that milestone in computing, the Atlas, the new 1906A is to use the fastest circuits known to be applied in data processing. These were specially developed under contract by Motorola from its third generation monolithic ECL series.

Cost will be in the $1.5 m to $4.5 m bracket. A prototype has been operating for over 12 months, first with a hybrid circuitry, and since the beginning of the year with the Motorola product.

A preproduction model will be working early next year and first deliveries are scheduled for 1969.

Ample support is expected for the unit, since ICT expects 40 contracts in Britain alone and there is major interest from Europe. ICT's market at the moment is only one-third of the machines upwards of $1.5 m sold in Britain, but it is seeking a much larger share, since 16 percent of total business is for this size machine, and that figure is expected to rise to 25 percent by 1972.

The new design is important in many ways, and it allows for years of expansion. For instance, a fast interleaved store will give a speed of 750 nanoseconds, but the processor will be able to handle a 100 nanosecond store if and when available.

A 48-bit word is standard but when particularly high precision is a must, a 79-bit word will be available. Two-way and four-way interleaving are employed in the stores and asynchronous processor logic allows for overlapping of instructions so that as many as eight can be in process of execution at the same time.

Contrary to most manufacturers' practice, ICT has almost completed work on the operating system for the 1906A, capable of large-scale batching and on-line multi-access operations. Maximum channels will include 30 slow, 16 fast, and two working at 1,500 Kch/sec.

Naturally, following such a blunderbuss from ICT, the new English Electric-Elliott Automation empire had to stage a counterblast. But it made odd reading. Where Elliott has made a submission to the Ministry of Technology on a range in the same price bracket as ICT, and English has tended to pour scorn on the assumed markets for big machines, the merged group is now talking of systems starting at well over $5m!

AEI Continues to Use U.S.-Made Processor

Much against his inclination, the Minister of Technology has had to announce a $3 m development aimed at giving Britain a lead in the adaptive on-line control of a cold-rolling mill which depends on a fast process-control machine basically of US(GE) design, but built in Britain by AEI Automation.

Many attempts have been made to induce the latter to adapt a processor built and designed in the United Kingdom, of the Ferranti Argus or Elliott Arch type, but since AEI has brought off some extremely successful steel and paper mill operations with its Con-pac machine, it does not see any reason to fall in with Ministry ideas — which AEI sees as part of a "grand scheme" to have only two makers of small computers — Ferranti and Elliott.

The cold-rolling mill is at the state-owned Steel Company of Wales. To develop the software, the company will work on model-making with a team at Imperial College, and will base their work on preliminary studies by British Iron and Steel Research Associations.

(Please turn to page 74)

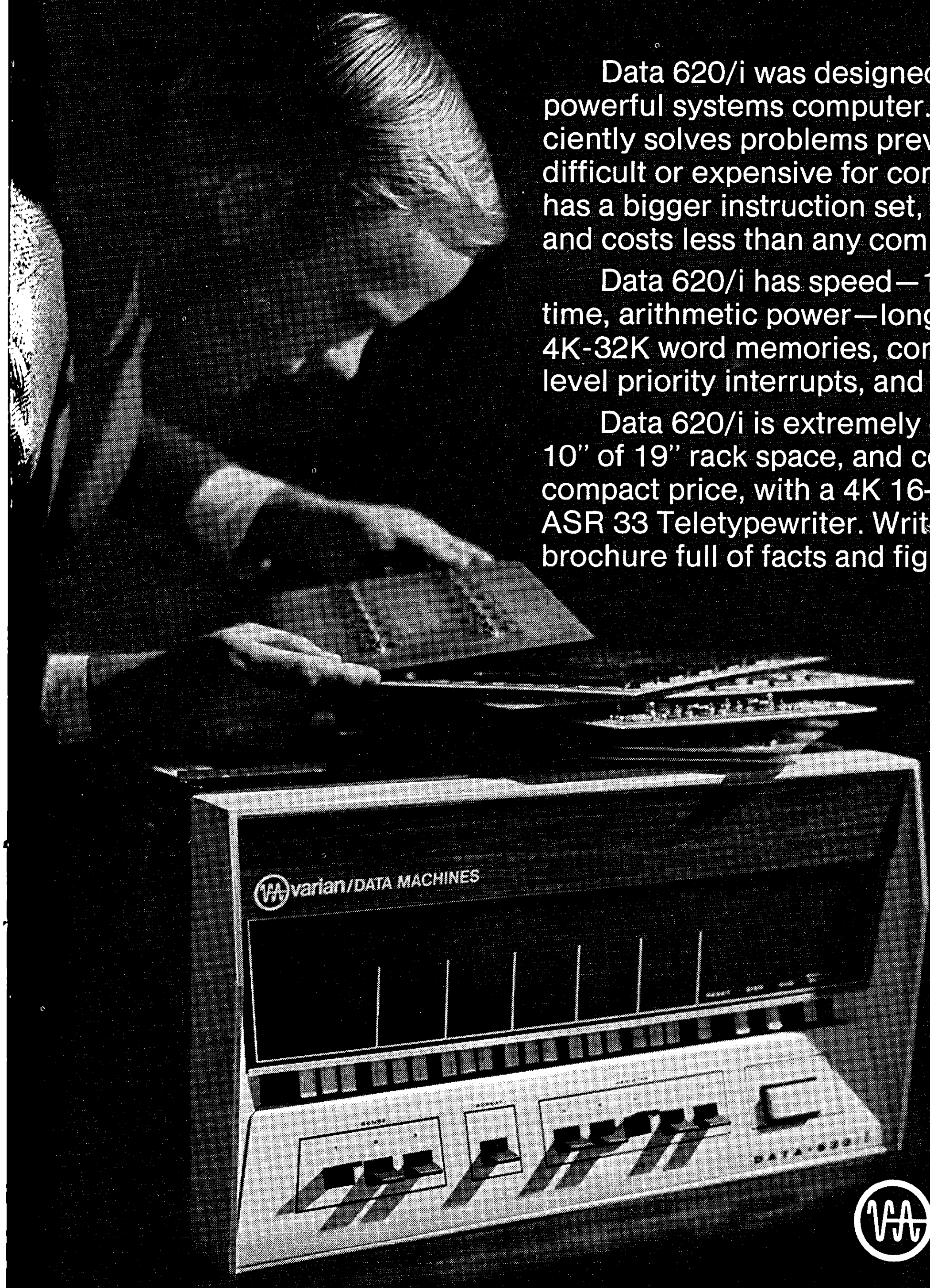
from
varian data machines

If you think your system can't afford computer power, take a look at the new DATA 620/i

Data 620/i was designed from scratch as a powerful systems computer. That's why it so efficiently solves problems previously considered too difficult or expensive for computer solution. Data 620/i has a bigger instruction set, one-half the components, and costs less than any computer in its class.

Data 620/i has speed—1.8 microseconds cycle time, arithmetic power—long 16 or 18 bit words and 4K-32K word memories, control and I/O facilities, multilevel priority interrupts, and field-proven software.

Data 620/i is extremely compact, requiring only 10" of 19" rack space, and comes at an even more compact price, with a 4K 16-bit memory and an ASR 33 Teletypewriter. Write for our new Data 620/i brochure full of facts and figures.



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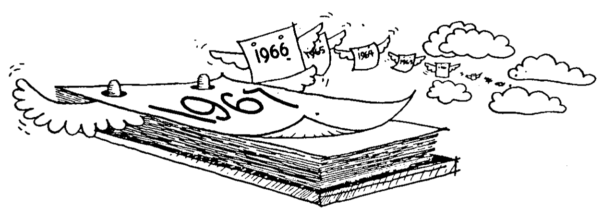
computers and automation

Vol. 2, No. 1 January, 1953



Automatic Computers on Election Night

Eugene F. Murphy and Edmund C. Berkeley

On November 4, [1952] two automatic computers made their appearance on television for the purpose of computing political trends: Univac (Remington-Rand Eckert-Mauchly), on Columbia Broadcasting System TV, and Monrobot (Monroe Calculating Machine Co.) on National Broadcasting System TV.

In the case of Univac, the main part of the problem assigned early in October was to be ready each hour to estimate the number of states to be carried by each candidate, the total electoral vote, and the total popular vote. Starting October 7, a group was formed consisting of Dr. Max A. Woodbury, professor of statistics at the University of Pennsylvania, Dr. Herbert F. Mitchell, Jr., Director of Univac Applications, Remington-Rand, and a couple of programmers — "part time." Several mathematical methods were tried using early election returns of previous years, and were found lacking; finally one was chosen. As the deadline approached, the group included 8 comptometer operators, and 6 programmers, and everyone was putting in a work week of 60 to 120 hours. The final program was checked out at CBS in the early evening of November 4.

At 9:15 on election night, Univac calculated the first complete set of predictions. The automatic printer typed out the following:

.... UNIVAC PREDICTS — WITH 3,398,745 VOTES IN —

	STEVENSON	EISENHOWER
STATES	5	43
ELECTORAL	93	438
POPULAR	18,986,436	32,915,049

THE CHANCES ARE NOW 00 TO 1 IN FAVOR OF THE ELECTION OF EISENHOWER

The men around the machine, many of them worn out with the hectic preparation of the preceding week, could not bring themselves to believe the result, contrary as it was to a great many predictions. So they agreed to change the "national trend factor" that the machine had computed from "40% shift to the Republicans" applying to a certain part of the vote, to 4%, and required the machine to recompute.

At 9:54, the prediction of the electoral votes using the arbitrary 4% trend factor was made: Stevenson 263, Eisenhower 268; and this was released over television. Shortly afterwards, it became clear that the 40% trend factor was much closer to the truth. At 10:32, using the 40% factor, Univac predicted Stevenson 155, Eisenhower 376; and General Draper of Remington-Rand spoke on TV to "explain". And not long afterwards, Stevenson conceded.

On November 13, after the smoke had cleared, Univac was run once again on the election prediction program. The results were:

Time	Stevenson	Eisenhower
9:15	93	438
9:54	103	428
10:32	155	376
11:10	159	372
11:45	172	359
12:45	119	412

On the same night, a Monrobot electronic calculator was rolled into the NBC television studio in Radio City, New York. It was assisted by a number of Monroe mechanical calculators which prepared data for it. The Monrobot was used primarily to compute the odds favoring a candidate in each state. Each calculation took into account the distribution of votes already reported, the number of voters still to be heard from, the trend of votes as shown by partial returns, corresponding data in previous elections, and the uniform or nonuniform behavior of the particular state's voting record.

The general public certainly became more aware of electronic computing machinery in one night than ordinarily would happen in several years of usual development and advertising. Here was first-class evidence of what automatic machinery for handling information could do. Here was evidence of the vast amount of work in preparing a program. Here was a lesson that once a program was in the machine correctly, it was important to keep human beings from tampering with the program. Here was evidence of the troubles of dealing with inaccurate, unchecked data. And all of this evidence was presented to an audience of millions — an audience that could notice oversights and mistakes, and yet be intrigued by this new device.

C.a

WORLD REPORT — AUSTRALIA

Private Industry's Biggest Computer Contract Anticipated

The most valuable computer contract to come from private industry in Australia is expected to be awarded before the end of the year by Broken Hill Pty. Co. Ltd. (B.H.P.), the nation's largest public company.

Industry authorities believe the order will be worth at least $5 million, ranking in value with top Federal Government contracts in recent years.

B.H.P. recently closed tenders for computer installations at its three major steel production centres — Newcastle and Port Kembla in New South Wales and Whyalla in South Australia. The company has not yet publicly disclosed its plans, but it is believed the new installations will provide a basis for a move into sophisticated process control, a type of computer application which so far has made little headway in Australia.

B.H.P., which has long had a monopoly of steel production in Australia, has entered a strong expansionary phase in the last few years with participation in the exploration and exploitation of recently-discovered iron ore and natural gas reserves, and is likely to become the leading private user of computers.

The company is investigating the economics of additional and larger computing requirements for the next six to eight years. This involves a detailed survey of the areas within the organisation where computers can be used to advantage and a study of the equipment currently or soon to become available.

As part of its preparation for vastly increased use of computers, B.H.P. earlier this year launched a large-scale training scheme for programmers and analysts. The move reflected, incidentally, the severity of the problems created for major computer users by the chronic shortage of programmer-analysts and the inability of the educational institutions to make progress in overtaking the growing demand.

The B.H.P. tender, as might be expected, was the major pre-occupation of several computer suppliers for a number of months this year. Altogether seven manufacturers — five American and two British — are understood to have responded. Among them are IBM and Honeywell, the two companies who already have some equipment operating in B.H.P. establishments. A third is Univac, a relative newcomer to the Australian market.

New Computer Users' Association Expected to Have Strong Impact

The newly-formed Australian Computer User's Association plans to establish branches in all States. Its operations so far have been held up by procedural work in drafting a constitution, but this is now completed.

The association, which is the first successful attempt to bring users together in this country, is expected to have a strong impact as a countervailing force to the suppliers. With their own training courses for executives and EDP staff for their customers, the suppliers have tended to exert a dominating influence over the development of computer usage.

No one in the industry denies the value of the contribution made by the suppliers, even allowing for their self-interest, but many individual users for some time have felt the need for an organisation to discuss common problems and to present their views in spheres of influence.

Among the objectives of the association are the interchange of information on such matters as: standards of performance of computers; peripheral devices; data transmission equipment, and ancillary equipment; the design of and relative efficiency of information processing systems; the availability and efficiency of programming languages and the use of programming techniques.

The association also will study developments in the design of information processing systems outside Australia, and the recruitment and training of computer personnel.

Digital Plotters

California Computer Products Inc. has just completed a four weeks' drive to sell more digital plotters in Australia. The campaign was led by its training director, Mr. Ralph Charlton, who gave a series of lectures to actual and potential users in Sydney, Melbourne, Brisbane, and Canberra.

The company, at present represented by a Sydney agent, foresees solid growth in the plotter market. There are now only about 15 plotters in use, mainly at scientific establishments and the universities, but a representative of the agent believes there is immediate scope for the sale of another 25 at least.

Questions Raised Re Use of Computers in Legal Cases

The output produced by computers is raising complex problems for the judiciary and the rest of the legal profession in Australia.

The questions which concern them are: How can the validity of the output be demonstrated? To what extent are the courts prepared to admit the output as evidence?

Light is being shed on these problems by Mr. K. S. Pope, market development manager for International Computers and Tabulators Australia Pty. Ltd., a subsidiary of ICT of the United Kingdom. He has made an extensive study of the legal aspects of electronic data processing, and has given several lectures on the subject of computer society meetings, some of which have included representatives of the legal profession; he was recently invited to speak at the British Computer Society's Datafair at Southampton University.

(Please turn to page 74)

C.a

IDEAS: SPOTLIGHT

COMPUTER-RUN SATELLITE MAY GUIDE SHIPS TO FISH

(Based on an article by William J. Fripp, Staff Reporter, in The Boston Globe, **Boston, Mass., October 13, 1967)**

Space-age computerized fish detection — with satellites directing skippers to fish schools — was predicted in Boston on October 12 by a leading government oceanographer.

"The potential is great for computerized fishing," Dr. Robert E. Stevenson told 300 fishing industry figures at the first annual American Fish Exposition at Suffolk Downs.

Stevenson, assistant director of the Biological Laboratory of the U.S. Bureau of Commercial Fisheries at Galveston, Tex., will participate in a 1969 manned Appollo flight experiment, designed to coordinate sea-space fish hunting.

The aim of the probe, the first of its kind, will be to determine how high-altitude sensory methods can assist commercial fishermen.

"The 1966 Gemini 12 flight revealed certain oceanic conditions that would be of great help to fishermen in detection," Stevenson said. High-resolution films taken 400 nautical miles up by Gemini clearly revealed conditions in sedimentation, tides, and currents marking fish populations and conditions.

Certain types of fish, such as tuna, herring and anchovies, are restricted to specific water conditions, discernible only by high-altitude photography, Stevenson noted.

Fishing boats are limited to five-mile detection through radar, and the skippers are restricted in their scientific knowledge of local conditions.

The 1969 Gemini experiment, Stevenson said, could provide a blueprint for fish hunting.

"What we could eventually have is a computer on every boat tied via telemetry systems to a satellite.

"A captain who was out for tuna in the Caribbean would put a card in the computer giving his location and what he was hunting, and the system would tell him right where to find it."

Ninety percent of commercial fishing is hunting, Stevenson said. "If we could cut down the hunting time to 60 percent, we'd be giving a great boost to industry production."

Fish Expo, sponsored by The Boston Globe, has drawn 12,000 fishing industry figures from government and business since opening day, October 10.

It marks commercial fishing's first attempt to examine its problems and promote its interests on a coordinated, worldwide basis.

C.a

PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

Problem 6712: Maximum Efficiency

Jane, the Computer Center typist, was making furious calculations on her scratch pad when John Lawthorne walked by.

"I thought that when we got this new computer it would put an end to the pencil and paper calculations", he said. "What's the problem?"

"Well, I've got these four reports to type and get reproduced, and I was trying to figure out how to do it in the shortest possible time."

"If they all take the same time, it shouldn't matter."

"But they don't." Jane's forehead furrowed. "They get longer and longer. I figure they'll take 5, 10, 15 and 20 minutes to type."

"And will they take proportionally long to reproduce? I mean, will the second one take twice as long as the first, and so on?"

"Well, no. I'm not making the same number of copies of each. I estimate it will take 8, 9, 11 and 12 minutes respectively to reproduce them."

"The reproducing machine is automatic. You can be running one report while you're typing the next. That should speed things up a bit," John said.

"Yes, but I can't start reproducing one until I've finished typing it."

"So your problem is to figure out in what order to do the reports to get them finished as quickly as possible, right? O.K., do them in this order."

In what order should she do the reports?

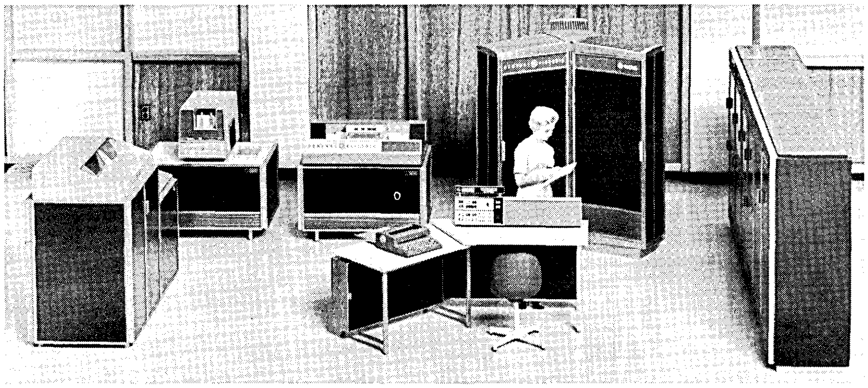
Solution to Problem 6710: Computing Without A Computer

The program would compute the value of $\frac{1}{3} + \frac{1}{7} + \frac{1}{43} +$ ... where D_n (the n-th denominator) $= D_{n-1}(D_{m-1} - 1) + 1$. Now $\frac{1}{2} = \frac{1}{3} + \frac{1}{6}$, $\frac{1}{6} = \frac{1}{7} + \frac{1}{42}$, etc., so that SUM $= \frac{1}{2}$.

Readers are invited to submit problems (and their solutions) for this column to: Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160.

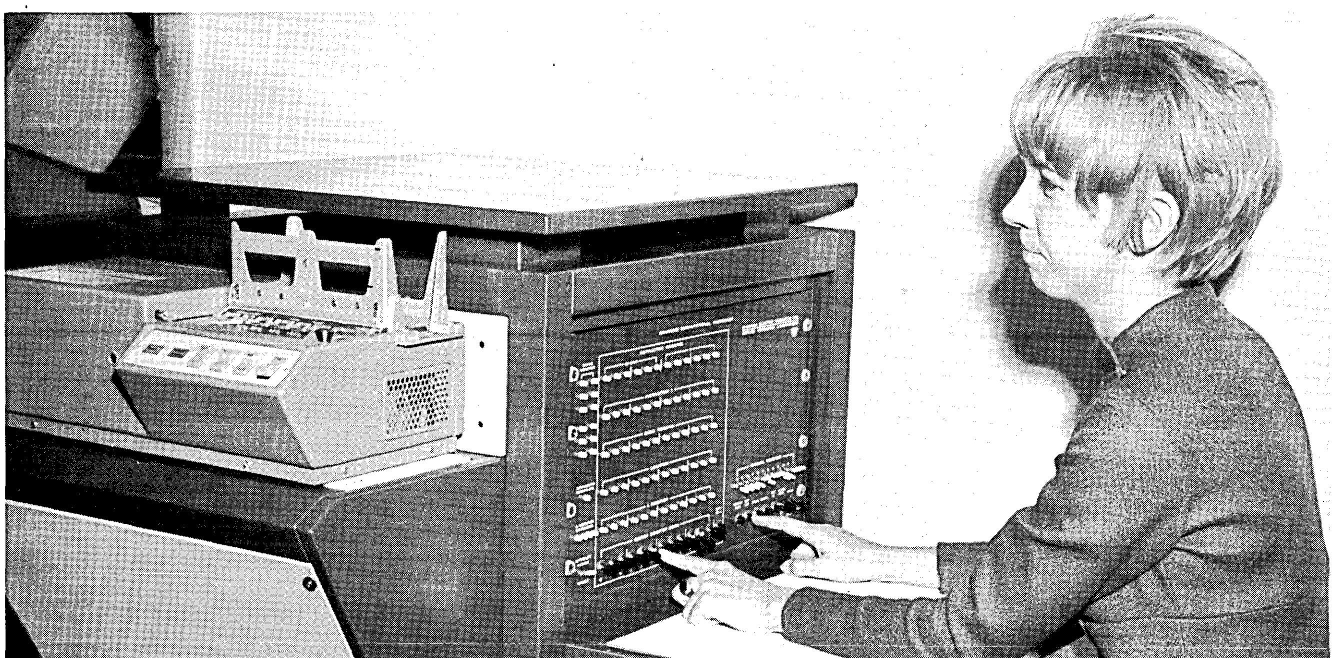
ANNUAL PICTORIAL REPORT

DIGITAL COMPUTERS



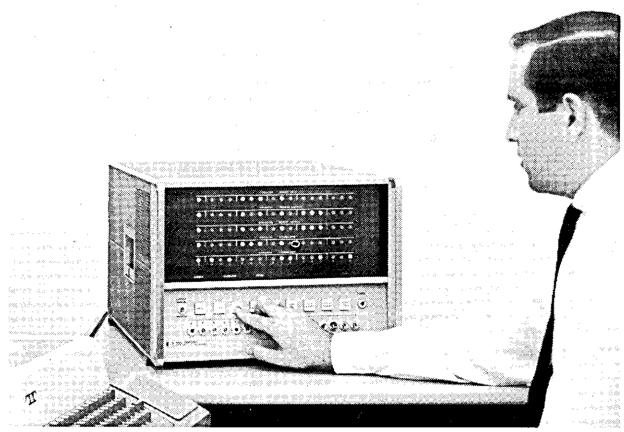
GE-405 COMPUTER / General Electric Company, Phoenix, Ariz. — This is the smallest member of the GE-400 "family" of medium-scale computers. The GE-405 offers 8,000 words of memory and an access speed of two microseconds. It is fully compatible with larger members of the GE-400 series of systems. (Circle #103 on the Reader Service Card.)

ADVANCED COMPUTATIONAL PROCESSOR (ACP) / Sylvania Electric Products Inc., Waltham, Mass. — This ultra-high-speed computer can convert speech into digital information as fast as the words are spoken. Designed and built by Sylvania's Applied Research Laboratory, the device analyzes the basic elements of sound waves as it performs its accelerated conversion. The quick-analysis technique, called "fast fourier transform", is necessary for on-the-spot processing of low frequency audio signals, including sonar and speech, into digital data. Constructed entirely of integrated circuitry, the device performs an average computation in one three-millionth of a second, about five times faster than digital equipment now employed for this purpose. Only complex, special-purpose analog circuitry previously has analyzed sound at input speeds. The fast computation rate of the ACP is due principally to its integrated circuit memory element, which replaces the slower conventional core storage. In addition to its increased speed, the ACP, as a digital computer, has built-in versatility. It takes instructions from relatively uncomplicated programming rather than requiring separate wiring or specialized equipment for each of its jobs as does the analog process. (Circle #107 on the Reader Service Card.)

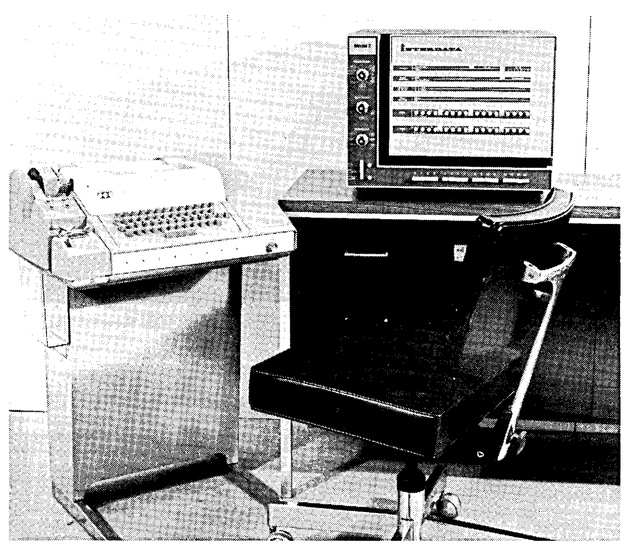


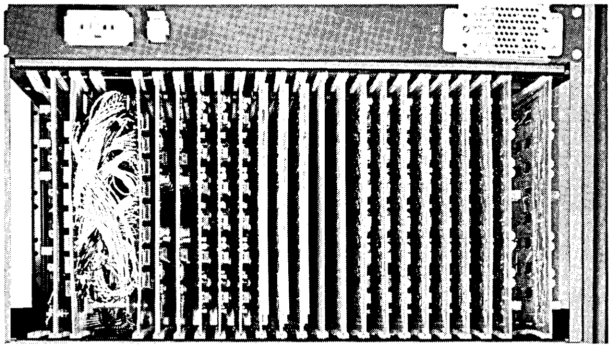
<u>CONTROL DATA 3500 COMPUTER SYSTEM</u> / Control Data Corp., Minneapolis, Minn. — This large-scale, general purpose, multiprogramming system is designed to meet the specific needs of business, scientific, and industrial data processing users. The built-in paged-memory organization and program-relocation features of the 2500 permit efficient multiprogramming for time-sharing applications. Average access time for the 3500 is 600 nanoseconds, and complete cycle time is 900 nanoseconds. (Circle #110 on the Reader Service Card.)

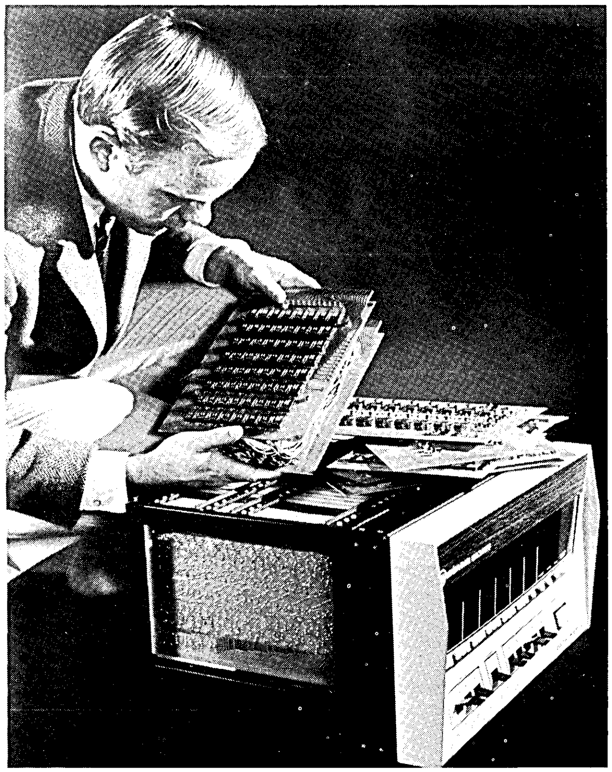
<u>HP 2115A DIGITAL COMPUTER</u> / Hewlett-Packard, Dymec Div., Palo Alto, Calif. — This compact general purpose digital computer has a 4K memory (8K memory alternately available), 16-bit word and 2-microsecond cycle-time. Its basic input/output structure is 8 channels, each with automatic priority interrupt (expandable to 40 channels). The user may reconfigure his hardware to operate with different I/O devices on a modular basis by adding circuits cards to the main frame. Software is designed in modular form to permit simple reconfiguration. Additional equipment to expand the power and versatility of the computer is available on a plug-in basis. This includes disc memory, direct memory access, and an extended arithmetic unit that significantly reduces multiply and divide time. (Circle #106 on the Reader Service Card.)



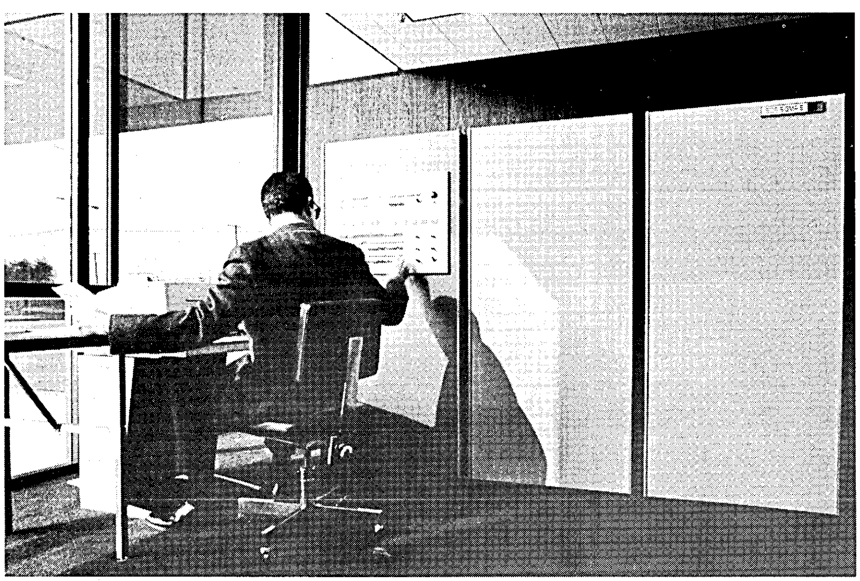
<u>INTERDATA MODEL 2 COMPUTER</u> / Interdata, Oceanport, N.J. — Applications for this special purpose programmable logic system include data acquisition and recording, special purpose device interface and control, small test systems, or as a programmable data buffer. The INTERDATA Model 2 computer is a small, low-cost third generation integrated circuit system. It has a 3 microsecond memory cycle time with 1,024 or 2,048 bytes of ferrite core memory. Over 70 instructions are standard in the repertoire as well as an integrated priority interrupt system for as many as 256 devices. The Model 2 is an economical substitute for hardwired or relay logic controllers with the advantage of stored program flexibility. (Circle #109 on the Reader Service Card.)







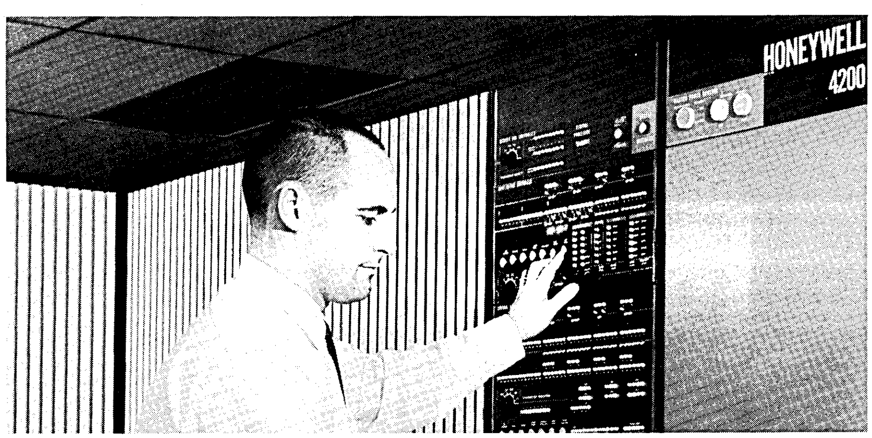
DATA 620i COMPUTER / Varian Data Machines, Newport Beach, Calif. — The 620i is suitable for air and sea duty and offers software field-proven on the former 620 models. Full cycle time is 1.8 microseconds. Typical applications are in analog data acquisition and digital control systems. The console contains displays and data entry switches for all operational registers. Also, there are three sense switches, instruction repeat, single step, run, and power on-off. Other features include interfacing ease, I/O balance with processing power, over 100 commands, and hardware registers for arithmetic and addressing speed. An important optional feature is MICRO-EXEC, which permits software programs to be hard-wired. MICRO-EXEC eliminates the need for additional stored program memory, allowing in some applications a 500 percent increase in speed over conventional stored program techniques. The processor can be supplied with memory modules ranging from 1024 to 37,768 words of 16 or 18 bits. The computer can perform single small tasks easily; numerous large tasks also can be performed with ease because they will not saturate the processing and throughput power. The processors are accessible from the front of the computer; the operation of 85% of all processors can be verified from the front panel without the use of an oscilloscope. Physically, the 620i is 10½ inches high, 19 inches wide, and 15 inches deep. Weight of the main frame alone is only 50 pounds. No additional cooling, sub-flooring, or special wiring is required. (Circle #99 on the Readers Service Card.)

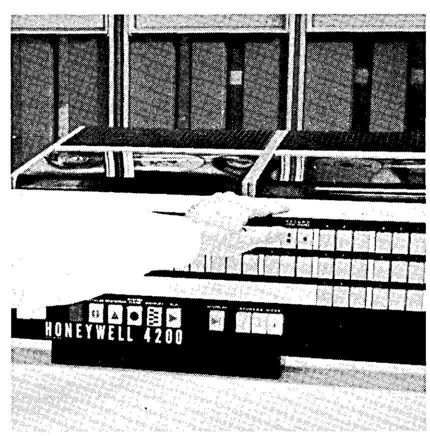


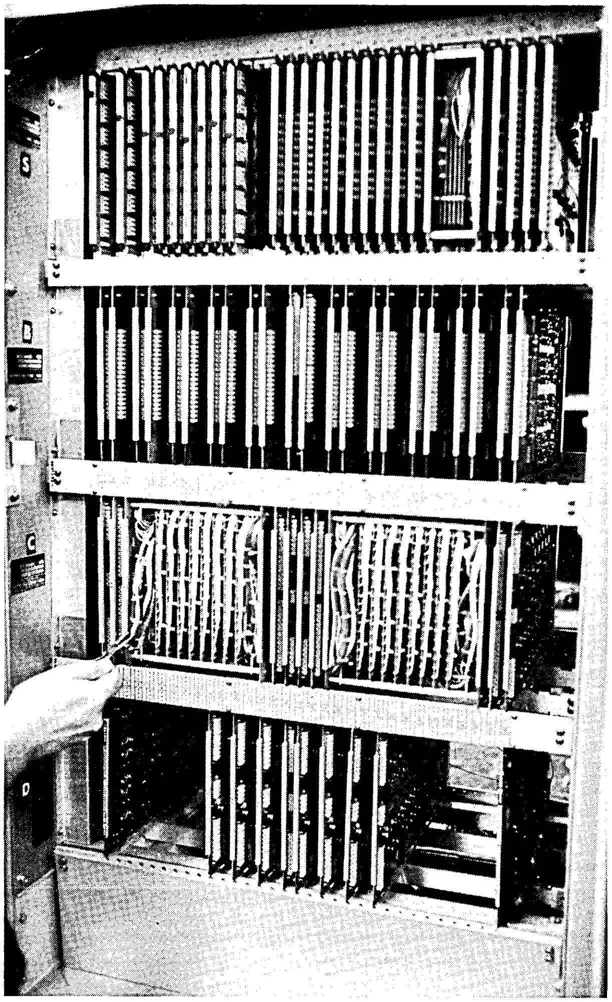
SDS SIGMA 5 COMPUTER / Scientific Data Systems, Santa Monica, Calif. — The Sigma 5, designed for scientific and business applications, can simultaneously perform general purpose computing, handle multiple real-time control functions and process a number of concurrent peripheral input/output operations. Memory cycle time is 850 nanoseconds, which is reduced to 600 nanoseconds when overlapping of memory units occurs. Memory size ranges from 4096 words of 32 bits to 131,072 words. Up to 8 I/O processors, each with capacity for 32 I/O channels, can be provided with the Sigma 5. (Circle #101 on the Readers Service Card.)

PDP-8/I COMPUTER / Digital Equipment Corp., Maynard, Mass. — The basic PDP-8/I has a 12-bit, 4,096 word core memory, expandable to 32,768 words. It is a single address, fixed word length, computer using 12-bit, two's complement arithmetic. Its 1.5 microsecond cycle time performs 333,333 additions per second. This low-priced integrated circuit general purpose computer has all the features of the popular PDP-8 plus a new ease of interfacing, expanded software and new options. The basic PDP-8/I is pre-wired so that the first extra 4,096 words of core memory and the most popular peripherals can be plugged in without further interface. The computer is available in a pedestal-mounted version and in a standard 19" rack mounted version (both shown) as well as in a tabletop model. (Circle #108 on the Reader Service Card.)

HONEYWELL 4200 COMPUTER / Honeywell Electronic Data Processing, Wellesley Hills, Mass. — The Honeywell 4200 combines medium-to-large-scale business data processing capabilities with powerful scientific operations that make it equally applicable to the problems of industry, science, education and government. Operator's area (in the foreground below) has keyboard/printer and pushbutton panel to control system's activity. The central processor subsystem (shown at the right) includes Large-Scale-Integration concepts, integrated circuitry and hybrid circuitry, and can have a maximum main memory of 524,288 characters of information. The maintenance panel provides checks on main memory data, main memory address, control memory data, read-only memory address and contents, and the arithmetic unit. (Circle #111 on the Reader Service Card.)

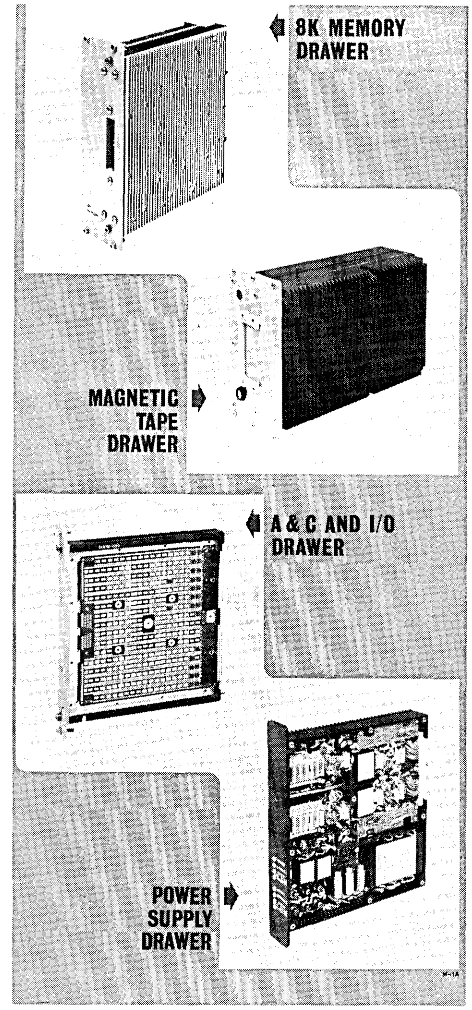


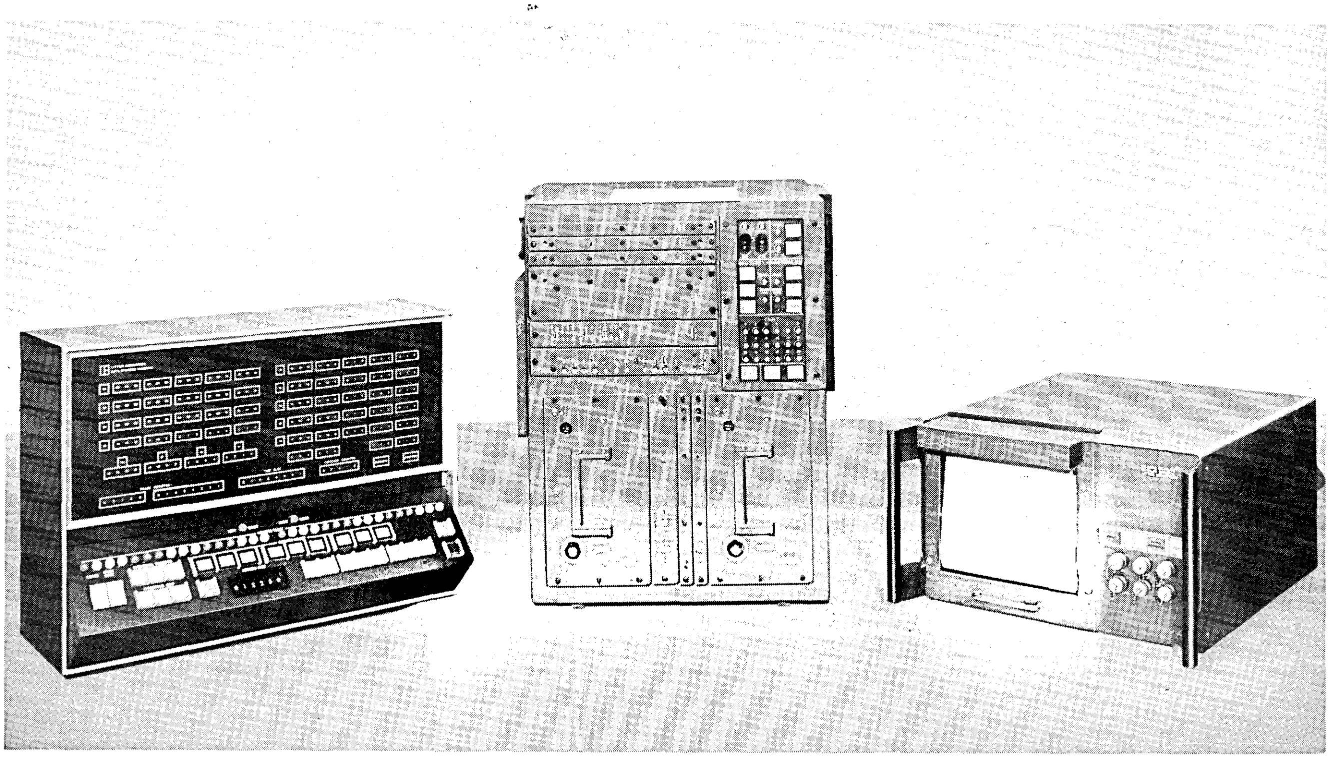




IC-6000 COMPUTER / Standard Computer Corp., Los Angeles, Calif. — A user oriented concept, machine language independence and multi-lingual capability, permits the use of existing program libraries with the IC-6000 without modifications or reprogramming. The IC-6000 is a unique construction that consists, in essence, of a computer within a computer. The inner computer, with its own memory and registers, acts as an interpreter; the outer computer for all practical purposes, acts just as though it were the computer it is intended to model. This interpretive technique is based upon a hardware-software combination called MINIFLOW. MINIFLOW does not take up space in main memory, since the inner computer has its own separate memory. It is much faster than other techniques because the MINIFLOW memory functions four times faster than the main memory, and the two memories operate in an overlap mode. Because MINIFLOW is a hardware-software combination it affords a greater flexibility than pure hardware techniques and greater speed than software translators or emulators. The MINIFLOW system results in complete compatibility of the IC-6000 with the computers it is programmed to model. Generalized input and output interfacing enables the IC-6000 to accept compatible data media such as cards and tapes created for the system it models, as though they were its own. The picture to the left shows the working parts which make the IC-6000 distinctive and unique. Near the right edge of the top line of the circuit board you will find the inner memory which permits the machine to run 7094 and 7044 material without any reprogramming whatsoever. The second row from the bottom contains the two main memory units. Below is an overall view of the IC-6000 installed at dataStation of Los Angeles. It is a twenty-tape system. (Circle #100 on the Readers Service Card.)

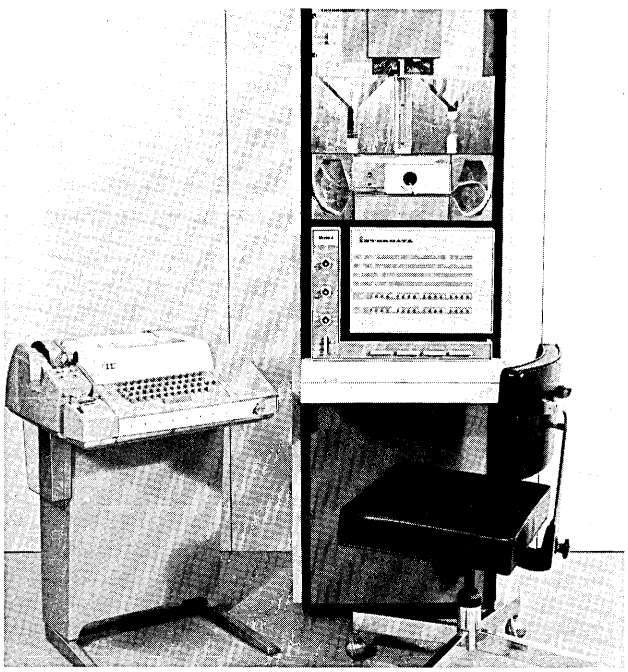
TACTICAL AUTOMATIC DATA PROCESSING SYSTEM (TADPS) / Litton Industries, Van Nuys, Calif. — The TADPS System, together with an extensive operational program package, was built for and delivered to the U.S. Army by the Data Systems Division of Litton Industries. The powerful L-304 computer system is programmed for airborne use. The module in the center of the photo below contains the L-304 stored program general purpose digital computer. The programmer's console for the L-304 is at the left in the picture and the device on the right is a high-speed printer produced by the Datalog Division of Litton Industries. It is an 88 column printer which operates at speeds of up to 100 lines per minute. The central processor of the TADPS System is a dual L-304 arranged in a multiprocessor configuration wereby both computers have complete access to up to 81,920 words of 32-bits each and 2.2 microseconds core memory. The modules shown in the picture to the right comprise the building blocks which make up the computer systems. Three of the module types marked A & C and I/O drawer are required to make one L-304 computer. These modules each contain approximately 500 flat-pack integrated circuits mounted solid copper and epoxy glass multilayer boards. The "8K Memory Drawer" contains 8192 words, 32-bits per word of core memory. The cores used are 22 mil litheum ferrite built in a flat stack configuration. Also contained in the drawer is the all-drive, sense and logic electronics required for the memory to operate independently of other memory modules in the system. The magnetic tape drawer contains a 9-track magnetic tape unit and associated read, write and buffer electronics. The power supply drawer contains the circuitry required to regulate power for two 8K memory drawers or up to 7 computer or interface type drawers. As it is used in a tactical real-time environment, the L-304 is required to respond to changing situations and multiple interrupts occurring at irregular intervals. To meet this requirement the computer is designed to handle up to 64 program levels arranged in a priority sequence, with switching between levels accomplished under logic control in less than 10 microseconds.





Digital

UNIVAC 9300 SYSTEM / Sperry Rand Corp., UNIVAC Div., Philadelphia, Pa. — This member of the 9000 series computers has a plated-wire memory, monolithic integrated circuitry and a memory cycle speed of 600 nanoseconds. The 9300 is equipped with a standard memory size of 8,192 bytes which can be expanded to 32,768. The system can accommodate a maximum of 16 tape units with simultaneous read, write, and compute capability. The UNIVAC 9300 operating system permits concurrent processing of one or two peripheral programs simultaneously with a main processor program. (Circle #102 on the Reader Service Card.)

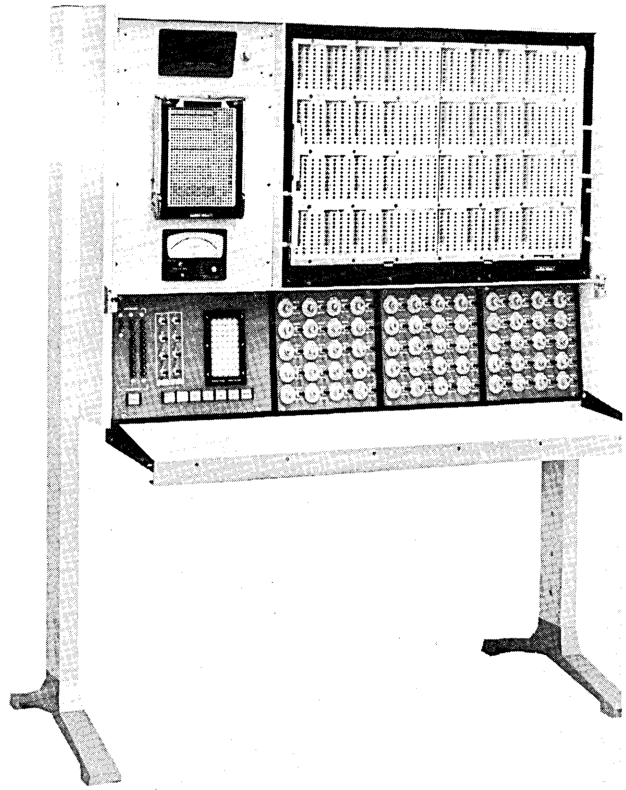


INTERDATA MODEL 4 COMPUTER / Interdata Oceanport, N.J. — The newest in a family of third generation computers from Interdata has an optional instruction repertoire of floating point instructions. The new system, the INTERDATA Model 4, is a medium scale, third generation integrated circuit computer for applications in such areas as automatic test and inspection systems, satellite data concentrator on large-scale systems, data acquisition and logging, nuclear and medical measurements and scientific computation. The Model 4 has a 1.5 microsecond memory cycle time with 4 to 64K bytes of core memory. Over 77 instructions are standard in the repertoire as well as integrated priority interrupt system for up to 256 devices. (Circle #105 on the Reader Service Card.)

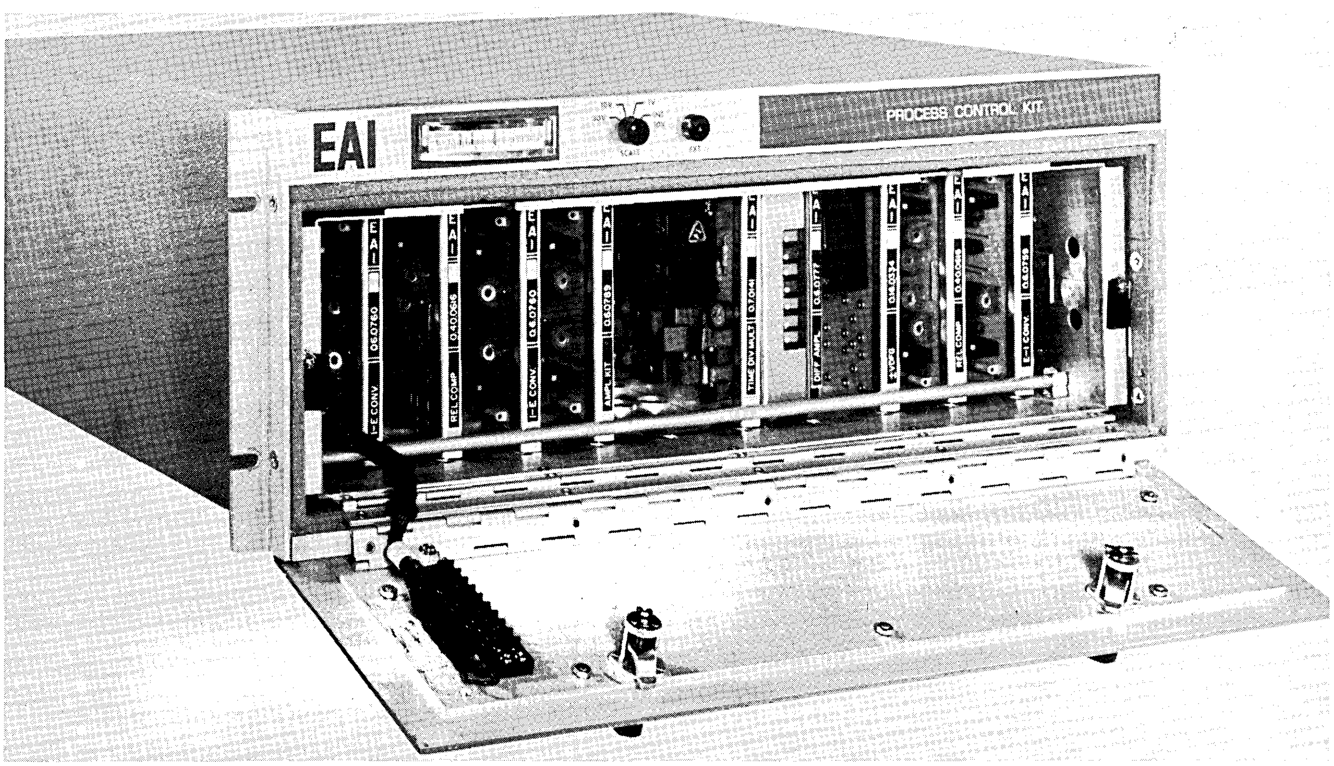
GE-420 TIME-SHARING COMPUTER SYSTEM / General Electric Co., Phoenix, Ariz. — This system is capable of handling 30 users at the same time, operating from remote Teletype terminals connected over telephone lines to the central computer. In normal time-sharing operations, the GE-420 can serve as many as 300 people. The system uses an extended form of the BASIC computer language, first developed by Dartmouth College and used on the GE-265 system. BASIC uses familiar English words as a means of communication with the computer and can be learned by persons totally unfamiliar with computer programming in as little as one hour. For the scientific/engineering user, FORTRAN will be available for the GE-420 during the first quarter of 1968. (Circle #104 on the Reader Service Card.)

ANALOG COMPUTERS

GPS 200T GENERAL PURPOSE ANALOG COMPUTER / GPS Instrument Co., Inc., Newton, Mass. — This all transistorized iterative computing system is for the solution of differential equations and the processing of analog data at high-speed repetition rates. It is designed for operation in multiple timescale repetitive, real time, and real time repetitive modes. The GPS 200T has removeable and interchangeable patching boards and all solid state circuitry. The extended computing range of the GPS 200T is based on an amplifier bandwidth in excess of one megacycle per second for full output. All associated computing elements are compatible with this bandwidth. Although furnished in a compact, desk top size cabinet, the GPS 200T is expandable to a complement of approximately eighty computing elements. (Circle #87 on the Readers Service Card.)



EAI SERIES 10 PROCESSOR / Electronic Associates Inc., West Long Branch, N.J. — The low cost, special purpose analog processor (shown below) is used for operator guides, closed-loop control, signal conditioning and instrumentation. It has modular components for flexibility. Provision is made in the basic unit for acceptance of 10 plug-in modules (shown in the housing unit), each with dual function capability. The Series 10 package includes a built-in power supply, meter and fan. (Circle #85 on the Readers Service Card.)



At last! The computer tape that's not "too good to be true."

Some tapes are. That is, certain of their properties are made "too good." Often at the expense of other, equally important characteristics.

Outstanding tape durability can be gained at the expense of increased head wear; remarkable coating adhesion could mask inherent internal weakness (and result in premature breakdown); "high-powered" magnetic properties may cause the tape to be electrically incompatible with your computer system.

Because magnetic tape properties are frequently interdependent, often conflicting, we make no boasts of specific superiorities for our new Audev K-68 computer tape.

Instead, we deliver a premium tape in which all the critical characteristics have been *balanced* to provide a high initial quality that will not deteriorate with storage or hard use.

What do we mean by balance? Read on.

It's a dirty shame what some "clean" tapes do to your heads.

To begin with, we know what happens when balance is lacking. There is, for example, one computer tape on the market that is excellent in its freedom from dropouts. It makes a remarkable "first-pass" impression. Yet, an imbalance in key properties makes this tape more than 40 times more abrasive than Audev K-68.

One of those key properties is friction, both static and dynamic. And one way to reduce friction is by lubricating the surface of the tape. But this "trick" solution is short-lived and tends to distort start/stop performance.

In Audev K-68, we attacked the problem differently. Carefully combining binder ingredients, processing and surface treatment for proper static and dynamic frictional balance, we've produced a wear-resistant surface that will not break down on high-speed transports.

But, you might ask, couldn't a really hard binder accomplish pretty much the same result? We say...

Don't get stuck by the "sticky tape" test.

Take one of those tough tapes and torture it. No amount of pulling, scratching or stripping off with pressure-sensitive tape will cause the surface to flake or shed oxide.

But this, too, may be an imbalance. What you may not see is a stiffness and brittleness which could make the edges particularly vulnerable to damage.

Audev K-68's balanced cohesive properties prevent coating failure. The binder is hard enough to prevent self-generated dirt caused by abrasion, yet tough enough to keep the edges from deteriorating.

At the same time, K-68's smooth, non-sticky coating provides few anchoring possibilities for ambient dirt or oxide redeposit. And its low resistivity virtually eliminates electrostatic pull on floating dust.

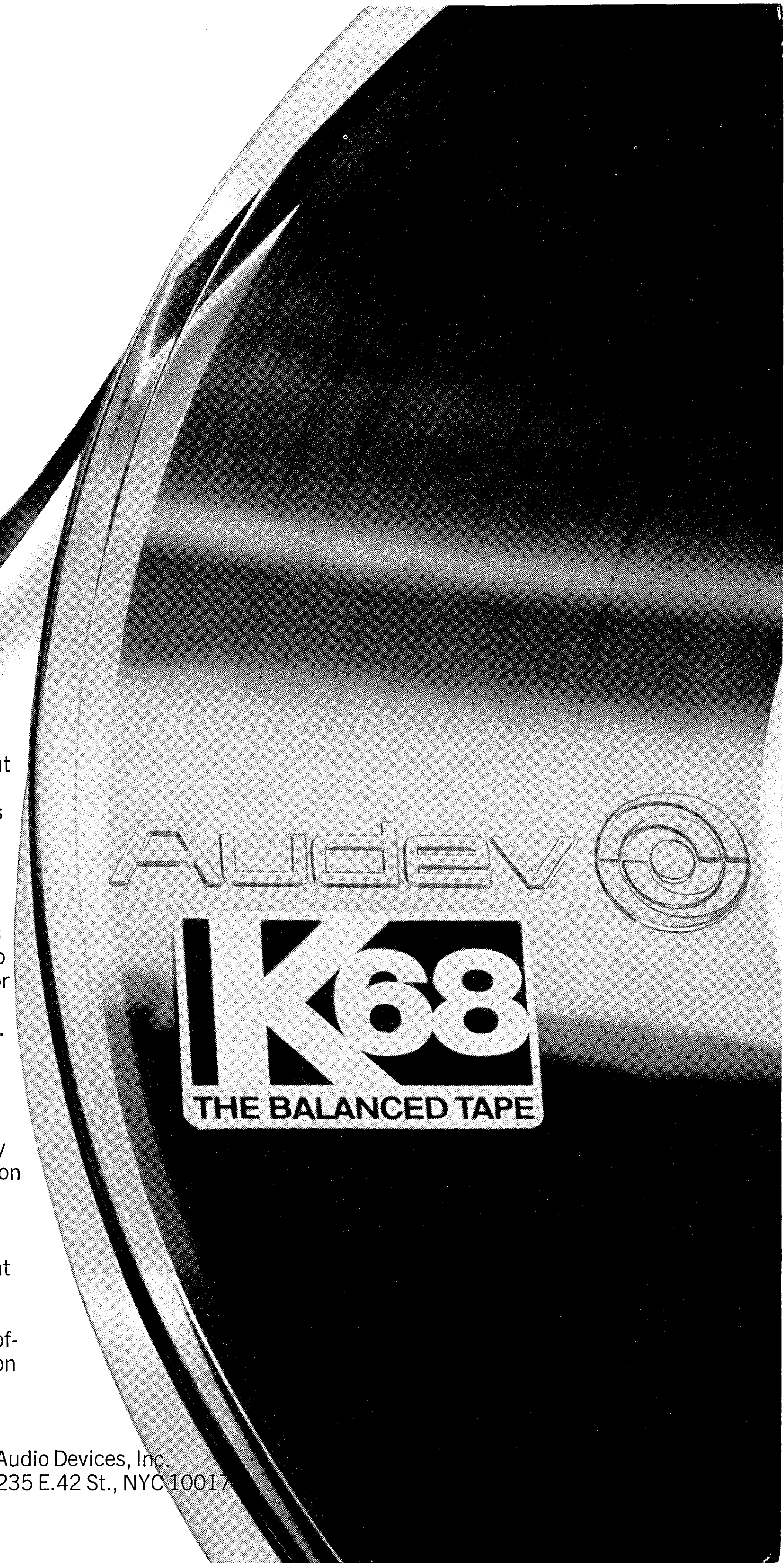
Balance also affects a tape's electrical characteristics.

We do our bit for today's high densities.

The higher bit densities of today's computer systems make demands that previously acceptable tapes can no longer meet. Use of a marginal tape in such circumstances often results in a gradual deterioration of quality. Dropouts increase; costly computer time is lost.

Audev K-68 takes these new, stringent conditions into consideration. Its magnetic properties, coating thickness and surface smoothness are balanced for total compatibility with all computer systems and for equal performance at densities from 556 bpi to 3200 fci and beyond.

How? A balanced interplay between low loss magnetics, precise



coating thickness and surface smoothness reduces pulse crowding, peak shift and dropout sensitivity without changing output or write current requirements.

K-68's balance also contributes to its environmental stability.

Keep cool.
K-68 can take the heat.

Some tapes are as perishable as ripe tomatoes. They react poorly to temperature extremes in storage or transit; they "bruise" easily when moved from transport to transport.

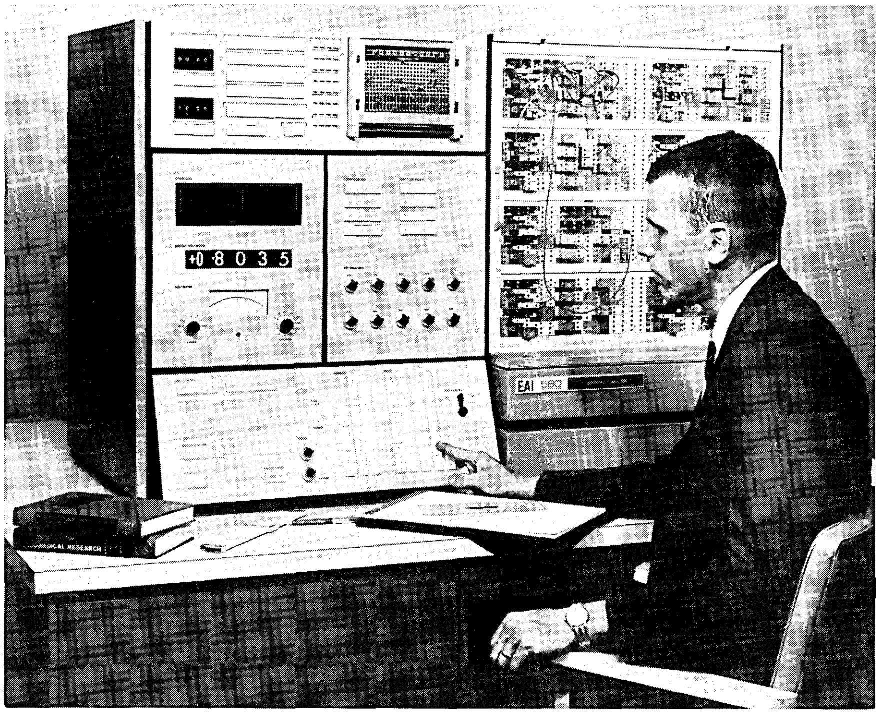
Not Audev K-68. Base and coating properties have been balanced to provide uniform dimensional behavior. Cupping, curling and edge ripples caused by differential expansion or contraction of coating and base have been virtually eliminated.

Nor is Audev K-68 prone to skew-produced, time-displacement errors. Precision slitting, together with the scientifically designed Audev reel—and the low moment-of-inertia of the tape / reel combination —provide smooth tape motion on any transport.

Test a sample reel on your transport. For a change, try a balance, not a compromise.

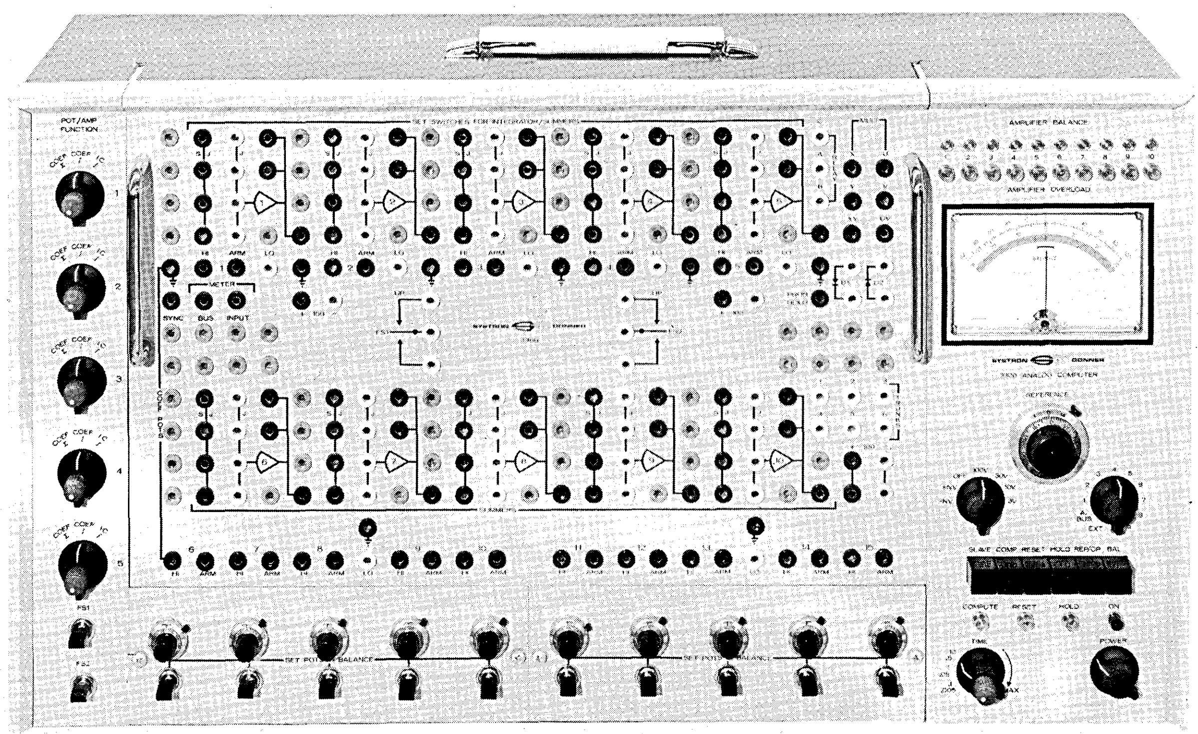
Audio Devices, Inc.
235 E.42 St., NYC 10017

Designate No. 20 on Reader Service Card

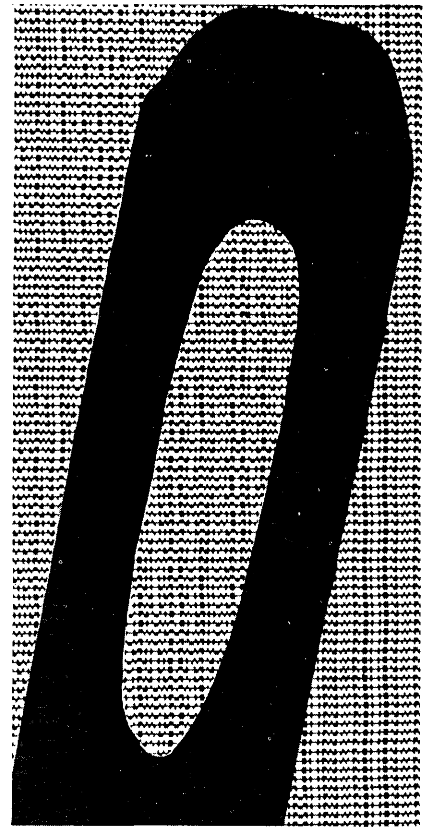


EAI 580 ANALOG/HYBRID COMPUTING SYSTEM / Electronic Associates, Inc., West Long Branch, N.J. — Hybrid computing, once limited to the floor of the computing laboratory, now becomes practical at the desk of the engineer/scientist with this computer. The system provides advanced analog computing capabilities plus all of the requirements for expansion to a full-scale hybrid computing system. The solid-state, 10-volt system includes 80 operational amplifiers, parallel digital logic expansion, and servo-set pots. Eight other amplifiers operate with the system's comparators. (Circle #86 on the Readers Service Card.)

SYSTRON DONNER 3300 ANALOG COMPUTER / Systron Donner Corp., Concord, Calif. — The 3300 Analog Computer (below) is specifically designed for educational classroom use. It features 100 volt range, removable problem board, REP OP mode control and is all solid state construction. (Circle #88 on the Readers Service Card.)

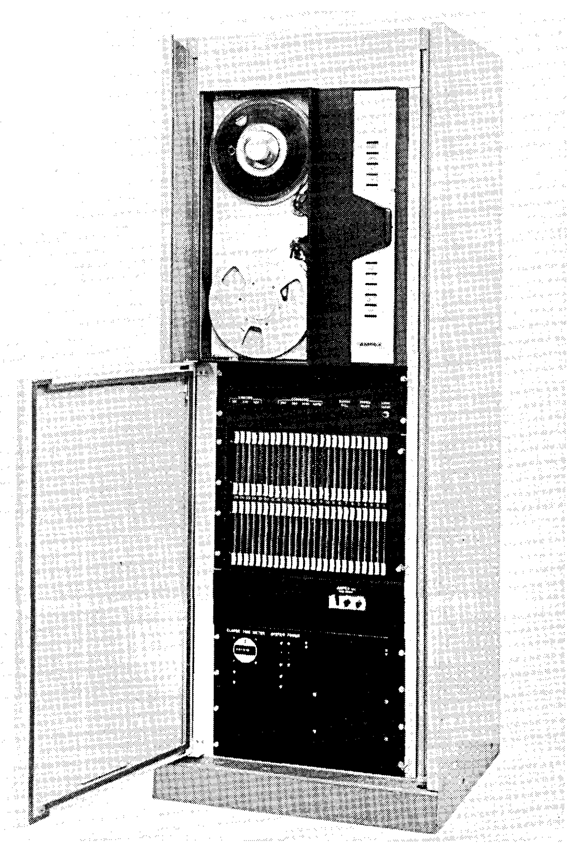


MEMORIES

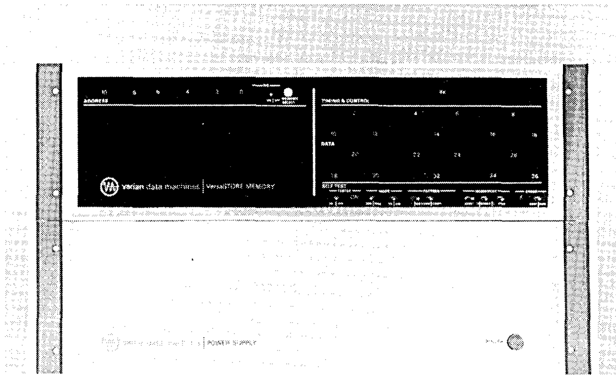


WORLD'S LARGEST COMPUTER STORAGE DEVICE / IBM Corporation, San Jose, Calif. — More than one trillion bits of information — enough data to provide the average person with nearly 200 years of uninterrupted reading — can be stored by this photo-digital storage system, built for the Atomic Energy Commission by the IBM Corporation. The system is installed as part of a vast time-sharing computer network at the Lawrence Radiation Laboratory in Livermore, Calif. Data is stored in files of stacked trays resembling egg crates. Each compartment of a tray (above) holds a plastic cell containing data recorded by an electron beam on pieces of film. The needles eye (shown in the picture at the right) frames more than 2,000 bits of information — enough to record the Lord's Prayer. The data is "painted" on high-resolution film by a beam of electrons. Information is recorded in binary language for computer processing.

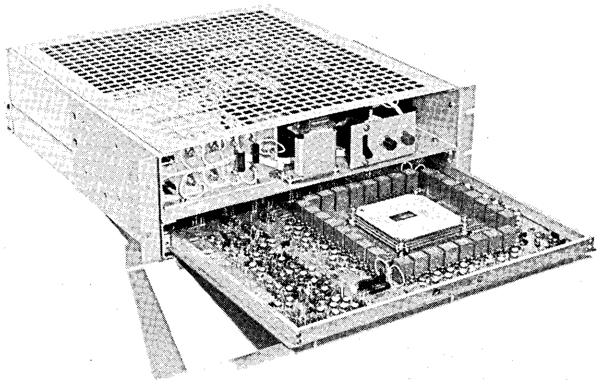
AMPEX BTM-7 BUFFERED MANGETIC TAPE MEMORIES / Ampex Corporation, Redwood City, Calif. — The Ampex line of buffered magnetic tape memories, first to be offered as standard products, includes the Models BTM-7 (pictured), BTM-9, BTM-11 and BTM-12. It accepts asynchronous digital data over a wide range of character rates, re-formats the information and records it on magnetic tape in computer-compatible blocked and gapped form. Applications requiring buffered tape memories are found in industrial data processing areas, test-instrumentation facilities, data transmission terminals, radar sites, telemetry processing centers and research laboratories. (Circle #49 on the Readers Service Card.)



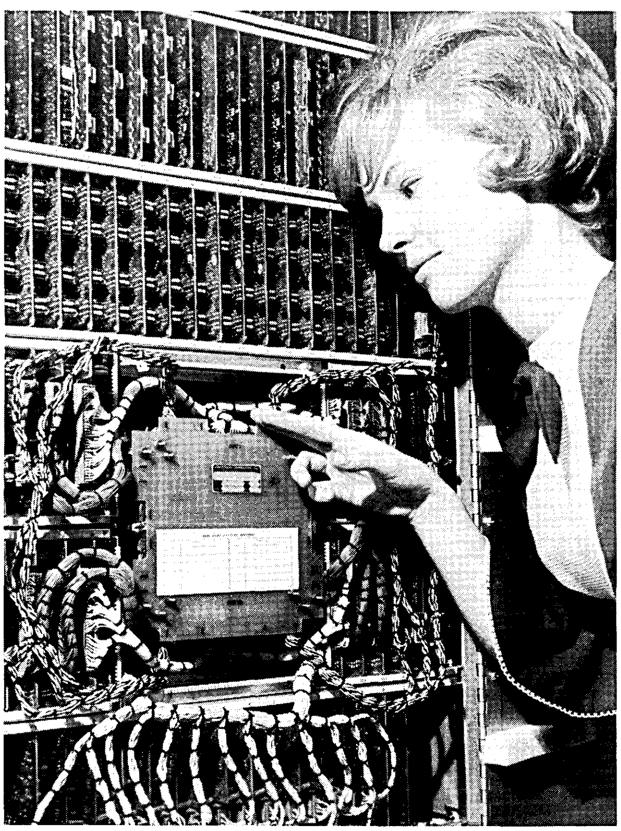
Memories



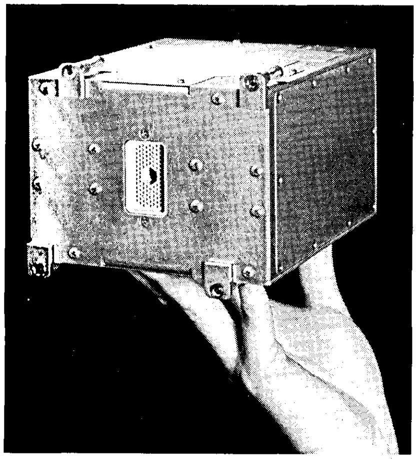
VERSASTORE II, CORE MEMORY SYSTEM / Varian Data Machines, Newport Beach, Calif. — VersaSTORE II operates synchronously at 1.7 microseconds with 750 nanosecond access time. The improved packaging design packs 50% more core memory in the same 5¼" rack-mounted package. The memory is available in increments to 4096 words of 36 bits, and also can be provided as an 8K word memory of up to 18 bits. Several options are available: party line — which enables basic VersaSTORE memories to be cabled in multiples, a built-in self-test feature for quick and easy testing of memory contents and operation, and a variety of timing and control flags. (Circle #60 on the Readers Service Card.)



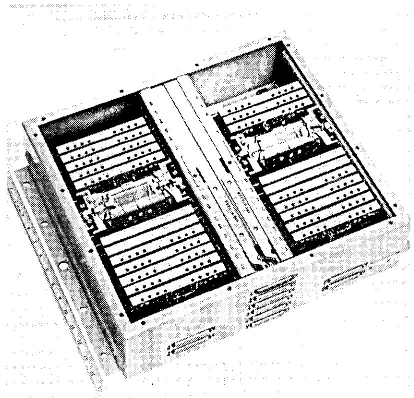
AMPEX MODEL RF-4 CORE MEMORY / Ampex Corp., Redwood City, Calif. — The RF-4 core memory is designed to fill such widely varying roles as high-speed buffer memory for data acquisition systems, main-frame memory for small-to-medium computers, and special purpose memory for land-mobile and airborne digital systems. Model RF-4, complete on a 17-inch square printed circuit board, offers data access time of 400 nanoseconds and capacity of 80,000 bits. (Circle #48 on the Readers Service Card.)



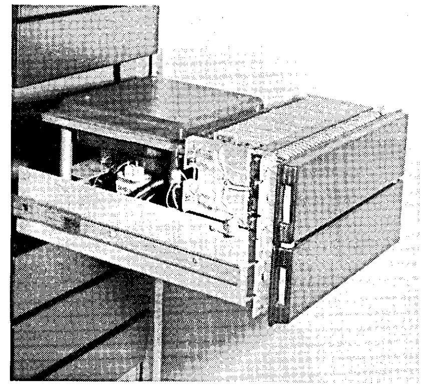
GE MEMORY MODULE / General Electric Company, Phoenix, Ariz. — Here, Gail Peak inspects one of the new GE basic 16,000-word memory modules designed to supplement in "building block" fashion the central memory banks of GE-425 and GE-435 computers. Addition of these modular memories permits a four-fold increase in the former 32,000-word storage capacity, up to as many as 131,000 words. Users can obtain added memory capacity in 16,000 word increments as their work loads require it. The extended memory modules will be available for first deliveries starting in the first quarter of 1968. (Circle #56 on the Readers Service Card.)



LCM 710 CORE MEMORY SYSTEM / Litton Industries, Inc., Guidance and Control Systems Div., Beverly Hills, Cal. — This is one of four memory systems produced by the division. The memories range from random access DRO configurations to serial access DRO, and random access NDRO types. Use of switch core selection techniques eliminates a significant number of semiconductor components. All are compact, light weight and low power designs. Standard expandable memory capacities are 256 to 4096 words with up to 32 bits per word. (Circle #58 on the Readers Service Card.)

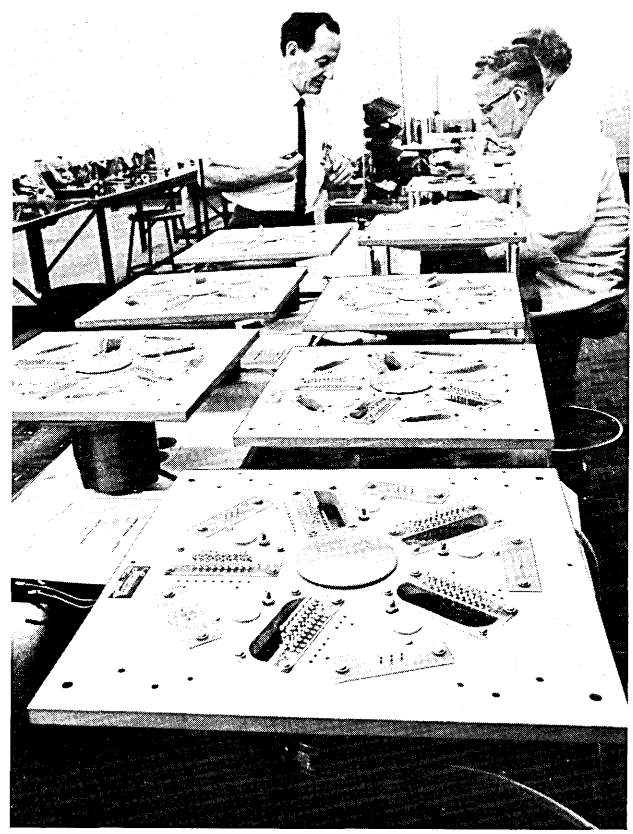


SEMS 7 MEMORY SYSTEM / Electronic Memories, Hawthorne, Cal., — A militarized core memory system, about the size of a briefcase, the SEMS 7 has a 2 microsecond cycle time, a 327,000 bit storage capacity, and meets all applicable MIL Specs. It is designed for military ground and shipboard applications. All system electronics are mounted on plug-in printed circuit boards for easy replacement. Fault diagnosis is simplified by use of functionally oriented modules rather than general purpose building blocks. Memory stacks are readily accessible for repair and replacement if necessary. (Circle #61 on the Readers Service Card.)

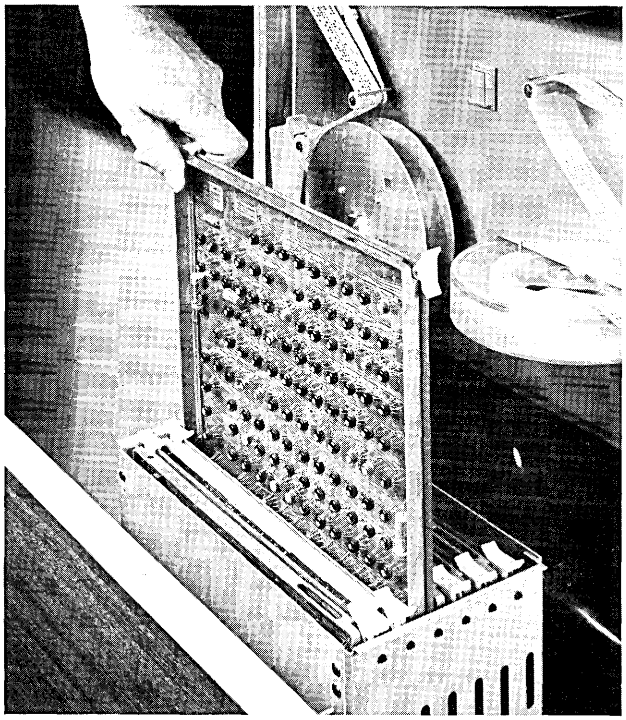


DF32 DECdisc MEMORY / Digital Equipment Corp., Maynard, Mass. — This low cost random access disc memory storage device has significantly expanded the memory capacity of Digital's PDP-8 and PDP-8/S computers. The DF32 DECdisc memory module has a single magnetic disc for storage and electrical interface. It has a capacity of 32,768 thirteen bit words (12 bits plus parity) and can be expanded to 131,072 words with the addition of up to three expander discs of 32,768 words each. The DF32 is a fixed disc with one head per track. Transfer rate is 66 microseconds per 12 bit word. Average access time is 16.67 milliseconds. (Circle #59 on the Readers Service Card.)

L100 SERIES DISC MEMORY SYSTEMS / General Precision Systems Inc., Librascope Group, Glendale, Cal. — Low cost, random access data storage units, which feature read/write heads that float on air during disc rotation, are shown in final assembly. The memories are available in two models: L110-25-1 and L110-8-1. Data and clock storage in both models is on one side of a 10-inch disc. The L110-25-1 has a 1200 rpm disc, a maximum storage capacity of 184,320 bits, and an average access time of 25 milliseconds. It requires 1-1/5 cubic feet of space and weighs 25 pounds. The L110-8-1 has a 3600 rpm disc, a maximum storage capacity of 560,000 bits and an average access time of 8 milliseconds. It requires 1-1/2 cubic feet of space and weighs 41 pounds. (Circle #57 on the Readers Service Card.)

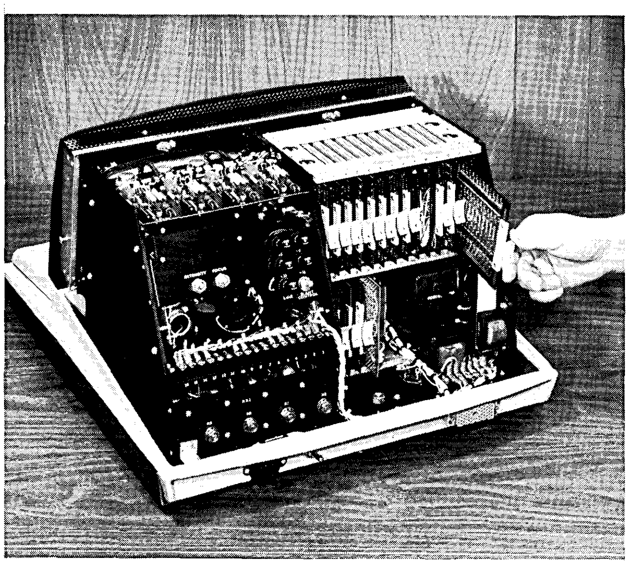


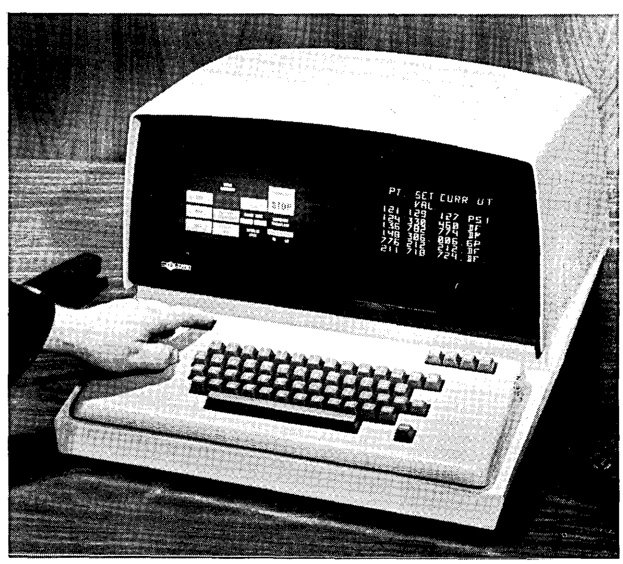
PERIPHERAL EQUIPMENT

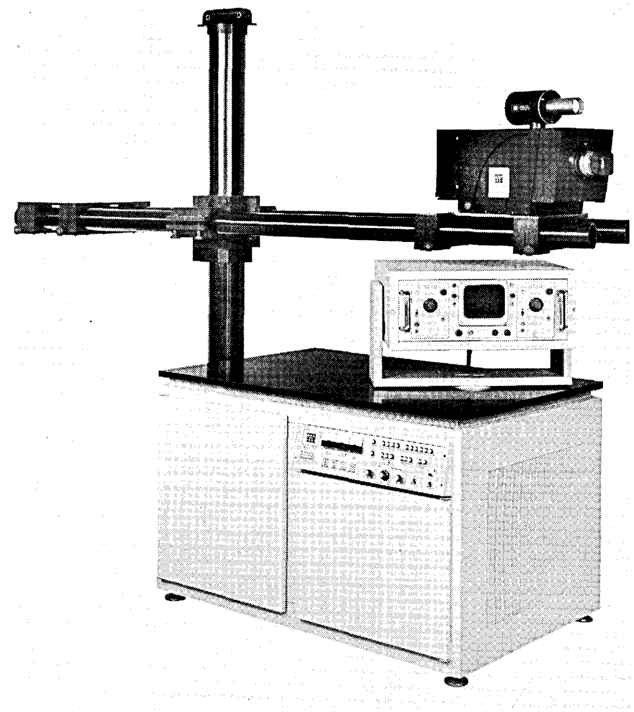


PHOTOTEXTSETTER® MODEL "2000" / Fairchild Graphic Equipment, Plainview, L.I., N.Y. — Model "2000" has a miniaturized, special purpose computer which adds the width of each character in the line, accurately computes the spacing between the words for justification, and then sends positioning instructions to the type matrix and optical system during exposure. The phototypesetting machine sets 18 newspaper lines of type per minute. The picture shows one of the modular circuit boards, which use Fairchild Semiconductor Micrologic integrated circuits. (Circle #64 on the Readers Service Card.)

<u>CRT DISPLAY SYSTEM</u> / Transistor Electronics Corp., Minneapolis, Minn. — An operator of TEC's CRT Display System communicates with the computer in plain English or a familiar code format. Data appears on the screen for review and editing before it is transmitted to the computer. The photo on the left below shows the backside of the system. Prominently identifiable is the card rack containing the control logic and memory printed circuit boards. On the left are the intensity and focus adjustments. The photo on the right below is a front view of the device showing the keyboard console (which can be custom designed to include special function and command keys) and the display panel. Fixed messages appear on the left as part of the DATA-PANEL Display System while variable messages appear on the right of the CRT Display System. The device serves as a desk-top computer terminal or it can be rack mounted. (Circle #62 on the Readers Service Card.)

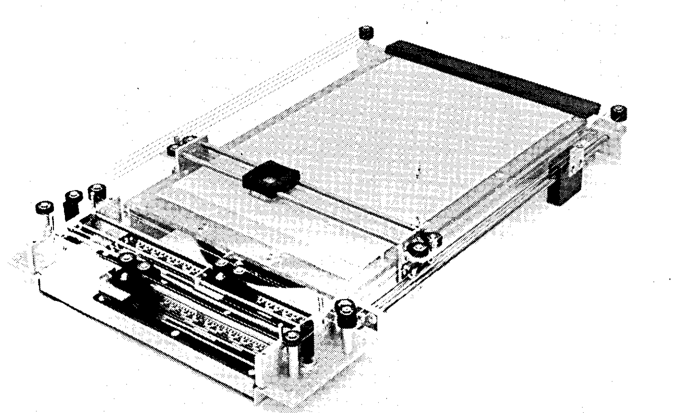


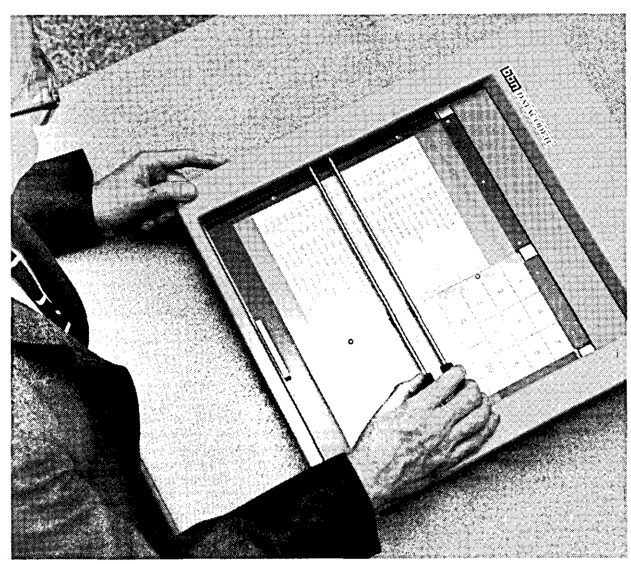




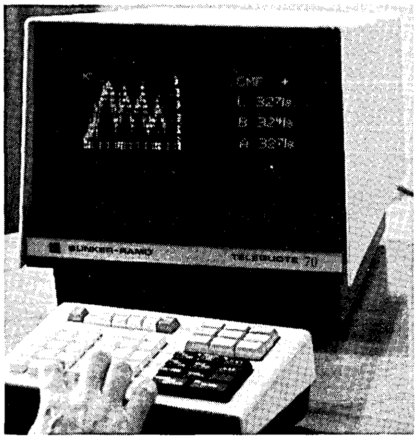
COMPUTER EYE / Information International Inc., West Los Angeles, Calif. — The Computer Eye under control of a computer program can optically sense the surrounding environment; select and examine points or areas in its field of view; recognize patterns; and call for appropriate responses. An outgrowth of III's Programmable Film Readers, the Computer Eye is based on responding to reflected light (reflected from the environment) rather than to transmitted light (transmitted through a previously made film). Among the possible applications of the machine are: measuring and classifying biological samples as "seen" through a microscope; interpreting and digitizing maps, x-rays, photographs, or engineering drawings; detecting and classifying physical flaws in objects; etc. (Circle #64 on the Readers Service Card.)

DATACODER GRAPHIC INPUT DEVICE / Bolt Beranek and Newman Inc., Santa Ana, Calif. — This low-cost on-line computer input device transmits alpha-numeric and graphic information as a function of its X-Y page position. The Datacoder consists of a traveler and manually operated cursor linked to wipers on a pair of X-Y 8-bit Grey encoder boards. It is fully enclosed in an 18" x 20" x 3" cabinet, and has a 12-1/2" x 10-1/2" active working area. Typically, the Datacoder is used in conjunction with a teletypewriter in a remote, time-shared computer terminal. It is well suited for information handling in applications such as hospital and management information systems; reservation systems; planning, production and inventory control; and computer-aided teaching. (Circle #65 on the Readers Service Card.)

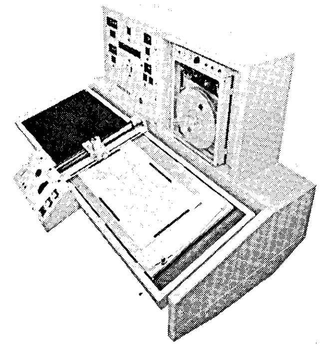




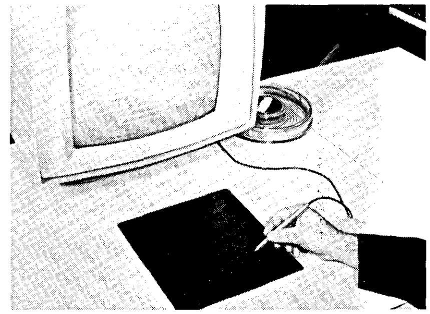
Peripheral Equipment



TELEQUOTE 70 / The Bunker-Ramo Corp., Stamford, Conn. — This market information system brings quotations, stock tickers, news tickers and market trends to the broker's desk on a dual cathode ray screen. The broker can query his computer for research reports and customer portfolio information — and can place buy and sell orders directly. Graphic displays of computer-stored records also can be retrieved. (Circle #73 on the Reader Service Card.)

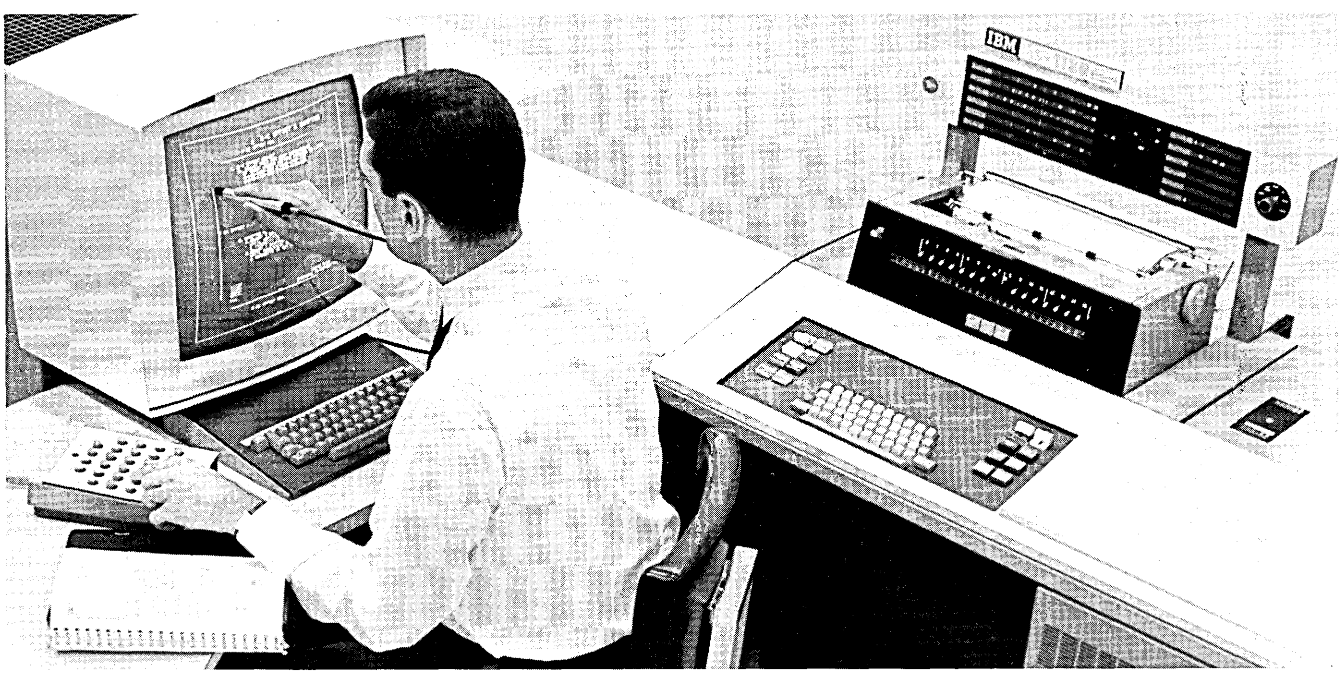


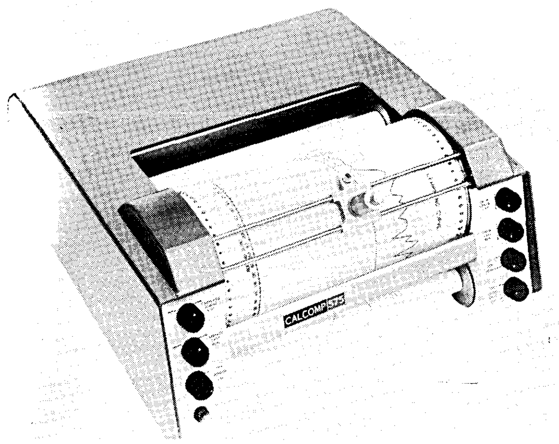
DIGIGRAF MODEL CP-1000 / Keltec Industries, Alexandria, Va. — the Digigraf Model CP-1000 digitizes nearly any graphic presentation — maps, line drawings, charts, curves, and seismograms — and records these data on computer-ready magnetic tape. The chart to be digitized is carried on a table top that moves horizontally parallel to the x-axis. Digitization is accomplished by use of a laterally fixed, vertical-motion lightbeam curve follower. (Circle #72 on the Reader Service Card.)



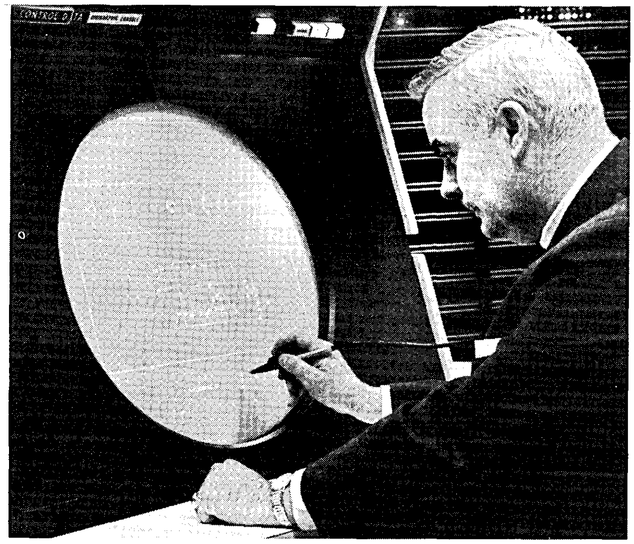
GRAFACON GI/360 / Bolt Beranek and Newman Inc., Data Equipment Div., Santa Ana, Calif. — The GI/360 System is designed to directly interface with the IBM System 360 Central Processor for rapid translation of graphic information into digital data. The system features the GRAFACON 1010A Digital Tablet, with a stylus and associated electronics. The Tablet provides 104 square inches of writing area. The compact GI/360 connects to either the Selector or Multiplexer Channel of the System 360 Central Processor and may be used in conjunction with the IBM 2250 Display Console. (Circle #71 on the Reader Service Card.)

IBM 2250 GRAPHICS DISPLAY DEVICE / IBM Corporation, White Plains, N.Y. — This advanced graphics display device permits users to exchange visual information with the desk-sized IBM 1130 (right). The display, developed especially for scientists, engineers and designers who need fingertip access to their computers, enables them to work with charts, diagrams, drawings, or printed letters and numbers directly on the face of a television-like screen. The user, with an electronic "light pen", can revise images, add or delete lines, modify curves, or change dimensions. He also can change information and images on the screen through the 1130 and 2250 keyboards. (Circle #70 on the Reader Service Card.)



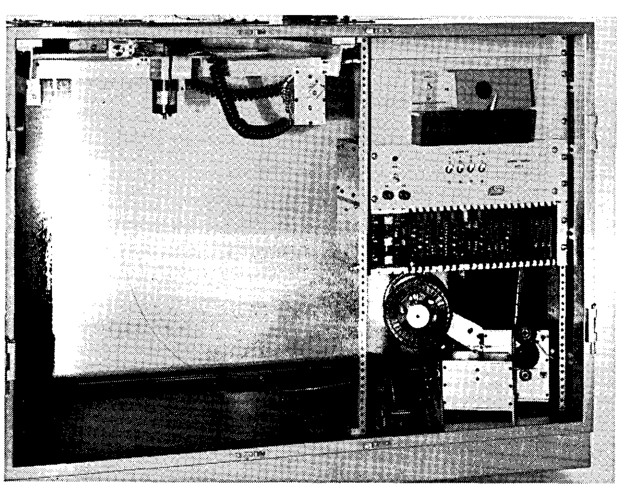


CALCOMP MODEL 575 / California Computer Products, Anaheim, Calif. — Model 575 is designed to interface with a standard telephone company DATA-PHONE device. It provides for high-speed incremental plotting of digital computer output at remote locations. (Circle #67 on the Readers Service Card.)

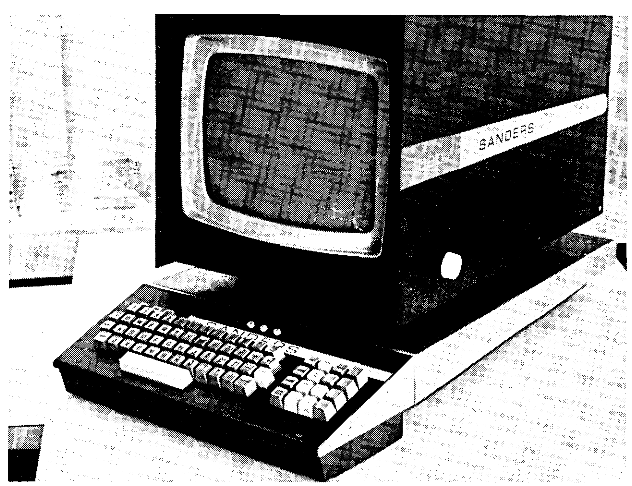


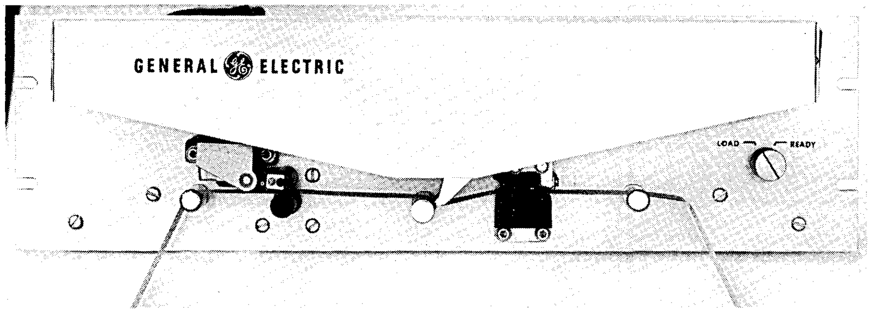
CONTROL DATA 274 DIGIGRAPHICS SYSTEM / Control Data Corp., Minneapolis, Minn. — The engineer in the photo above is using a light pen to make changes in the design of an electronic circuit. Both the circuit and components are displayed on the console of the Control Data 274 Digigraphics System, developed for use with a small-scale CDC 1700 Computer. The Digigraphics System allows an operator to enter data in graphic form directly into an electronic computer for processing, storage and retrieval. (Circle #69 on the Readers Service Card.)

SPATIAL 3-D PLOTTER / Spatial Data Systems, Inc., Goleta, Calif. — Model 501 three-dimensional plotter, shown below in action, is used with a digital computer, and has a resolution of 1/100 inches. The surface of the plotting board can be annotated with ink or pencil before or after a plot is made. The end product is a styro-foam board which supports a group of wire pins. About 100,000 pins per hour may be placed automatically in the 11" x 17" board. Each point on a plot is represented by the top of a wire projecting vertically from the plotting board. The position of each wire on the board represents the X and Y dimension of each point as in an ordinary graph plotter. The height of each wire above the board represents the Z value. The top of each wire represents a point in space. When many wires are placed in the board, a three-dimensional line or surface is produced. (Circle #66 on the Readers Service Card.)

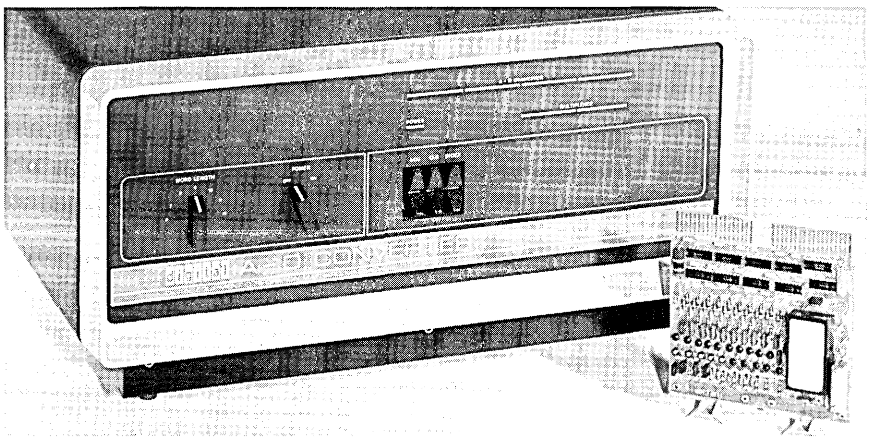


SANDERS 620 DATA DISPLAY / Sanders Associates, Inc., Nashua, N.H. — The 620 "Stand Alone" Data Display is a complete display system housed in a single compact, desk-top terminal. The 620, connecting directly to DATA-PHONE modems, provides instant visual communications to local or remote computer systems. Messages may contain up to 768 characters, which, with standard systems, may be positioned at any of 2048 locations on horizontal screens, and 2080 locations on vertical screens. The 620 is compatible with all major systems, including System/360. (Circle #68 on the Readers Service Card.)

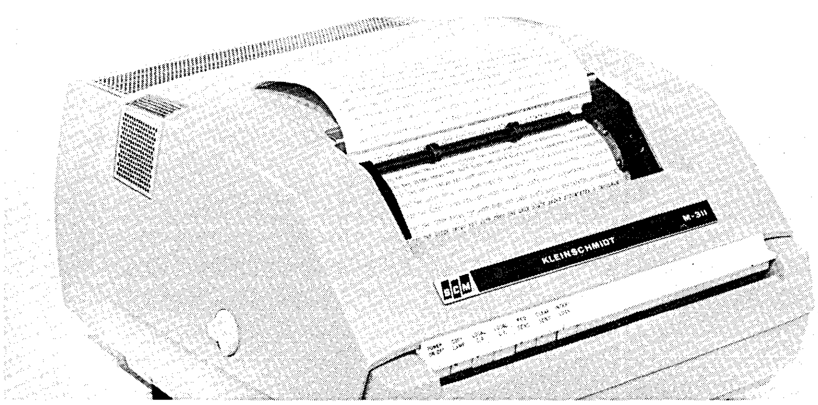




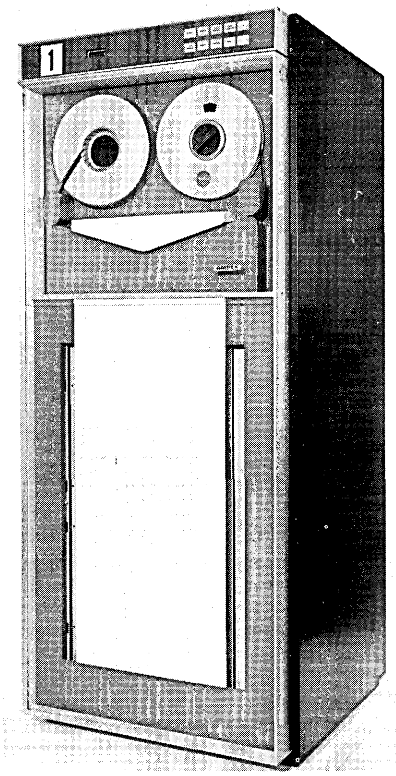
PTR-80 SERIES OF READERS / General Electric Corp., Philadelphia, Pa. — The PTR-80 (unidirectional), shown above, and PTR-81 (bidirectional), based upon a reflected light reading technique, will read virtually any type, width, color, thickness or transparency of tape with no adjustment. Both models offer high reliability at synchronous reading speeds up to 500 characters a second. (Circle #74 on the Reader Service Card.)



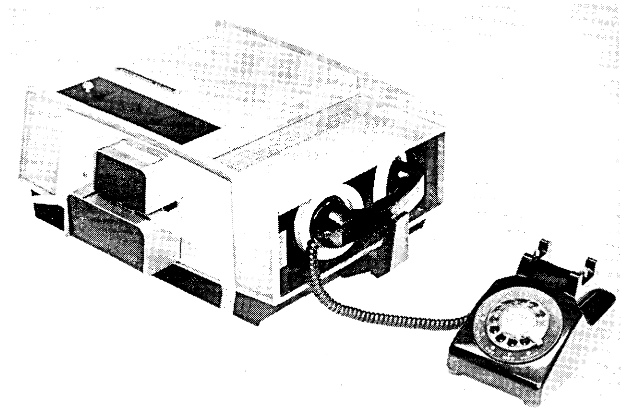
A-D AND D-A CONVERTERS / Digital Equipment Corp., Maynard, Mass. — The variable word length A-D converter (ADC-1) and the 10-bit D-A converter (A-611), shown in the lower right of the picture, represent two of the three new converters recently developed by Digital Equipment Corp. The ADC-1 has a variable word length of up to 12 bits. The 10-bit integrated circuit D-A (A-611) is a complete converter contained on one DEC double FLIP CHIP® logic module. (Circle #76 on the Reader Service Card.)



RECEIVE ONLY MODEL 311 / Kleinschmidt, Div. of SCM Corp., Deerfield, Ill. — Printed read-out of a CRT display is available in the Receive Only Model 311. It is a 40-character-per-second printer, self-contained with interface, electronics, and dc power supply, in a table-top package, designed to operate on ASCII code. A modified ASCII code enables the printer to function without reference to certain parity and control bits of the full ASCII code. (Circle #75 on the Reader Service Card.)

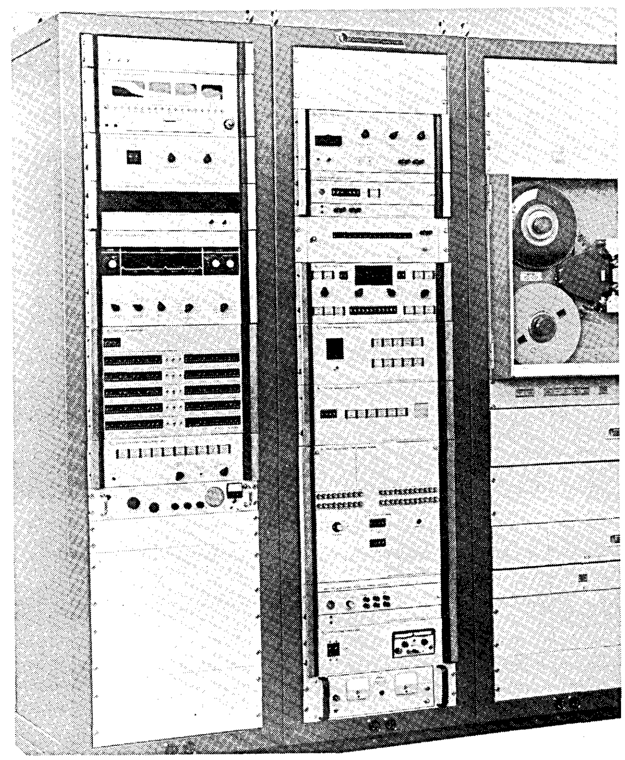


IBM-REPLACEABLE TAPE TRANSPORT / Ampex Corp., Redwood City, Calif. — Ampex Model TM-16 digital tape transport is plug-interchangeable with IBM 729 and 2400 units and has straight-line tape path design for maximum operator speed and convenience. The TM-16 also is designed to incorporate phase encoding, the method of doubling maximum data packing density from 800 to 1600 bits per inch. Tape speeds range from 75 to 150 inches per second, and 75 or 112½ ips in the IBM-replaceable version. (Circle #77 on the Reader Service Card.)



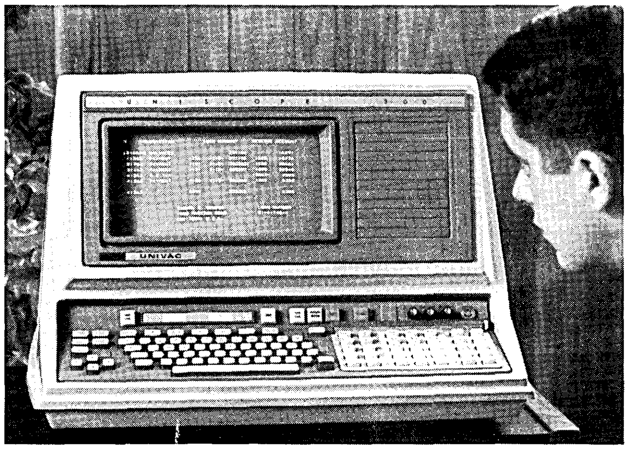
AUDIO-VERTER MODEL 8050 PAPER TAPE TRANSMITTER / Digitronics Corp., Albertson, N.Y. — AUDIO-VERTER (for OEM sales) transmits data from any 5- through 8-channel paper tape using a standard telephone and telephone lines. Model 8050 converts input data to audio tones and couples these tones, via an acoustic coupler, to a standard telephone for transmission. Data is transmitted at 30 characters per second (alphanumeric code) or 43 characters per second (numeric code). The transmitter can send data to a Digitronic 523 Magnetic Tape Terminal or 504 Paper Tape Terminal, with data received in form ready for computer input. (Circle #91 on the Reader Service Card.)

RCA SPECTRA 70/630 DATA GATHERING SYSTEM / Radio Corporation of America, New York, N.Y. — Immediate inventory updating is possible with the Spectra 70/630 Data Gathering System. Key element of the system, the input terminal (shown in the picture above), transmits data from the work area to a computer and provides management with information on inventory changes, down-time on machines and other production facts. DGS is designed for use with Spectra 70/35, 45, or 55 computers. The system is applicable in warehouses, factories, offices, libraries and other institutions. (Circle #90 on the Reader Service Card.)

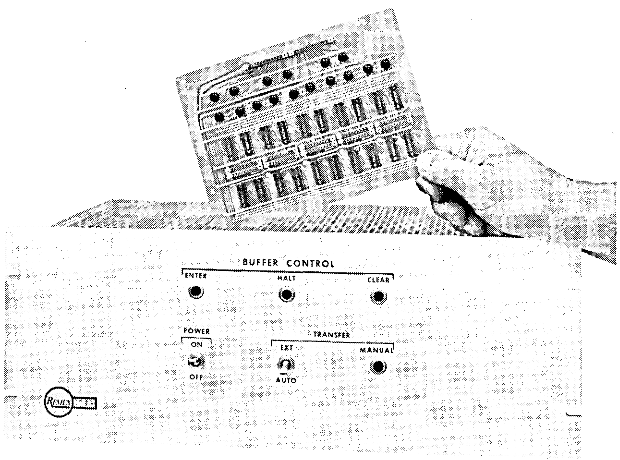


1051 FORMAT CONTROL BUFFER / Electronic Engineering Company of California, Santa Ana, Calif. — Analog or Digital Data can be converted to the 9 track NRZI computer format by EECo's 1051 Format Control Buffer. The 1051 can be tailored to accept inputs from analog multiplexers, A-D converters, time code generators or tape search can control units. Either fixed or variable sampling rates are easily accommodated, and Binary or BCD codes can be used. Controls are provided for single or multiple block operation and writing speeds up to 100K tape characters per second are offered. The output magnetic tape is suitable for use by IBM 360 or RCA Spectra 70 computers. (Circle #89 on the Reader Service Card.)

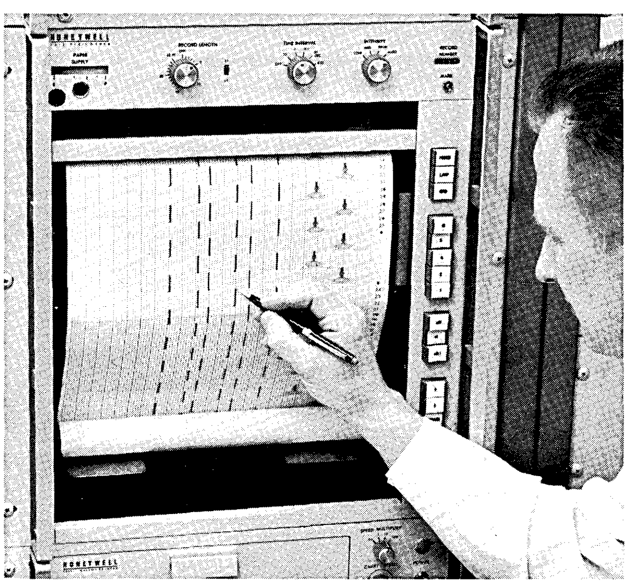
Peripheral Equipment



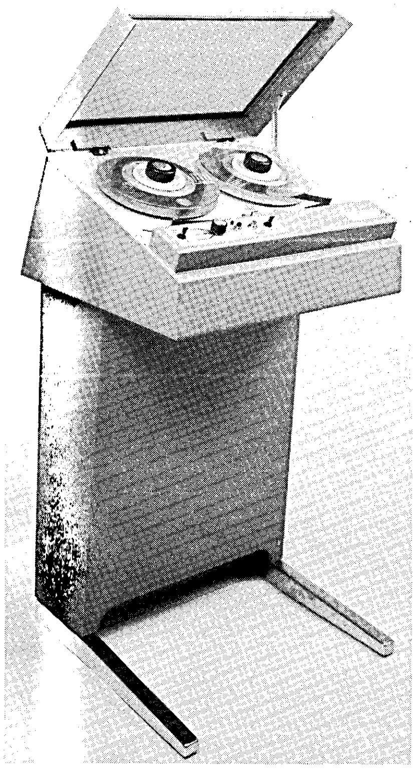
UNISCOPE 300 VISUAL COMMUNICATIONS TERMINAL / Sperry Rand Corp., Univac Division, Philadelphia, Pa. — Designed for instantaneous viewing of computer-stored information, the UNISCOPE 300 consists of a keyboard, a cathode ray tube display screen and associated control unit. The device is suitable for use as a self-contained unit or in a multi-station version providing up to 48 keyboard displays directed by one control unit. Many different queries and replies can be shown on the screen concurrently. For purposes of comparison and analysis the screen can be split in half or into other segments. Each UNISCOPE keyboard operates independently of any other keyboard. (Circle #93 on the Reader Service Card.)



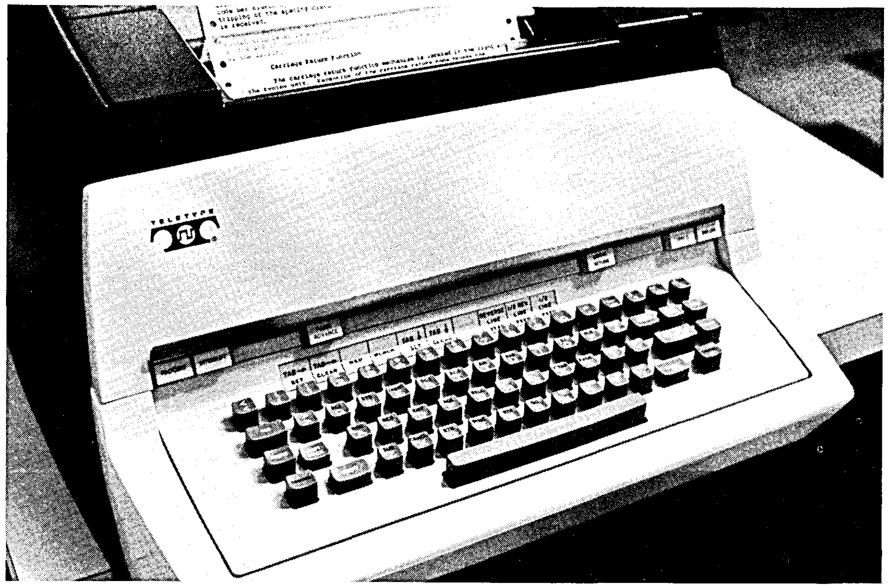
RBC-400 BLOCK-STOR / Remex Electronics, Hawthorne, Calif. — The RBC-400 has all integrated circuit logic and is capable of storing up to 40 lines of data in the single rack mounted unit — twice the storage capability of other comparable devices. The BLOCK-STOR combines the advantages of a block reader with the speed and reliability of a photoelectric tape reader. Its primary advantage over conventional block readers is that it can accept tapes that have large amounts of accumulated linear tolerances between characters. (Circle #94 on the Reader Service Card.)



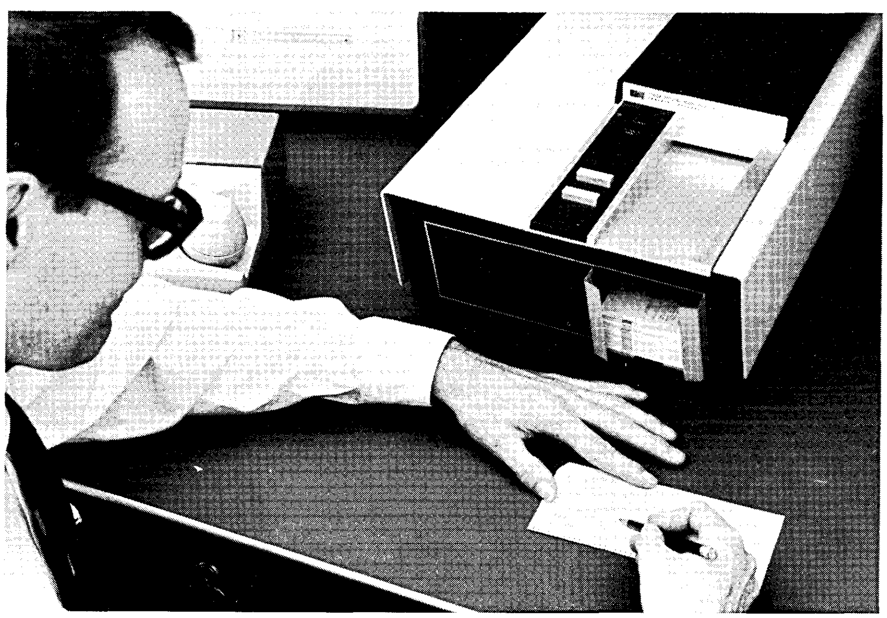
MODEL 1912 VISICORDER / Honeywell Test Instruments Div., Denver, Colo. — The Visicorder oscillograph achieves precise and reliable recording of analog data through the extensive use of integrated circuits and advanced servo drive techniques. The Model 1912 is a 12-inch, 36-channel, light-beam, direct-print instrument that can record dynamic data at frequencies in excess of 13kHz. It has 15 operating speeds, from 0.1 to 160 inches per second. (Circle #92 on the Reader Service Card.)



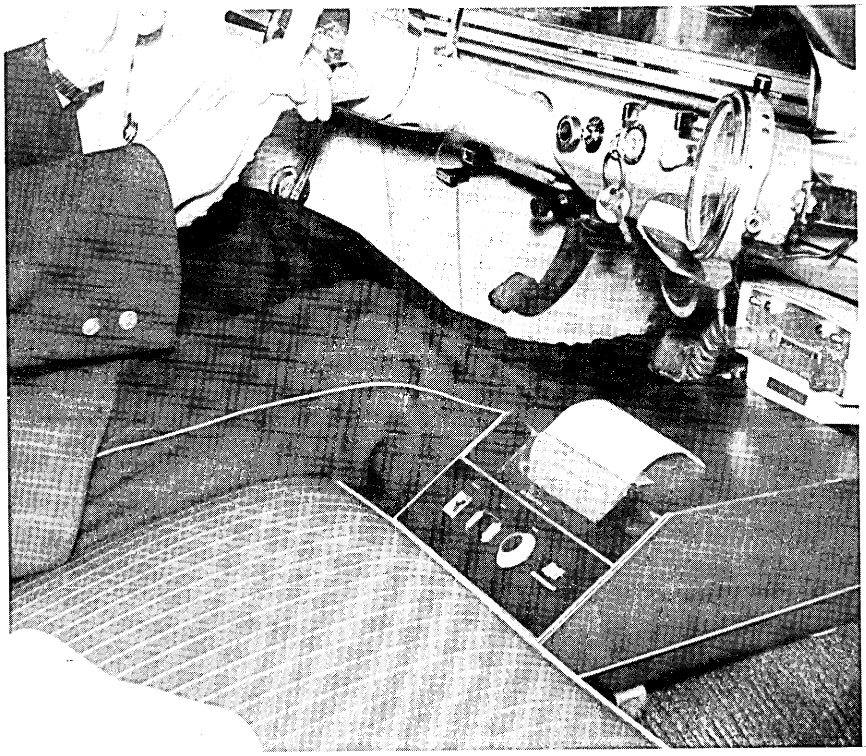
SERIES 407 OFF LINE MAGNETIC TAPE READER / Trans-Controls, Inc., Pacific Grove, Calif. — The Series 407 is an economical magnetic tape "read-only" transport with associated electronics designed to operate with incremental plotters manufactured by Houston Omnigraphic Corp., Benson-Lehner Corp., and California Computer Products, with "plug-in" compatibility. The Series 407 can read an IBM compatible 7 track 1/2-inch tape (200, 556, or 800 BPI) on an 8 1/2-inch reel. Thus, the computer can write tapes at high speed in real time which may then be placed on the Series 407 and plotted at the slow plotter speed "off-line". Various configurations are available which provide local or remote plotting via telephone lines. (Circle #95 on the Reader Service Card.)



MODEL 37 KSR (KEYBOARD SEND-RECEIVE) SET / Teletype Corp., Skokie, Ill. — The ability to operate at 150 words per minute (15 characters per second) and print 128 graphics are key features of the Model 37 KSR Set. First in a full line of data communications equipment, it is designed to use the complete U.S.A. Standard Code for Information Interchange (USASCII). It also can be used as a computer input/output device and has applications in such office routine as the preparation of sales orders and other business forms. (Circle #96 on the Reader Service Card.)

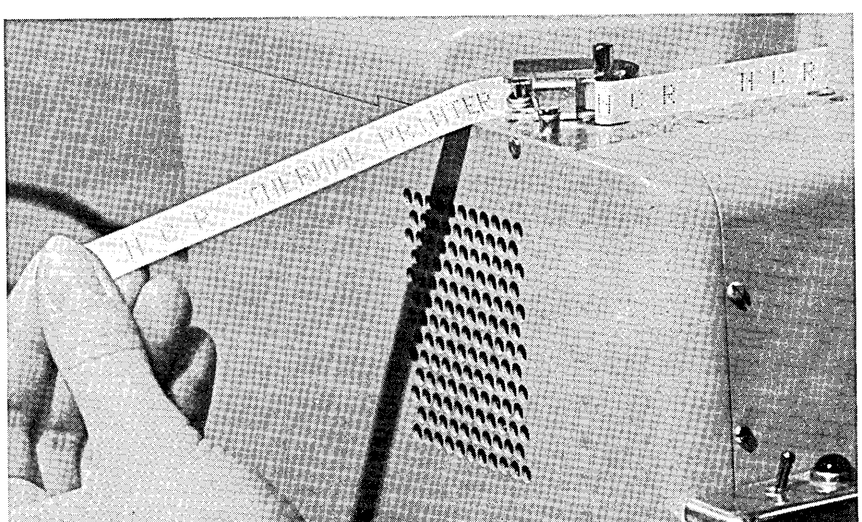


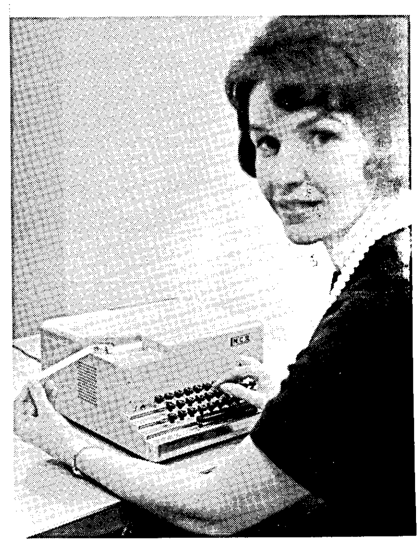
MODEL 2760A OPTICAL MARK READER / Hewlett Packard, Palo Alto, Calif. — Tab cards to be read by the Model 2760A may be all punched, or all marked in soft pencil, or any combination of the two. Errors in pencilled entries can be erased. Reading rate and output format of the reader are compatible with standard telephone data sets, and appropriate for simple data communication situations using Teletype, Data-Speed, or other tape perforators. Standard rate is 105 characters per second; 10 characters per second is optional. Model 2760A is available both to OEM and user markets. (Circle #97 on the Reader Service Card.)



TELESCRIPTER / Kleinschmidt Telecommunications Div. of SCM Corp., New York, N.Y. — A compact electronic page printer, the Telescripter is designed for mounting to the floor board of a vehicle or for placement on a mobile radio console. The fully transistorized machine weighs only 12½ lbs. including paper, and prints any shape or number of characters at the rate of 75 words per minute. In contrast to conventional radio communications systems which often are misinterpreted due to distortion or garbling, words and numerals are printed out clearly. In addition, the police officer or commercial field vehicle operator who must leave his vehicle from time to time, will find accurate printed messages in the Telescripter upon his return. (Circle #78 on the Reader Service Card.)

"THERMAL" PRINTING DEVICE / National Cash Register Co., Dayton, Ohio — A printing concept developed by NCR may eventually provide noiseless desk-top computer printers for data output to management in remote locations. An experimental "thermal" printing device is equipped with a keyboard and a single printing head. Similar devices equipped with multiple printing heads would have a potential for printing data, line-by-line, at speeds of up to several thousand lines a minute. Design of the device is based on a newly developed principle to convert electrical signals directly into characters and symbols. The unique printing action, requiring only heat, is virtually instantaneous, and because there is no impact, the operation is noiseless. The only moving parts are in the paper transport. NCR is manufacturing a Miniature Page Printer and a Tape Printer-Reader as part of a new communications system for the Armed Forces. (Circle #98 on the Reader Service Card.)



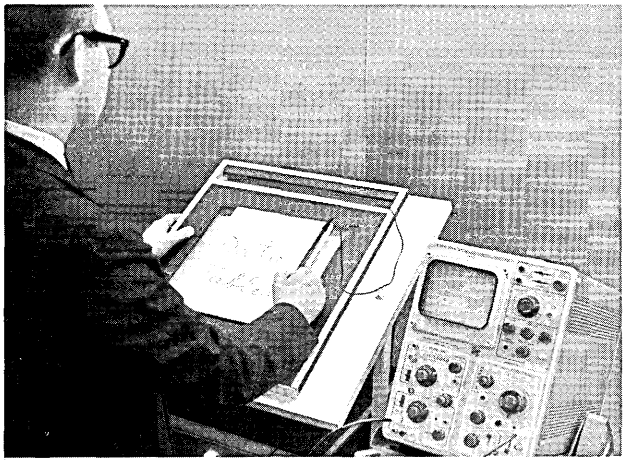


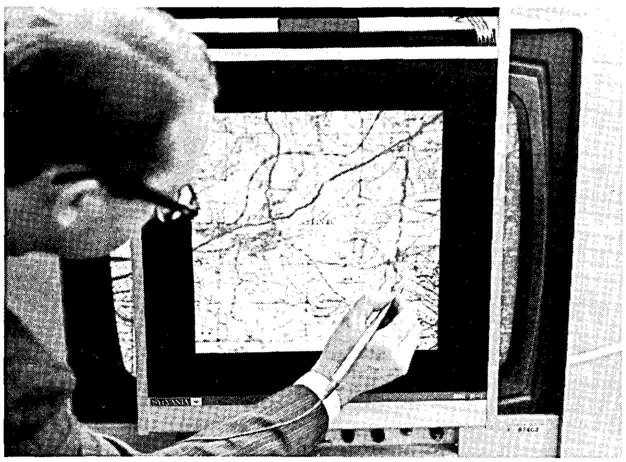
CONTROL DATA 512 LINE PRINTER / Control Data Corp., Minneapolis, Minn. — Horizontally moving type insures consistant print quality by this high-speed line printer which was demonstrated by Control Data at the Fall Joint Computer Conference last month. Control panels are located in both the front and the rear of the 512 to save operator time and effort. Type cartridges used on the 512 Line Printer are available in a variety of fonts. A 48-character font is printed at 1200 lines perminute; faster printing speeds can be obtained with fewer characters (up to 1500 lines perminute), and larger fonts can be printed at slower speeds. The 512 is designed for use with all CDC® 6000 and 3000 Series Computers. (Circle #80 on the Readers Service Card.)

PTR-120 HIGH-SPEED PRINTER / General Electric Co., Phoenix, Ariz. — The PTR-120 has a special buffering mechanism that permits a continuous printing while computing or performing an input or output operation. It is available with up to 136 print positions per printed line. It has standard 120-column print positions, with a normal print character set of 64. A maximum speed of 780 lines per minute is attained with the 48 most commonly used characters. When using the full 64 characters, printer speed is 630 lines perminute. (Circle #83 on the Readers Service Card.)

UNIVAC DCS-1 COMMUNICATIONS SYSTEM / Sperry Rand Corp., UNIVAC Div., Philadelphia, Pa. — A highly-flexible communications capability for the UNIVAC 9200/9300 Computer Systems has been achieved with the introduction of the DCS-1 Data Communications Subsystem. Using the DCS-1, the 9200/9300 computers can be used either as remote processing terminals or as small-scale central computer facilities. Features of the DCS-1 include the use of monolithic integrated circuits; nanosecond memory access; fully overlapped processing and communication; modular design; and a wide selection of options to allow on-site conversion as communication needs change. (Circle #79 on the Readers Service Card.)

Peripheral Equipment

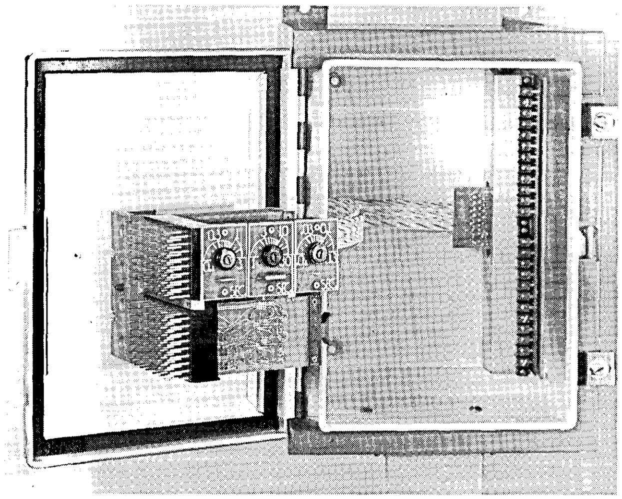




SYLVANIA DATA TABLET - MODEL DT-1 / Sylvania Electronic Systems, a division of Sylvania Electric Products Inc., Waltham, Mass. — The Sylvania Data Tablet is transparent — has a protective coating on the surface — and does not require contact by the stylus. Any nonconductive material such as paper (see photo to the immediate left) or film up to ½ inch in thickness, can be interposed between stylus and surface. An operator can write on a pad of paper placed over the tablet, and his writing will register. An inking capability on the stylus provides the option for creating hard copy simultaneously with electronic entry. The DT-1 can be used at a desk, console, or as a transparent overlay for a CRT or other display, such as the map on the cathode ray tube at the left. The operator can post new information graphically on the tablet which the computer will accept for up-dating the map. This graphic input device is easily interfaced with almost any computer. It is suitable for many diverse applications such as military command and control, machine-aided design, training devices and as a general research tool. (Circle #84 on the Readers Service Card.)

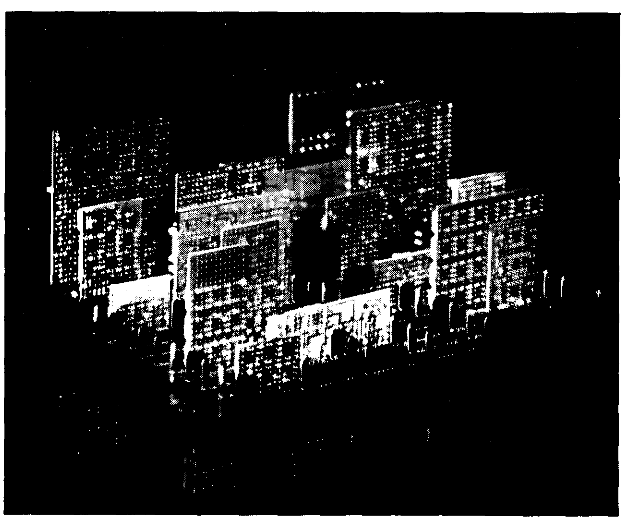
NCR 400 ELECTRONIC ACCOUNTING MACHINE / National Cash Register Company, Dayton, Ohio — The NCR 400, shown by Caroline Fannin, was the first electronic accounting machine to use loops of prepunched tapes to program various accounting jobs. Unrestricted by mechanical limitations, the system can follow any number of instructions punched in a tape loop of any length. The system also uses magnetic ledger records and has a magnetic disc memory with a capacity up to 200 electronic totals. (Circle #82 on the Readers Service Card.)

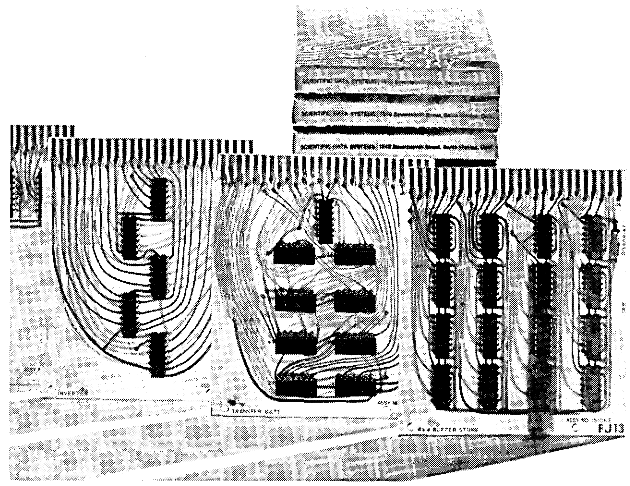
COMPONENTS



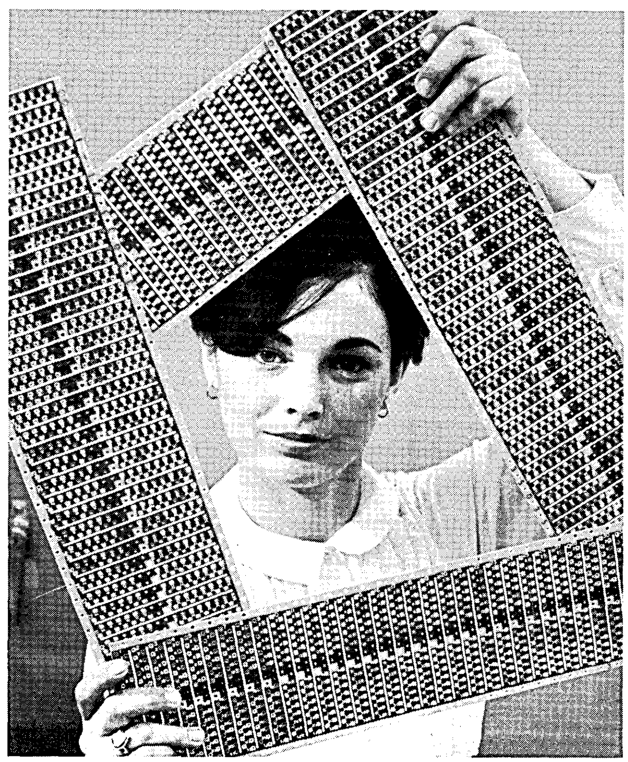
K-SERIES INDUSTRIAL CONTROL MODULES / Digital Equipment Corp., Maynard, Mass. — In the K series, the upper frequency range is 100 KHz, with provision for reduction to 5 KHz for maximum noise immunity. The modules incorporate all silicon diodes, transistors, and integrated circuits. English (non-inverting) logic or NOR logic can be built with Digital's K series. NEMA symbology is used. The hardware has been specifically designed for standard NEMA enclosures. Since K series modules fit standard DEC sockets, FLIP CHIP® mounting hardware can be used for rack mounting. (Circle #46 on the Readers Service Card.)

SKYSCRAPERS AT MIDNIGHT? / IBM Corporation, New York, N.Y. — What appears to be a nighttime metropolis actually is a set of printed circuit cards manufactured by IBM for its computers. The cards hold electronic components used in data processing equipment.



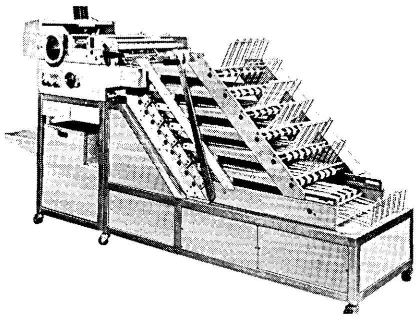


J SERIES IC LOGIC MODULES / Scientific Data Systems, Santa Monica, Calif. — The J Series line of general-purpose, integrated circuit digital modules is for use in systems operating at clock rates up to 5 MHz. Designed for low cost and low power consumption, these modules use diode-transistor logic and complement the company's high-performance T Series logic modules. (Circle #47 on the Readers Service Card.)

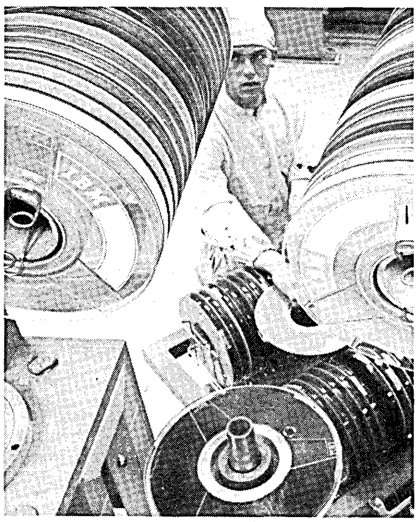


PRINTED CIRCUIT PANELS / Radio Corporation of America, New York, N.Y. — Four printed circuit panels used in RCA's new generation Spectra 70 computers provide an electronic border for Diana Stearns, a computer production specialist at RCA's data processing manufacturing plant in Palm Beach Gardens, Fla.

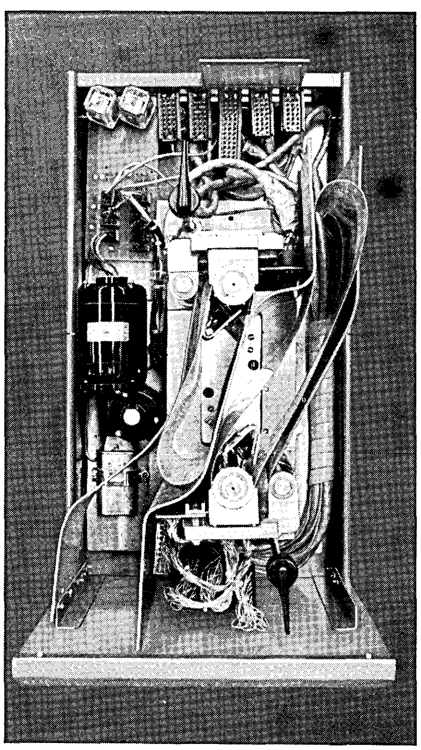
DATA PROCESSING ACCESSORIES



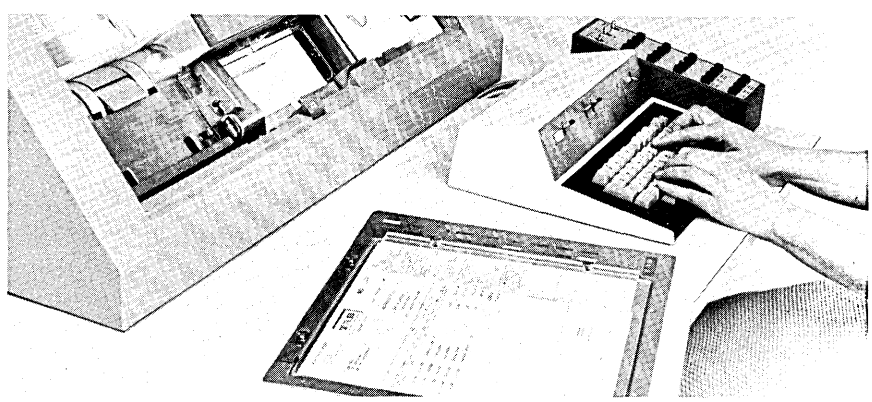
MOORE DETACHER-SORTER (Model 447) / Moore Business Forms, Inc., Niagara Falls, N.Y. — Documents processed by computers can be sorted "off-line" by means of this Moore Detacher-Sorter, Model 447. It will detach and sort continuous forms into six categories at the rate of 95 feet of continuous forms per minute. One part forms only are accommodated, but can be in widths from 5-1/2" to 16-1/2" after margin removal, and can range in depths of 2-5/6" to 11". Paper weights of 20-24 lbs. substance can be used in forms. (Circle #54 on the Reader Service Card.)



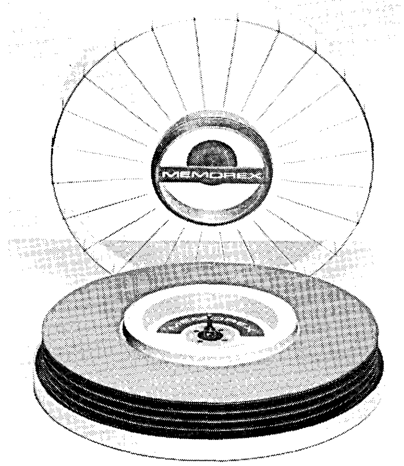
SERIES/500 DATA PROCESSING MAGNETIC TAPE / IBM Corporation, Princeton, N.J. — This new tape has a highly durable coating which makes it less prone to contamination while on computer tape drives. It can be used on all IBM tape data processing systems, as well as computers of other manufacturers. IBM Series/500 data processing magnetic tape is automatically slit and wound onto the familiar half-inch reels (see picture). After curing, an automatic conveyor system carries the reels of tape to and from the slitter. The tape is then tested before it is shipped. (Circle #53 on the Reader Service Card.)



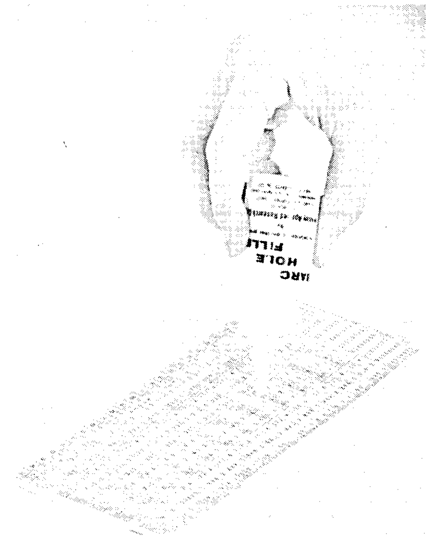
DATAFINDER / Tab Products Co., San Francisco, Calif. — An "electric light beam" positioned within an 11" x 11" viewing panel (immediate foreground of photo) provides operators with a moving "ruler" which automatically underscores each field of the source document in punching sequence. This automatic guide for keypunch operators, called Datafinder, fits any standard IBM card punch or verifier. Datafinder's instruction panel (to the right of keyboard), provides special punching and coding directions, and indicates the size of the card field to be punched. The Datafinder operating unit (shown in the picture at the left) is installed in the key punch pedestal drawer, where it is readily accessible. Control of the Datafinder is effected through interchangeable punched Mylar belts which allow instant shifting among card punching programs for different source document forms. (Circle #55 on the Reader Service Card.)



MS-200 MAGNETIC TAPE HEAD CLEANER / Miller-Stephenson Chemical Co., Inc., Danbury, Conn. — For removing oxide dust from magnetic tape heads, this patented tape head cleaner in aerosol form is said to be more effective than cotton swabs wetted with ordinary cleaning agents. It can be applied while tape is running without interference with transmission. (Circle #50 on the Reader Service Card.)

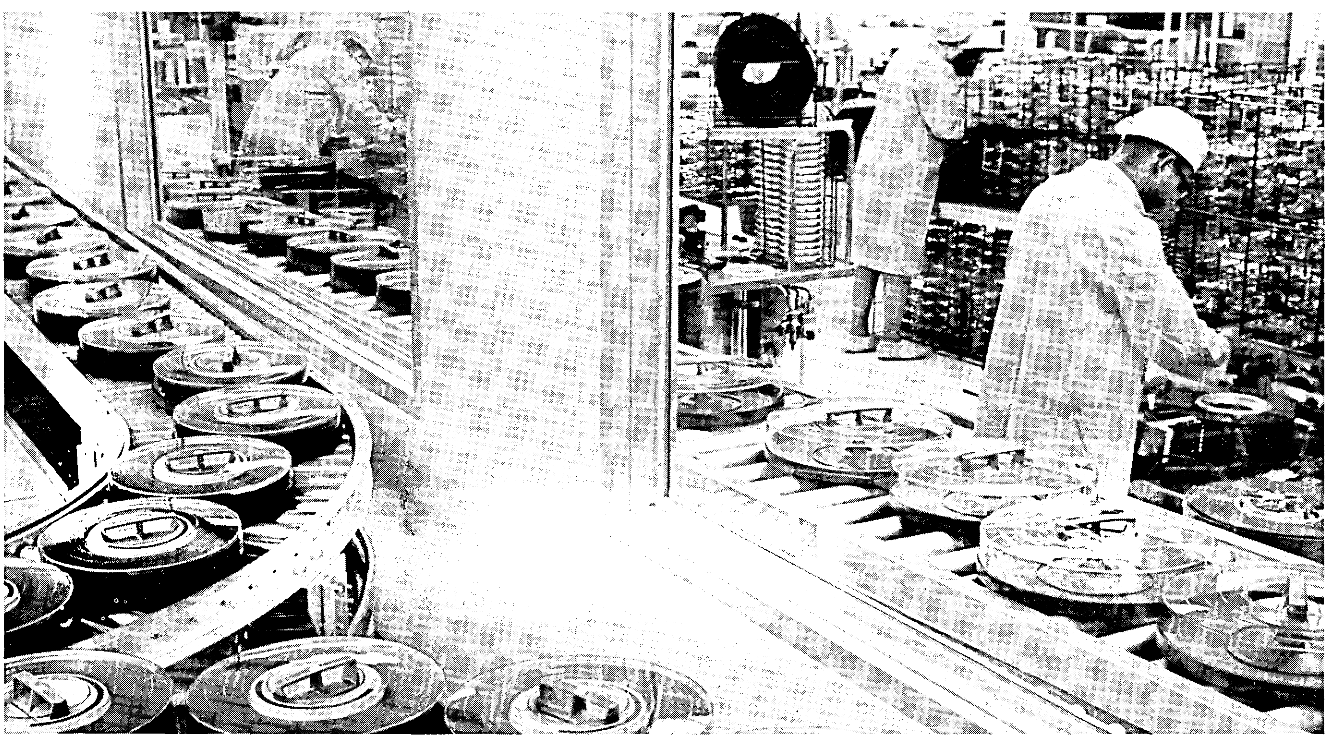


MARK I DISC PACK / Memorex Corp., Santa Clara, Calif. — The industry compatible Mark I disc pack is an advanced random access memory storage media for computers. It consists of 10 coated surfaces for magnetic recording and has a high level of performance reliability and superior cover set, guaranteed against breakage. (Circle #51 on the Reader Service Card.)



BARC HOLE FILLER / Berkeley Applied Research Corp., Alamo, Calif. — This opaque liquid plastic, used to correct punched card errors, dries in less than a minute and is compatible with all data processing machines. A patched hole may be repunched without fouling the punch. One bottle of Hole Filler will correct approximately 5000 cards. (Circle #52 on the Reader Service Card.)

DISC PACK PRODUCTION / IBM Corp., San Jose, Calif. — More than 29 million characters of information — the equivalent of a string of typewritten digits 40 miles long — can be stored in one of the computer disc packs shown below at IBM's production facility in San Jose. Most operations are performed in controlled-environment "clean rooms" as pictured here. A new, on-line computer improves control of test operations.



ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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APPLICATIONS

STANFORD STUDENTS LEARNING RUSSIAN BY COMPUTER

Some 30 Stanford University (Stanford, Calif.) undergraduates are learning Russian by computer in what may be the first experiment of its kind in the U.S. The students were selected at random from a group which signed up for beginning Russian at the start of the fall term. The project is under the direction of Joseph Van-Campen, associate professor of Slavic languages.

His students learn in a small room fitted with six teletypewriter terminals in Casa Ventura, the campus headquarters of the Institute for Mathematical Studies in the Social Sciences (IMSSS). The typewriter terminals, which connect to a PDP-8 computer in nearby Pine Hall at the Stanford Laboratory for Computer-Based Instruction, can print messages in both the English and Russian alphabets from a single type box.

The learning system, devised by Prof. Van-Campen under a $100,000 one-year grant from the U.S. Office of Education, also uses the tape-recorded voice of Mrs. Elise Belenky, petite Russian-born research associate at IMSSS. Although Mrs. Belenky is always present in the computerized classroom to assist any students who encounter mechanical difficulties, Prof. Van-Campen believes that this is the first elementary Russian course to rely on computerized instruction to the complete exclusion of the classroom teacher.

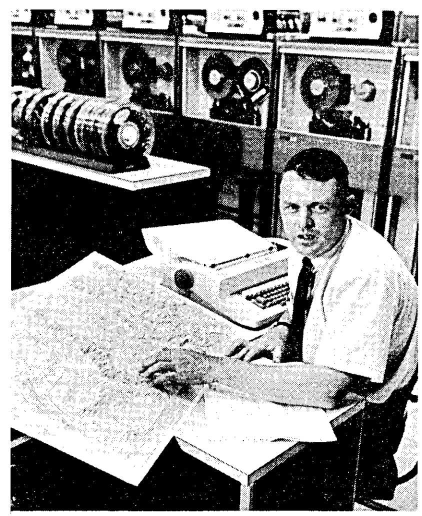
"On the basis of an early check," he says, "I believe that these students are making more rapid progress than those who are taking Russian I in the standard classroom program." Both groups check their pronunciation by tape—recording Russian sentences and playing the material back in the Stanford Language laboratory in the main library.

COMPUTER-BASED RIVER MANAGEMENT

A computer capable of simulating any river system in the world may soon bring faster help to flood-threatened cities and drought-stricken farmlands. Dr. Norman H. Crawford, assistant professor of civil engineering at Stanford University, Palo Alto, Calif., has developed a computer program, called Stanford Watershed Model V, to manage more efficiently the complex behavior of interconnected rivers, dams, reservoirs and man-made canals — especially during emergency conditions.

Dr. Crawford, speaking at a scientific computing symposium held at IBM's Thomas J. Watson Research Center, Yorktown Heights, N.Y., said that hourly rainfall and evaporation data are fed into an IBM System/360 Model 67. "In two minutes, with the help of the computer, we can determine how much water will flow through a river bed in a whole year," he said.

Given current information about water resources, rainfall and snow runoff, the Stanford Computer can calculate the effects of a flood wave at any point downstream.



— Dr. Crawford is shown here with a relief map of a river system

This information then can be used to decide when floodgates should be opened to divert water from low-lying populated areas, and to indicate how high levees must be built.

During droughts, the computer program can generate a water distribution plan that will take into account available water resources, the needs of urban centers, farm irrigation systems and hydroelectric power stations.

The Stanford Watershed program is written in a new, general-purpose computer programming language called PL/I. Developed by IBM, PL/I allows users to write computer instructions in concise statements for both scientific and commercial applications. Dr. Crawford's program contains over 3000 such instructions. Development of the program was supported by a grant from the National Science Foundation.

COMPUTER TO AID IN INTENSIVE CARE OF CRITICALLY ILL PATIENTS

The University of Southern California School of Medicine will use an SDS Sigma 5 computer for automated real-time collection and analysis of biological data from critically ill patients. The status of patients in shock will be monitored automatically by specially designed sensing devices which relay information directly to the SDS computer about patients' respiratory, cardiovascular, or metabolic condition as changes are actually occurring. The initial installation will provide for simultaneous study of two patients.

The bedside of each patient will be equipped to transmit various physiological signals. This information is processed by specialized devices and then communicated in suitable form to the computer. The medical staff is provided with a communication terminal with which verbal information is entered into the computer. Observations by medical and nursing staff, chemical laboratory measurements which are not automatically performed and specific information on drugs and treatment are included in the information resource.

As data on the status and management of the patient is accumulated, computations are made, then displayed on a graph plotter, a large-screen oscilloscope, and a multichannel recorder, in a format in which it will be most meaningful to the physician. This bedside facility also serves to control various valves, switches, and pumps for periodic withdrawal and analysis of blood, urine, and other fluids as part of an on-line bedside chemical monitor.

Doctors may request specialized displays of waveforms, recall data gathered during a previous interval, and they may also make use of statistical procedures for the purposes of evaluating patient status and predicting the response to treatment. Corrective action such as the intravenous injections of fluids or medications, electrical pacing, and the control of mechanical respirators may proceed under computer control in response to specific instructions of the attending physician.

In addition to performing its real-time functions, the computer will process other information important to the purposes of this research and demonstration program, which is intended to improve operation and competence of critical care facilities.

COMPUTER TO BE USED FOR WATER POLLUTION CONTROL

The first attempt ever made to regulate water pollution 'on-line' by means of a digital computer has been made public by K. L. Mick, Chief Engineer and Superintendent of the Minneapolis-Saint Paul District (Minn.). The key contract was awarded to the Badger Meter Manufacturing Company of Milwaukee, Wis., who will provide the computerized supervisory control system for the project, which is partially financed with Federal Funds. When other contracts are included, the total cost of the project is expected to be in the neighborhood of $1.75 million. Fifty per cent of this will be supplied by the Federal Government under a grant from the Water Pollution Control Administration. The system will be in operation in the Spring of 1968.

Measurements of rainfall, sewer levels, gate positions, and water quality will be taken at 38 locations and telemetered via phone lines back to a central station. The computer (a Digital Equipment PDP-9), in combination with communications equipment, will "interrogate" various points in the system, receive the data, then store it for analysis.

In the Minneapolis-Saint Paul Area, storm and sanitary sewers empty into the Sanitary District Plant through the same mains. During periods of heavy rainfall, the interceptor sewer system is overtaxed and the excess flow is diverted into the river through gates, or valves, in the sewer system.

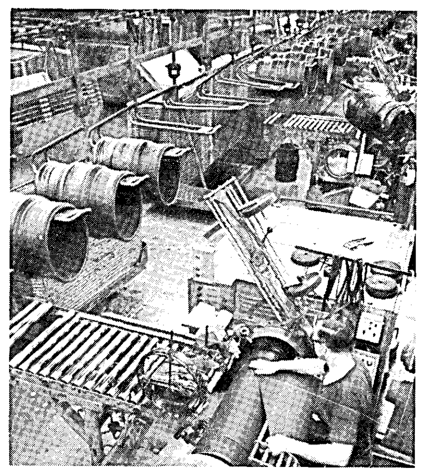
One of the main objectives of the Demonstration Program is to obtain 'round-the-clock measurements of water quality in the river and sewer level and flow at strategic points in the system. Using this and rainfall information, the control system then will let the water that is most polluted flow into the treatment plant and divert cleaner water into the river during rainstorms. It is expected that the unique control system will produce results equivalent to partial separation of storm and sanitary sewers.

TIRE-MAKING PROCESS CONTROLLED BY COMPUTER

The Kelly-Springfield Tire Company has opened a new dimension in the production of automobile tires by installing a computer to control the tire-making process. President George B. Newman says the system is the only one of its type in the industry.

The computer, an IBM 1800 data acquisition and process control system, is linked to sensors at hundreds of work stations in the company's Cumberland (Md.) plant.

As tires pass through various stages of production, the system automatically keeps a running count of all the different sizes and types of tires as well as the various



— A tire builder (foreground) assembles "green tire". "Green tires" on conveyor head for presses to be shaped, molded and vulcanized.

component parts. It isolates and reports machinery and stock delays and monitors critical vulcanizing temperatures and pressures.

The system also directly benefits employees such as tire builders who assemble tires from plies, beads, treads and other component parts. With the new system, these employees will use manual reporting devices — wired to the computer and an associated Weltronics control console nearby — to signal problems at their machines.

While the computer logs the reason for the call — machinery breakdown, power failure, stock delay and others — the console operator is able to direct a public address system call for immediate assistance at the proper location.

Initially, the 1800 system will be used to control production and inventory in Kelly—Springfield's passenger tire operations. Newman said the company also plans to extend the system's capabilities to its other manufacturing facilities.

COMPUTERS CAN BE USED TO TEACH PITCH TO SINGERS

Experiments at Stanford University, Stanford, Calif., indicate that a computer fitted with a special device can be used to teach pitch to singers. Prof. Wolfgang Kuhn of Stanford's Music Department, writing in the fall issue of The Journal of Research in Music Education, reported favorable results with an experimental "pitch extraction device". The device was developed as a laboratory research tool by two IBM engineers, Jerome D. Harr and Bruce Moncreiff, for use with IBM's 1620 computer at the company's Los Gatos Advanced Systems Development Division.

The computer is programmed to evaluate a series of musical tones by comparing a student's pitch to the true pitch. It can distinguish between male and female voices, which it translates as "high" or "low". It also can detect deviations from perfect pitch from as much as four per cent to as little as half a per cent. When a student is ready to practice with the computer, a tape-recorder can offer him a sample pitch or he may play a series of notes on an organ-like keyboard which produces a true tone. Then he sings into a microphone the tones which the computer has printed out to the beat of a metronome.

Prof. Kuhn programmed a series of sight-singing exercises together with tests and options into the computer's memory with the help of his assistant, Raymond Allvin. He used 10 undergraduate music students from San Jose State College. They were instructed in the use of the machine, and given a standard musical achievement test. Then they went through a three-hour period on the machine, spread over a three-week period, after which they were again tested against the same (Aliferis) achievement test.

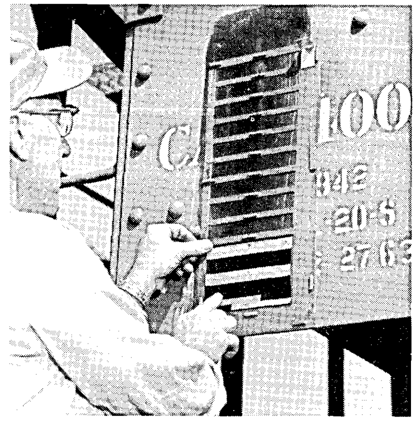
The students noted an increased awareness of pitch and accepted the machine's criteria of perfect pitch. Prof. Kuhn said IBM's pitch-extraction device worked well; only once in 10,000 tries did it give an erroneous report. "Each note in the performance was sampled," Prof. Kuhn reports, "and the pitch analyzed. The computer decided whether a specific exercise was to be repeated, or whether the student should go forward in the program or repeat similar material for more practice." Each student's records of performance are collected and stored in the computer memory so that his progress can be accurately measured and help given where needed.

Prof. Kuhn, who used a small Music Department allocation for his study, foresees the day when a complete curricula in melodic, rhythmic and harmonic sight-singing and dictation could be computerized and adapted for any level of musical development. He also envisions instructional systems for learning to play instruments.

AUTOMATIC CAR IDENTIFICATION ADOPTED NATION-WIDE BY AMERICA'S RAILROADS

Thomas M. Goodfellow, president of the Association of American Railroads, has announced the adoption of an industry-wide automatic car identification system to monitor the 1.8 million freight car fleet. The KarTrak® automatic car identification system, selected by the AAR, is designed and manufactured in Bedford, Mass., by the Commercial Electronics Division of Sylvania Electric Products Inc.

Major components in the new system are a trackside electronic "scanner" made by Sylvania and the 3M Company's "Scotchlite" reflective sheeting. Strips of reflective sheeting are coded by color and deisgn in such a manner as to represent numbers to the scanner. A light beam from the scanner "reads" numbers from bottom to top. The retro-reflective sheeting "bounces back" numbers to the scanner which feeds them into a centralized computer. The system works at train speeds of up to 80 MPH and is unaffected by weather conditions. The system makes possible instantaneous location of any freight car in the country.



— Strips of reflective sheeting are one of main components in new system

The TeleRail Automated Information Network (TRAIN) recently established by the AAR will be tied in with the nationwide ACI system and the advanced information systems of individual railroads. TRAIN, based at the Association's Washington headquarters with computer links to all Class I railroads, will provide the AAR Car Service Division with complete reports of car locations by railroads and car flows through principal rail gateways, and will permit more rapid distribution of the equipment to meet shipper needs for freight cars.

HOW DOES MAN LEARN? COMPUTER AIDS RESEARCH

A Trinity University professor is on the trail of one of nature's best-kept secrets: How does man learn? Dr. Frederick Bremner, professor of psychology at Trinity (San Antonio, Texas) is seeking the answer with the aid of an IBM computer. "Science has demonstrated that the brain of all animals receives signals from each sense organ, but how the brain reacts to these signals is still unknown," he explained. "In a sense we are trying to map the brain. For years, researchers have studied the brain from the standpoint of description rather than functionally as we are."

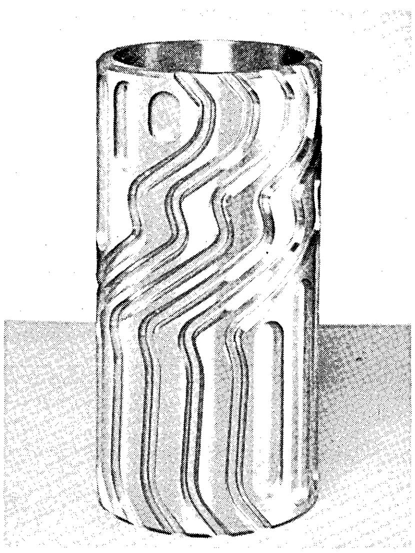
Dr. Bremner is conducting experiments with rats to determine exactly what happens physically within the brain when it receives stimuli. The computer — an 1800 data acquisition and control system — is being used to monitor the experiments. Sensors placed in the brain of the rats are connected by wire to the 1800. During an experiment — for example, a test of the rat's reaction to a light going on and off — the sensors pick up the changes in electrical pulses which traverse the brain's network of nerves. As these physical changes occur, the sensors relay the information to the computer.

The computer system collects and processes the vast amounts of data taken during each experiment and makes the results available to the scientist via a high-speed printer or a digital plotter. After processing the data, the computer is used to compare the reactions of many rats in similar experiments to see if there is a pattern to their responses.

The experiments Dr. Bremner has conducted at Trinity thus far support the prevailing belief of most researchers — that particular types of behavior result in predictable patterns of physical changes in the electrical system of the brain. When his experimentation is completed, Dr. Bremner plans to investigate the relationships between his findings and the processes involved in human learning.

COMPUTED CAMS

The use of electronic data processing in the manufacture and design of mathematically precise contours for cams is illustrated by this intricate barrel cam. Instead of conventional roller types, the cam followers are hardened steel balls. To accommodate these balls, cam grooves are ground to Gothic arch cross-sectional contours. Spacing of cam grooves is held to a required ±.0003.



Cam Technology, Inc.'s (Elmsford, N.Y.) EDP techniques eliminate the preparation of long tables of ordinates, manual machining and hand finishing to speed production schedules. Design data is electronically computed and converted to punched tapes for automatic machining. The same computer technology can be applied to cams for the electrical-electronic, aviation and aerospace, metalworking, instrument, plastics, food processing and packaging industries among others. (For more information, designate #41 on the Readers Service Card.)

ORGANIZATION NEWS

R. DIXON SPEAS AGREES TO MERGE WITH PLANNING RESEARCH

An agreement whereby R. Dixon Speas Associates, Inc., of Manhasset, N.Y., one of the nation's leading aviation consulting organizations, becomes an autonomous, wholly owned subsidiary of Planning Research Corporation of Los Angeles (AMES and PCSE) has been announced by officers of the two firms.

Under terms of the agreement, Planning Research will issue up to 70,000 shares of its common stock to Speas stockholders. Initially, 35,000 shares will be exchanged for all shares of Speas Associates. An additional 35,000 would be issued if the earnings of the Speas organization reach a predetermined level over the next four years. Speas' stockholders are primarily associates in the firm and through the exchange of stock will continue their professional-ownership interests and responsibilities.

CORNELL AND NCR JOIN TO DEVELOP COMPUTER MANAGEMENT SYSTEMS FOR HOTELS

The hotel industry's foremost training center, Cornell University's School of Hotel Administration, and National Cash Register Company, have announced a cooperative program to develop computer management systems for hotels.

The joint effort provides for an NCR computer system and various peripheral devices to be installed at the school. NCR also will contribute its programming resources toward the development of computer software for the hotel industry.

In return, the School of Hotel Administration will work closely with NCR personnel on a consulting basis, will assist in the definition of system requirements, will develop instruction materials for the use of both NCR and hotel personnel, and will test new systems at the Statler Inn, a part of the school on the Cornell campus.

Under the leadership of Dr. Robert A. Beck, E.M. Statler Professor in Hotel Administration and dean of the school, an expansion of the Statler Inn is being planned. This will provide additional facilities for research in foods, hotel equipment and data processing systems.

COMPUTING & SOFTWARE, INC. ACQUIRING ASSETS OF CONTROL PROCESSING SERVICES

Computing & Software, Inc. (C&S), Panorama City, Calif., announced that it has reached agreement with Control Processing Services, Inc. (CPS), Hyattsville, Md., whereby C&S will acquire the assets of CPS for common stock valued in excess of $3.5 million.

Control Processing Services is prominent in the field of providing computer derived services for the management and upgrading of specialized mailing lists. Their principal business areas include fund raising, mail order and subscription fulfillment.

DIEBOLD, SANDERS PLAN JOINT EFFORT IN INFORMATION RETRIEVAL MARKET

A cooperative program to develop and market a totally new automatic information retrieval system has been announced jointly by Sanders Associates, Inc., Nashua, N.H. and Diebold, Inc., Canton, O.

Two significant user advantages of the new system, to be known as the Sanders/Diebold 500, will be the system's ability to retrieve intermixed micro-images of all sizes and formats, and a remote viewing capability. Both will be standard features.

The new system is expected to be unveiled in prototype form early next year. It will represent a combination of capabilities from both companies with Diebold contributing the data storage and Sanders the retrieval and readout technologies.

CCM, INC. ENTERS THE INFORMATION SERVICES FIELD

Crowell Collier and Macmillan, Inc., New York, N.Y., one of the nation's most diversified educational corporations, has entered the information services field. Raymond C. Hagel, Crowell Collier's chairman, has announced the establishment of CCM Information Sciences, Inc. and the election of Jeffrey Norton as its president.

The new company, which will be an autonomously operated subsidiary, will package and publish specialized data in a variety of media. "Bits on magnetic tape and microfilm are as essential to today's intellectual product as ink on paper," Mr. Hagel declared.

In addition to developing data banks and other information services, the new division will publish books on information processing and indexes to information available through computers. An initial objective will be to seek out existing information systems requiring the packaging and distribution resources of an international publisher.

NEW FIRM TO PROVIDE COMPUTER RENTAL AND SOFTWARE SUPPORT FOR CHICAGO AREA FIRMS

A new data processing service organization has been organized to provide computer rental and software support for Chicago area firms. The new firm is Computer Processing Unlimited. Officers are David S. Pemberton, president; Richard A. Forsythe, executive vice-president; Joseph A. Consolo, vice-president-operations; and George Vitek, vice-president-programming and systems.

In addition to computer services, CPU offers current leasors of IBM computer equipment financial help through its association with Boothe Computor Corporation. CPU has been designated Chicago area representative for Boothe which purchases IBM 360's and leases them back to users at rates lower than those charged by IBM.

MOHAWK DATA — ANELEX MERGER APPROVED BY STOCKHOLDERS

The merger of Mohawk Data Sciences Corp. (Herkimer, N.Y.) and Anelex Corporation (Boston, Mass.) has been approved by stockholders at special meetings held by both companies, according to a joint announcement made by V. E. Johnson, President of MDS, and Herbert Roth, Jr., President of Anelex. Terms of the merger call for issuance of one share of MDS stock in exchange for each three shares of outstanding Anelex common.

Mohawk, whose stock has been traded in the Over-the-Counter market, has been accepted for listing on the American Stock Exchange. Trading in the company's stock is under the symbol "MDS". Following completion of the exchange of shares under the Merger Agreement, MDS will have a total of 2,400,000 shares of common stock outstanding.

Anelex, which will be operated as a wholly-owned subsidiary of MDS with Mr. Roth continuing as President, is a recognized leader in the design and manufacture of high speed and low speed printers for use with computers.

EDUCATION NEWS

COMPUTER PROGRAMMING CLASSES BEING GIVEN BY E.C.P.I. AT SING SING

Electronic Computer Programming Institute, Inc. (E.C.P.I.), New York, N.Y., began computer programming instruction November 11th at Sing Sing Prison in Ossining, N.Y. Mr. Sidney Davis, President of ECPI, disclosed that the agreement to give classes at Sing Sing represented a pilot program which will be followed by the offering of its courses in various types of federal and state institutions throughout the United States.

A programming aptitude test was administered by ECPI personnel to 31 inmates on October 28, 1967. Of these applicants, 14 were found qualified to take the course. All applicants had to have a minimum of a high school diploma and be eligible for parole within 18 months.

The programming course, being given on Saturdays, is comprised of IBM 360 programming and is conducted in exactly the same manner and given with the same content as the course presently offered in the company's regular schools. All ECPI texts and visual materials are used and the same strict academic standards are adhered to as in its regular classes.

ECPI will utilize its national placement service in conjunction with State Correction Department Officials and Educational Officers of the Institutions in order to find work for each student upon his successful completion of the course and his eligibility for parole or dismissal.

COMPUTER RELATED SERVICES

COMPUTER CENTER SUPPLIES CREDIT REPORTS IN PACIFIC SOUTHWEST

Computer Reporting Systems, Inc., Anaheim, Calif., has announced that its IBM System/360 Model 30 computer now is fully operational and serving the members of 38 local credit bureaus and major area-wide credit grantors in the Pacific Southwest. This brings to the semi-final stage computerization of the individual credit records of more than five million people in that geographical area.

Eugene S. Mikkelson, president and general manager of the company, said, "The mobility of the individual in the Pacific Southwest has made it imperative that a centralized and computerized reporting system be developed here. Not only does the average family move every five years, but often lives in one community and shops in another. In addition, retail credit has been used more extensively by individuals residing in this region".

A commitment in excess of $4 million has been made by CRS for computer programming, credit file conversion and an IBM System/360 Model 50 random access computer system. The latter is expected to be on-line in all 38 bureaus by mid-1968. With this completed network of bureaus, it will be possible for credit grantors to obtain complete credit information about any individual on record "within a matter of seconds".

Each of the 38 bureaus is a participating owner in Computer Reporting Systems, Inc., which is the first centralized, computerized credit information service company organized by credit bureaus anywhere in the nation. The bureaus will continue to provide personalized local service as in the past. Owner bureaus are located in California, Arizona, and Nevada.

These bureaus, through CRS, are committed to the development of a full and complete credit report on each individual seeking credit. This will include positive as well as negative factors, and long-term as well as current repaying habits, to permit the credit grantor to make a balanced judgment.

Systems similar to CRS' are being developed in other parts of the country, some with the direct assistance of CRS technicians. Notably, this includes cooperation with the Associated Credit Bureaus of America, an association of 4200 credit bureaus and collection services, including all those affiliated with CRS. An experimental computerization program is being co-sponsored by ACB of A and credit bureaus in Dallas and Houston, Texas, which is expected to lead eventually to a nationwide network of credit reporting computer centers.

"DECISION ROOM" FOR BUSINESS

A "Decision Room," where management can develop timely and accurate information on which to formulate solutions to business problems, has been disclosed by Lester B. Knight & Associates, Inc., Chicago, Ill.

The consulting firm plans to use the room to assist its clients to determine optimum solutions to their business problems by simulating these problems with a computer and evaluating the consequences of alternate courses of action. This will enable companies to answer the question "What would happen if..." so that they may select that alternative which will enable them to maximize profit and return on investment.

The Knight organization has developed several computer-based management programs for clients, including inventory simulation, facilities planning, sales forecasting, and job shop simulation, and are able to illustrate the effect of such systems in the Decision Room. The conference-like room is equipped with an IBM 1130 computer and an array of audio-visual equipment.

Another Knight program available with the Decision Room facilities is designed to assist clients in corporate development through mergers and acquisition.

NATIONAL INFORMATION CENTER FOR EDUCATIONAL MEDIA

In February of this year, McGraw-Hill established the National Information Center for Educational Media on the campus of the University of Southern California by extending a grant that would make it possible to build the most complete data bank on non-book educational media under Mr. Glenn McMurray's direction on the USC campus. NICEM provides services for the entire educational community: Teachers, Scholars, Audio-Visual Directors, Curriculum Coordinators, Librarians, Producers, Distributors, and others.

The objectives of NICEM are: to gather comprehensive information about all types of non-text educational media; to organize and edit the media data bank so that it will be of maximum usefulness to all areas of education; to conduct research in computerized cataloging techniques; to prepare printout for research, instructional material catalogs and other bibliographic listings; and to cooperate with other education research groups towards establishing more comprehensive forms of information on new media.

NICEM's cooperative programs provide such computer related services as coded inventory cards, catalog cards, order cards, imprinted labels for booking cards and film cans. New data storage and retrieval techniques can be shared with other members of the educational research community.

NICEM's publishing program includes a periodic updating service and several directories. The first published book is the INDEX TO 16mm EDUCATIONAL FILMS. The one volume comprehensive audio-visual resource file supplies essential data on over 14,000 instructional films. Other media directories will follow. (For more information, designate #42 on the Readers Service Card.)

SOFTWARE

EXODUS II / Computer Sciences Corp., El Segundo, Calif. / The new product, an automated translation system for computer programs, converts IBM 1401 Autocoder and Symbolic Programming System (SPS) source decks to IBM System/360 Basic Assembly Language (BAL). Exodus II, which is written in 360 BAL, translates and executes programs for operation under either the Disk Operating System (DOS) or Operating System (OS). Exodus II requires a low core capacity and only two machine passes. The new system produces a one-to-one translation which retains all the original program logic at speeds equivalent to the original Autocoder assembly time on the 1401.
(For more information, designate #43 on the Readers Service Card.)

ON-LINE TEST EXECUTIVE PROGRAM (OLTEP) / IBM Corporation, White Plains, N.Y. / OLTEP is a monitor program that controls on-line test routines for individual I/O units. Without interrupting normal operations, it can: determine the condition of I/O units; aid in making adjustments; exercise a malfunctioning I/O device to determine the cause of the malfunction; and verify a repair action prior to switching the device on-line. OLTEP, designed to increase systems availability to the user, can be run in a batch-only environment, or in the background partition of a multi-programming system. The program now is available to OS/360 users and DOS/360 users. In the first

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quarter of next year it will also be available to TOS/360 users. (For more information, designate #44 on the Readers Service Card.)

POLYTRAN / URS Corporation, San Francisco, Calif. / This new conversion system is for use with "high level" programming languages such as FORTRAN, PL1, ALGOL, and COBOL. The distinctive feature of POLYTRAN is its adaptability to a variety of target and source languages and to unique user environments. It can be tailored for specific, individual requirements to make possible very low conversion costs. The new URS techniques, presently implemented with COBOL, is capable of translating 100% of all procedure and data divisions in the program. POLYTRAN currently is used with an IBM System/360, but is designed for operation with any machine. (For more information, designate #45 on the Readers Service Card.)

AUTOMATION

AUTOMATIC MEASURING DEVICES INFORM WEATHER BUREAU OF RAINFALL IN RURAL AREAS

Weather bureau specialists in Iowa obtain information on rainfall in rural areas by telephone from automatic measuring devices, General Telephone & Electronics announced. Connected to data communications equipment and circuits supplied by General Telephone Company of Iowa, a GT&E subsidiary, the measuring device can report the amount of precipitation to the U.S. Weather Bureau radar station at Des Moines at any time of the day or night.

To obtain the weather information, station personnel dial the unlisted telephone number of the remote measuring post and receive the coded rainfall data as a series of "beep" tones. Previously, weather bureau specialists depended solely upon citizens here who reported this information on a voluntary basis.

The rain-measuring device is installed in a container open to the sky at the top, and a scale at the bottom of the container measures the weight of rainwater collected. As the weight of the water increases, a lever attached to the scale moves along three electrical circuits which are connected to a data set in a closed container nearby. The picture shows a technician inspecting the connections linking the au-

tomatic rain guage (left) to the data transmission telephone equipment housed in the rectangular cabinet (right).

When the unlisted telephone number of the station is called, the data set closes the circuits to the measuring device. The position of the lever on the scale then determines the number of electrical impulses which will pass through the circuit to the data set. The data set converts these impulses to tones or "beeps" which the weather bureau specialists in Des Moines can translate into a meaningful measurement. (The weather station in Des Moines is operated by the Environmental Science Services Administration of the U.S. Department of Commerce.)

RESEARCH FRONTIER

TRAFFIC 'RABBITS' PROPOSED BY WESTINGHOUSE RESEARCHERS

Traffic "rabbits" to pace motorists through tunnels and similar bottlenecks have been proposed by Westinghouse researchers. They envision lights that would move along the roadside to lead drivers quickly through tunnels, somewhat like mechanical rabbits leading dogs on racetracks.

Tunnels and their approaches would be lined with rows of lamps or fixtures spaced two or three feet apart. Each lamp would flash as a car approached it, giving the driver the appearance of a single light always moving just ahead of his car. A central computer "brain" connected to each light would be aware of all hazards in a tunnel, and would know the position, velocity and acceleration of every car at every moment. Motorists would be guided more smoothly, safely and quickly than they can drive unaided, especially in rush-hour or holiday weekend traffic.

The "rabbits" were suggested by J. W. Wigert, engineering manager of the Westinghouse lighting division, Cleveland, Ohio. "Drivers tend to slow down in tunnels because walls rushing by make their velocity seem to be greater than it really is. Moving lights would help motorists to maintain appropriate speed," Mr. Wigert said.

Dr. A. J. Federowicz, of the mathematics group at the Westinghouse Research Laboratories, worked out the computer control system to increase safety and effectiveness. He designed on paper a scheme whereby the computer could get instantaneous information about traffic conditions in a tunnel, and could control sequentially flashed lights to indicate to each driver his best speed and best distance from the car ahead. The computer would be programmed to figure out "best" speed and distance from data provided by field investigations of driver capabilities.

Detecting devices — perhaps treadles or radar — all along the tunnel would keep track of every car. The central computer would calculate whether each auto should be driven faster or slower, and change the speed of its assigned light accordingly. If a car breaks down or its driver puts on the brakes in a tunnel, the system would detect this and slow down or stop all lights behind that car, so all drivers would know the situation at once.

Dr. Federowicz pointed out that a driver would be able to respond more quickly to a light than to changes in motion of the car in front, which now are his only guide. The proximity and angle of the light would make shifts in its motion more readily and immediately apparent, he said.

"This semiautomated system might be a step toward completely automated highways of the future when, according to some forecasters, cars will be driven by electronic signals from transmitters buried in the road," Dr. Federowicz stated.

'DIAL-A-PAPER' FORESEEN IN HOMES

Thousands of books, magazines and newspapers literally at your fingertips: this is the prediction of scientists and engineers who foresee electronic systems that will allow you to "dial-a-paper" by telephone and have it appear in seconds on your home television screen. Edward F. Conway, manager of administrative services for Westinghouse Electric Corporation's motor divisions, Buffalo, N.Y., says the idea is by no means as far-fetched as people might think. A system that could be considered a forerunner of the dial-a-paper idea is being installed now at the company's Buffalo plant, which houses five major Westinghouse divisions.

Once an engineer has completed a design, his work is saved for future use by himself or others. Over the years, these drawings accumulate. In the Buffalo plant, for instance, 500,000 drawings are stored, some dating back to the early 1900's. An engineer who needs one of these drawings — Mr. Conway says there are 1500 individual requests a day — can ask for it by telephone or written request. He will get the drawing in 15 minutes or an hour if it isn't already in use or if it has not been misfiled. Mr. Conway said Westinghouse, to eliminate even the slightest time lag, is installing a system called Westar.

Westinghouse engineers will be provided with touchtone telephones at their desks. To request a drawing, the engineer merely touch tones a number that connects him with the retrieval system. He then touch tones the document number, type of document, his own telephone number, and his department code and employee number. In the case of active drawings, the request is filled in two seconds by the system and a copy is made and sent to the engineer.

Mr. Conway explained the system has been designed so that in the future each engineer will have a video display device on his desk. When he wants to see a document — and the system will store up to 10 million of them — he'll simply touch tone for it and have it displayed instantly on his video screen. "Which is not too far removed from having the same system available in the home," said Mr. Conway.

BUSINESS NEWS

BECKMAN LAUNCHES TRADE-IN POLICY FOR ELECTRONIC COUNTERS, TIMERS

The Electronic Instruments Division of Beckman Instruments, Inc., Fullerton, Calif., now is giving a trade-in allowance on used instruments toward the purchase of new counters and timers, according to Leo M. Chattler, division manager. The new trade-in policy "will give the customer maximum values for his old instruments while also relieving him of the chore of disposing of his used, obsolete equipment," Mr. Chattler said.

Trade-ins will be accepted on any order of ten or more of most Beckman frequency meters, accumulators, or counter-timers. On certain Beckman models a one-for-one trade-in consideration will be accepted. Any make or model counters, timers, or frequency meters can be traded in, just as long as they are in operating condition, he added.

Mr. Chattler explained that Beckman salesmen will make allowances according to a "trade-in appraisal guide" that establishes trade-in values for any equipment from a low-frequency, tube-type accumulator in poor condition, to a high-frequency, solid-state counter-timer in good condition. Salesmen will be able to make value judgements for exceptional cases, he said.

SANDERS ASSOCIATES RECORDS OVER 100% SALES INCREASE FOR '67 FISCAL YEAR

A 110% increase in sales, resulting in record net earnings for the 1967 fiscal year, has been announced for Sanders Associates, Inc. (Nashua, N.H.) by President Royden C. Sanders, Jr. He also reported a dividend action by the board of directors which in effect doubles the company's regular payments.

Net sales and other income for 1967 climbed to $139.5 million, up from the previous record of $66 million mark set last year. Net earnings, keeping close pace with the sales increase, came to $4.7 million — up 85% from last year's $2.25 million.

The regular quarterly dividend of 7.5 cents per share declared by the board of directors (paid November 3 to stockholders of record October 16), in effect doubles the company's regular dividend payment since the company distributed a 100% stock dividend last July 28. The current payment initiates a new policy of distributing dividends quarterly rather than semiannually.

HONEYWELL FORMS FINANCE UNIT

Honeywell Inc. has announced the formation of a wholly owned subsidiary to provide working capital for its expanding computer operations.

James H. Binger, board chairman of the automation systems company, said the new unit, Honeywell Finance Inc., will replace the sale-leaseback financing technique used by Honeywell until recently. Honeywell Finance Inc. will be supported initially by a $60 million line of bank credit, Mr. Binger stated.

Mr. Binger said the creation of Honeywell Finance Inc. "is a strong method of financing for us, because of the unique long-term lease position we hold." More than 75% of Honeywell's Series 200 commercial customers hold long-term leases. Using as assets a portion of the "forward committed" rental revenues of Honeywell's EDP systems, HFI can borrow capital economically, while at the same time enabling the parent company to retain ownership of the equipment that was borrowed against, the Honeywell executive explained.

COMPUTER LEASING FILES REGISTRATION STATEMENT WITH THE SEC

Computer Leasing Co., Washington, D.C., reported that the company has filed a registration statement with the Securities and Exchange Commission covering a proposed issue of $12 million in Convertible Subordinated Debentures, and 200,000 shares of no par value common stock. In its statement to the SEC, Computer Leasing also reported that it intends to apply to the American Stock Exchange for listing of its common stock following completion of this current offering.

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
ITT Data Services, a division of ITT Corporation., Paramus, N.J.	Garden State Credit Bureau, Clifton, N.J.	Design and operation of a multi-million dollar computerized credit information system	—
Sylvania Electric Products Inc., (a subsidiary of GT&E), Needham, Mass.	IBM Corporation	Providing power and communications equipment and van and shelter mounting of IBM data processing units for the U.S. Army's Combat Service Support System (CS3)	$4 million
Conductron-Missouri, a division of Conductron Corp.	Pan American World Airways, New York, N.Y.	Construction of a Boeing 747 flight simulator to be delivered to Pan Am in June, 1969	$2.1 million
Data Products Corp., Culver City, Calif.	Recognition Equipment, Inc., Dallas, Texas	Model 4300 LINE/PRINTERS which will be used in conjunction with optical character reading equipment designed by Recognition Equipment	over $800,000
Planning Research Corp., Los Angeles, Calif.	Navy Purchasing Office	Continued technical support of the Navy Maintenance and Material Management (3M) System	$400,000
System Development Corp. (SDC), Santa Monica, Calif.	Defense Communications Agency	Development of a computer-based information system for the Department of Defense Special Assistant for Strategic Mobility (SASM)	$353,548
Lehigh University, Bethlehem, Pa.	National Science Foundation	Research into interactions between man and computer	$268,150
Computer Communications, Inc., Inglewood, Calif.	Jet Propulsion Laboratories (JPL)	Providing programming support for a computer-based communications system; CCI also will conduct studies on the performance of the system, teach courses to JPL personnel, and provide related consulting services	$215,000
Purdue University, Schools of Engineering, Lafayette, Ind.	National Science Foundation	Acquisition of a large-scale hybrid computer system which will "greatly expand" Purdue's research program	over $197,000
General Electric Research and Development Center, Schenectady, N.Y.	U.S. Air Force Materials Laboratory, Manufacturing and Technology Division	Twelve month study to identify areas in which the computer can aid in the development and manufacture of integrated electronic equipment	$97,500
System Development Corp. (SDC), Santa Monica, Calif.	U.S. Air Force	Design of a computer-directed training subsystem for the Air Force Base Level System	$96,000
System Development Corp. (SDC), Santa Monica, Calif.	U.S. Department of Transportation (DOT)	An initial study leading to formulation of the nation's first National Traffic Safety Data Center for the Federal Highway Administration	$92,000
Systems Engineering Laboratories, Inc., Fort Lauderdale, Fla.	Republic Aviation Division of Fairchild Hiller, Farmingdale, L.I., N.Y.	An SEL 810A computer system; the computer will acquire, process and control data for the automatic degaussing of naval vessels	$76,000
Bryant Computer Products, Walled Lake, Mich.	Applied Logic Corporation, Princeton, N.J.	An Auto-Lift Drum System which will be made a part of Applied Logic's second time-shared computer system, utilizing a dual-processing PDP-10	$68,000
System Development Corp. (SDC), Santa Monica, Calif.	U.S. Air Force's Military Personnel Center	Investigating methods of improving career counseling for officers with the help of computers	$48,000
Informatics Inc., Sherman Oaks, Calif.	National Military Command System (NMCS)	For programming support of the Exercise Production System (EPS); the EPS programs are to be written in JOVIAL for the CDC 1604B computer	—
California Computer Products, Inc., Anaheim, Calif.	Texas Instruments Inc., Dallas, Texas	A sub-contract to provide the "militarized" digital plotter for use in Tactical Information Processing & Interpretation Systems being built by Texas Instruments for the Aeronautical Systems Division, Wright-Patterson AFB, Ohio	—
Information Displays, Inc., Mt. Kisco, N.Y.	National Aeronautics and Space Administration, Goddard Space Flight Center	An "information retrieval and modification subsystem" to be used by NASA for monitoring space shots	—
COMRESS, Inc., Washington, D.C.	American Airlines	Work involving the use of the SCERT (Systems and Computers Evaluation and Review Technique) simulation services to select the optimum computer packages for American Airlines	—
	General Electric's Information Systems Marketing Operation	Renewed contract for use of COMRESS-designed simulation system GECAP (General Electric Computer Analysis Program) throughout GE's product line to develop proposal preparations for expanding GE's numerous systems	—
C-E-I-R, Inc., Washington, D.C.	Automatic Electric Co., a subsidiary of General Telephone & Electronics	Development of a comprehensive "package" of computer programs which would in effect automate the design and construction of those printed circuit boards which utilize integrated circuit (IC) components	—

NEW INSTALLATIONS

OF	AT	FOR
Control Data 6400 computer system	French Weather Bureau, Paris, France	The study and prediction of European weather, as well as extensive research and statistical studies in the atmospheric sciences
Honeywell DDP-224 computer	Massachusetts Institute of Technology, Lincoln Laboratory (4 computers)	Use in radar systems developed by the Laboratory to study re-entry characteristics of ballistic missiles
Honeywell 200 computer	EDP Data Centres Ltd., Vancouver, B.C., Canada	First step in an expansion program outside Toronto headquarters which will result in the opening of other bureaus in other cities
IBM System/360, Model 40	Texas Commerce Bank, Houston, Texas	An "on-line" computerized data processing system enabling savings and loan associations to provide better service for customers; also will simplify an association's accounting procedures (system valued at $1 million)
IBM System/360, Model 50	University of Miami, Coral Gables, Fla.	Initiating linkage with satellite computers at its School of Medicine and Institute of Marine Sciences on other campus; will serve administrative, academic and scientific communities; replaces present IBM 7040/1401 and IBM 1401
IBM 1130 computer	Tennessee Gas Pipeline Co., a division of Houston-based Tenneco Inc., Houston, Texas	Monitoring 2000-mile-long natural gas pipeline; prepares daily activity reports on such items as sales, purchases and inventories which are used primarily by gas dispatchers to maintain the pipeline system at its optimum operating levels
NCR 315 computer system	Cherry Electrical Products Co., Highland Park, Ill.	Bulk data via magnetic tape, as well as order processing, billing and production scheduling
NCR 500 computer system	East Coast Personal Finance Ltd., Grimsby, England	Maintenance of personal accounts
	Redditch Benefit Building Society, London, England	Computerization of entire mortgage and investment accounting operation
RCA Spectra 70/25 computer	Pioneer Natural Gas Co., Amarillo, Texas	General accounting and billing for domestic, commercial, industrial and irrigation gas customers in the Texas Panhandle
RCA Spectra 70/35 computer	Beneficial Management Corp., Morristown, N.J.	The nucleus of a personnel record and payroll system covering four countries
RCA Spectra 70/45 computer	Marriott-Hot Shoppes, Inc., Washington, D.C.	Inventory control of over 2000 products distributed to 180 restaurants and drive-ins throughout the U.S.
	The State of Washington, Dept. of Motor Vehicles, Olympia, Wash.	Providing police with instant information on state's two million motor vehicles and their drivers; also will be used by safety officials to analyze statistics on problem drivers, high accident areas and the effectiveness of the state's driver training programs
	Eaton Yale & Towne, Telecomputer Center, Cleveland, Ohio (2 systems)	Forming the nerve center of a worldwide communications network which eventually will link all of the firm's plants
UNIVAC 418 computer system	Bell Telephone Company of Canada, Toronto, Canada	Automatic exchange of written messages and data in a cooperative program between Bell Canada and seven other major Canadian telephone systems forming the Trans-Canada Telephone System
	Mainichi Broadcasting System, Osaka, Japan	General management control and information checking, as well as for the automated delivery of radio-television programs
UNIVAC 1108 computer system	Sun Oil Company, Philadelphia, Pa.	Processing a wide variety of Sun Oil's business operations and scientific problems (system valued at $2.2 million)
	Japanese Ministry of Labor, Labor Market Center, Tokyo, Japan	Better balance between supply and demand of labor and more efficient adjustment of national labor supply to benefit the economy; system is linked to 560 public employment offices throughout Japan (system valued at $1.6 million)
	Carnegie-Mellon University, Pittsburg, Pa.	Accommodating the growing computation needs of teachers, student researchers and production personnel; consideration being given to expansion of services to small colleges and universities in area
UNIVAC 9200 computer	Warner Company, Inc., Denver, Col.	Inventory control, invoicing, sales analysis and accounts receivable
	M & S Computer Service, Inc., an affiliate of Valley Transit Corp., Chicago, Ill.	Valley Transit's bus, school and cost accounting, plus general ledger and financial statements
	Spanger Candy Company, Bryan, Ohio	Inventory control, billing and various accounting applications
	Ellner & Pike, Westbury, N.Y.	Store billing, perpetual inventory control for both warehouses and stores, accounts payable, payroll and payroll analysis, expense analysis, and weekly gross profit percentage by store location
UNIVAC 9300 computer system	Ennis Business Forms, Inc., Ennis, Texas	Handling accounts receivable, accounts payable, and payroll processing

MONTHLY COMPUTER CENSUS

The number of electronic computer systems installed or on order changes rapidly. The following is a summary made by "Computers and Automation" of reports and estimates of the number of general purpose electronic digital computers manufactured by companies based in the United States. These figures include installations and unfilled orders inside and outside of the United States.

These figures are mailed to the individual computer manufacturers from time to time for their information and review and for any updating or comments they may care to make.

Our readers are also invited to submit information that would help make these figures as accurate and complete as possible.

The following abbreviations apply:

(R) – figures derived all or in part from information released directly or indirectly by the manufacturer, or from reports by other sources likely to be informed

(N) – manufacturer refuses to give any figures on number of installations or of orders, and refuses to comment in any way on those numbers stated here

X – no longer in production

C – figure is combined in a total (see adjacent column)

E – figure estimated by "Computers and Automation"

? – information not received at press time

AS OF NOVEMBER 15, 1967

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTAL-LATIONS	MFR'S TOTAL INSTAL-LATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL ORDERS
Autonetics (R)	RECOMP II	$2495	11/58	30		X	
	RECOMP III	$1495	6/61	6	36	X	0
Bunker-Ramo Corp. (R)	BR-130	$2000	10/61	160		X	
	BR-133	$2400	5/64	62		X	
	BR-230	$2680	8/63	15		X	
	BR-300	$3000	3/59	18		X	
	BR-330	$4000	12/60	23		X	
	BR-340	$7000	12/63	19	297	X	X
Burroughs (R)	205	$4600	1/54	38		X	
	220	$14,000	10/58	31		X	
	B200 Series, B100	$5400	11/61	790		31	
	B300 Series	$9000	7/65	300		150	
	B2500	$5000	2/67	7		45	
	B3500	$14,000	5/67	2		50	
	B5500	$22,000	3/63	71		19	
	B6500	$33,000	2/68	0		6	
	B8500	$200,000	8/67	0	1240 E	3	310 E
Control Data Corp. (R)	G-15	$1600	7/55	285		X	
	G-20	$15,500	4/61	23		X	
	LGP-21	$725	12/62	159		X	
	LGP-30	$1300	9/56	322		X	
	RPC-4000	$1875	1/61	73		X	
	046/136/636	?	-	28		C	
	160*/8090 Series	$2100-$12,000	5/60	594		X	
	924/924A	$11,000	8/61	30		X	
	1604/A/B	$45,000	1/60	59		X	
	1700	$3500	5/66	48		C	
	3100/3150	$10,000	12/64	87		C	
	3200/3300	$16,250	5/64	132		X	
	3400	$18,000	11/64	20		C	
	3600/3800	$48,750	6/63	57		X	
	6400/6500/6600	$52,000-$117,000	8/64	49	(as of	X	
	6800	$130,000	6/67	0	1938 June 30)	C	320 E
Digital Equipment Corp. (R)	PDP-1	$3400	11/60	59		X	
	PDP-4	$1700	8/62	55		X	
	PDP-5	$900	9/63	114		X	
	PDP-6	$10,000	10/64	22		X	
	PDP-7	$1300	11/64	165		C	
	PDP-8	$525	4/65	1010		C	
	PDP-8S	$300	9/66	520		C	
	PDP-9	$1000	12/66	57		C	
	PDP-10	$7500	7/67	0	2002	C	400 E
Electronic Assoc., Inc. (R)	640	$1200	4/67	13		23	
	8400	$12,000	7/65	19	32	4	27
EMR Computer Div. (R)	ASI 210	$3850	4/62	26		X	
	ASI 2100	$4200	12/63	7		X	
	ADVANCE 6020	$4400	4/65	14		11	
	ADVANCE 6040	$5600	7/65	7		3	
	ADVANCE 6050	$9000	2/66	18		8	
	ADVANCE 6070	$15,000	10/66	7		2	
	ADVANCE 6130	$1000	8/67	5	84	36	60
General Electric (N)	115	$1340-$4800	12/65	400 E		600 E	
	205	$2500-$10,000	6/64	C		X	
	210	$16,000-$22,000	7/59	C		X	
	215	$2500-$10,000	9/63	200 E		X	
	225	$2500-$26,000	4/61	C		X	
	235	$6000-$28,000	4/64	C		C	
	405	$5120-$10,000	11/67	C		C	
	415	$4800-$13,500	5/64	300 E		70 E	
	425	$6000-$20,000	6/64	C		C	
	435	$8000-$25,000	9/65	C		C	
	625	$31,000-$135,000	4/65	C		C	
	635	$35,000-$167,000	5/65	C		C	
	645	$40,000-$250,000	7/66	C	1330 E	C	850 E
Hewlett-Packard (R)	2116A	$600	11/66	56		C	
	2115A	$412	2/68	0	56	C	20 E
Honeywell (R)	DDP-24	$2500	5/63	85		X	
	DDP-116	$900	4/65	172		41	
	DDP-124	$2050	3/66	38		33	
	DDP-224	$3300	3/65	50		8	
	DDP-516	$700	9/66	49		154	
	H-120	$3900	1/66	535		242	
	H-200	$8400	3/64	1115		87	
	H-400	$8500	12/61	120		X	
	H-800	$28,000	12/60	89		X	
	H-1200	$3800	2/66	132		94	
	H-1400	$14,000	1/64	12		X	
	H-1800	$42,000	1/64	21		1	
	H-2200	$12,000	1/66	45		64	
	H-4200	$20,500	6/67	0		15	
	H-8200	$35,000	4/68	0	2460 E	5	740 E

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTAL-LATIONS	MFR'S TOTAL INSTAL-LATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL ORDERS
IBM (N)	305	$3600	12/57	C		X	
	360/20	$3000	12/65	4000 E		6000 E	
	360/30	$9340	5/65	5000 E		4000 E	
	360/40	$19,550	4/65	3000 E		2000 E	
	360/44	$12,180	7/66	C		C	
	360/50	$32,960	8/65	C		C	
	360/65	$56,650	11/65	C		C	
	360/67	$138,000	10/66	C		C	
	360/75	$81,400	2/66	C		C	
	360/90 Series	-	10/67	C		C	
	650	$4800	11/54	C		X	
	1130	$1545	2/66	1900 E		4500 E	
	1401	$6480	9/60	7650 E		X	
	1401-G	$2300	5/64	C		X	
	1401-H	$1300	5/67	C		C	
	1410	$17,000	11/61	C		C	
	1440	$4300	4/63	3600 E		C	
	1460	$10,925	10/63	C		X	
	1620 I, II	$4000	9/60	C		C	
	1800	$4800	1/66	C		C	
	701	$5000	4/53	C		X	
	7010	$26,000	10/63	C		C	
	702	$6900	2/55	C		X	
	7030	$160,000	5/61	C		X	
	704	$32,000	12/55	C		X	
	7040	$25,000	6/63	C		C	
	7044	$36,500	6/63	C		C	
	705	$38,000	11/55	C		X	
	7070, 2, 4	$27,000	3/60	C		X	
	7080	$60,000	8/61	C		X	
	709	$40,000	8/58	C		X	
	7090	$63,500	11/59	C		X	
	7094	$75,500	9/62	C		X	
	7094 II	$82,500	4/64	C	31,500 E	C	19,500 E
Interdata (R)	Model 2	$200-$300	-	0		3	
	Model 3	$300-$500	3/67	24		75	
	Model 4	$400-$800	-	0	24	5	83
National Cash Register Co. (R)	NCR-304	$14,000	1/60	24		X	
	NCR-310	$2500	5/61	14		X	
	NCR-315	$8500	5/62	563		150	
	NCR-315-RMC	$12,000	9/65	52		50	
	NCR-390	$1850	5/61	600		6	
	NCR-500	$1500	10/65	1400	2650 E	580	790 E
Pacific Data Systems Inc. (R)	PDS 1020	$550-$900	2/64	130	130	20	20
Philco (R)	1000	$7010	6/63	16		X	
	2000-210, 211	$40,000	10/58	16		X	
	2000-212	$52,000	1/63	12	44	X	X
Radio Corp. of America (R)	RCA 301	$7000	2/61	635		C	
	RCA 3301	$17,000	7/64	75		C	
	RCA 501	$14,000	6/59	96		X	
	RCA 601	$35,000	11/62	3		X	
	Spectra 70/15	$4500	9/65	122		125	
	Spectra 70/25	$6500	9/65	72		57	
	Spectra 70/35	$10,400	1/67	34		135	
	Spectra 70/45	$22,000	11/65	68		107	
	Spectra 70/46	$34,400	-	0		C	
	Spectra 70/55	$34,300	11/66	5	1110 E	14	420 E
Raytheon (R)	250	$1200	12/60	175		X	
	440	$3500	3/64	20		X	
	520	$3200	10/65	27		0	
	703	sale only	10/67	7	229	22	22
Scientific Control Corp. (R)	650	$500	5/66	28		0	
	655	$1800	10/66	3		19	
	660	$2000	10/65	4		0	
	670	$2600	5/66	1		0	
	6700	$30,000	10/67	0	36	1	19
Scientific Data Syst., Inc. (N)	SDS-92	$1500	4/65	100 E		30	
	SDS-910	$2000	8/62	200 E		30	
	SDS-920	$2900	9/62	200 E		20	
	SDS-925	$3000	12/64	C		C	
	SDS-930	$3400	6/64	200 E		40	
	SDS-940	$10,000	4/66	C		C	
	SDS-9300	$7000	11/64	C		C	
	Sigma 2	$1000	12/66	30		200	
	Sigma 5	$6000	8/67	C		C	
	Sigma 7	$12,000	12/66	C	830 E	C	500 E
Standard Computer Corp. (N)	IC 6000	$10,000-$22,000	5/67	6	6	10 E	10 E
Systems Engineering Labs (R)	810	$1000	9/65	24		X	
	810A	$900	8/66	29		23	
	810B	?	-	0		5	
	840	$1400	11/65	4		X	
	840A	$1400	8/66	14		25	
	840 MP	?	-	0	71	5	58
UNIVAC (R)	I & II	$25,000	3/51 & 11/57	23		X	
	III	$20,000	8/62	67		X	
	File Computers	$15,000	8/56	13		X	
	Solid-State 80 I, II, 90, I, II & Step	$8000	8/58	222		X	
	418	$11,000	6/63	118		33	
	490 Series	$35,000	12/61	160		58	
	1004	$1900	2/63	3195		40	
	1005	$2400	4/66	740		200	
	1050	$8000	9/63	285		16	
	1100 Series (except 1107 & 1108)	$35,000	12/50	9		X	
	1107	$55,000	10/62	33		X	
	1108	$65,000	9/65	58		75	
	9200	$1500	6/67	2		1100	
	9300	$3400	7/67	0		650	
	LARC	$135,000	5/60	2	4930 E	X	2170 E
Varian Data Machines (R)	620	$900	11/65	75		0	
	620i	$500	6/67	34	109	267	267
				TOTALS —	51,144 E		26,586 E

BOOKS AND OTHER PUBLICATIONS

Neil Macdonald
Assistant Editor
Computers and Automation

We publish here citations and brief reviews of books and other publications which have a significant relation to computers, data processing, and automation, and which have come to our attention. We shall be glad to report other information in future lists if a review copy is sent to us. The plan of each entry is: author or editor / title / publisher or issuer / date, hardbound or softbound, number of pages, price or its equivalent / comments. If you write to a publisher or issuer, we would appreciate your mentioning *Computers and Automation.*

Reviews

Westin, Alan F. / Privacy and Freedom / Atheneum Press, 162 E. 38 St., New York, N. Y. 10016 / 1967, hardbound, 487 pp., $10

This book examines the use and effect on privacy of such devices as the hidden camera, the miniature microphone, and the computer. Part I, "The Functions of Privacy and Surveillance in Society," discusses privacy and its modern origins and some intrusions upon it. Part II, "New Tools for Invading Privacy" includes chapters "The Listening and Watching Devices: New Techniques of Physical Surveillance," "Private and Government Use of Physical Surveillance", "Probing the Mind: Psychological Surveillance" and "The Revolution in Information Collection and Processing: Data Surveillance." Part III is "American Society's Struggle for Controls: Five Case Studies" and Part IV is "Policy Choices for the 1970's" and is made up of "Privacy and American Law," and "Restoring the Balance of Privacy in America."

Klir, J., and M. Valach; translated into English by Pavel Dolan; edited by W. A. Ainsworth / Cybernetic Modelling / D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. / 1967, hardbound, 437 pp., $12.00

This book was translated from Czech, and is intended for scientists and engineers. Part I, "Cybernetic Modelling as a Methodological Approach," is an introduction; Part II is "Biological Systems as Objects of Modelling"; Part III, "Some Chapters in Cybernetic Modelling," contains chapters "Higher Types of System Behavior," "Proper Model and Information," "Perception and its Disorders," "Language as a Means of Communication Between Man and Machine," "Sensors in the Service of Inanimate Systems," and "Can an Inanimate System Live?". This book is essentially an outgrowth of discussion and analysis by a group of Czech computer scientists influenced by Dr. A. Svoboda.

University of Tex. Graduate School of Biomedical Sci. at Houston, Div. of Continuing Education etc. / The Fifth Annual Symposium on Biomathematics and Computer Science in the Life Sciences / Shamrock Hilton Motel, Houston, Tex. / 1967, softbound, 132 pp., $?

These are the papers presented at the Symposium on Biomathematics and Computer Science March 30-April 1, 1967. Subjects covered are: "Medical Applications of Computers," "Experimental Data Analysis," "Cardiovascular Physiology," "Medical Management Systems," "Laboratory Automation and Physiologic Simulations" and "Topics in Bioengineering."

Notices

Lauret, Annette / Principes de Programmation des Ordinateurs / Masson et Cie, Editeurs, 120 Boulevard Saint-Germain, Paris (6e), France / 1967, Softbound in cloth, 168 pp., 46f / in French

Goldfield, E. D., director of preparation / Pocket Data Book USA 1967 / U. S. Dept. of Commerce, Bureau of the Census, Washington, D. C. / Dec. 1966, paperbound, 365 pp., $?

Hickey, A. E., and J. M. Newton / Computer-Assisted Instruction — A Survey of the Literature: Second Edition, Jan. 1967 / Entelek, Inc., Newburyport, Mass. 01950 / 1967, paperbound, 74 pp., $?

Lee, R. M. / A Short Course in Fortran IV Programming Based on the IBM Operating System 360 Programming and Basic Fortran IV / McGraw-Hill Book Co., New York, N. Y. / 1967, paperbound, 235 pp., $?

Wisconsin Bureau of Systems & Data Processing / Data Processing in Wisconsin State Government: A Five-Year Plan 1967-72 / Dept. of Admin., Bureau of Systems & Data Processing, Madison, Wisconsin / 1967, paperbound, 46 pp., $?

NEW PATENTS

Raymond R. Skolnick
Patent Manager
Ford Instrument Co.
Div. of Sperry Rand Corp.
Long Island City, N.Y. 11101

The following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the U. S. Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington, D.C. 20231, at a cost of 50 cents each.

September 19, 1967

3,343,143 / Arliss E. Whiteside, Royal Oak, Mich. / The Bendix Corp., a corporation of Delaware / Random access memory apparatus using voltage bistable elements.

3,343,144 / Thomas J. Matcovich, Maple Glen, and Henry S. Belson, North Hills, Pa. / Sperry Rand Corp., N. Y. / Low power thin magnetic film.

3,343,145 / Bruce I. Bertelsen, Poughkeepsie, N. Y. / International Business Machines Corp., N. Y. / Diffused thin film memory device.

3,343,147 / John Ashwell, Liverpool, England / Automatic Telephone & Electric Co., Ltd., Liverpool, England / Magnetic core switching and selecting circuits.

September 26, 1967

3,344,405 / John L. Craft, Beacon, Eugene R. Floto, Brewster, and John W. Newitt, Briarcliff Manor, N. Y., and Howard J. Smith, Jr., Glen Rock, N. J. / International Business Machines Corp., N. Y. / Data storage and retrieval system.

3,344,410 / Arthur F. Collins and Jack E. Greene, Vestal, and Holger R. Jensen, Endwell, N. Y., Martin J. Kelly, Los Gatos, Calif., and Elliott R. Marsh, Endicott, and Flavius M. Powell, Endwell, N. Y. / International Business Machines Corp., Armonk, N. Y. / Data handling system.

3,344,413 / John C. Mallinson, Palo Alto, Calif., and Lawrence G. Wiley, Camp Hill, Pa. / AMP Inc., Harrisburg, Pa. / Magnetic core readout.

3,344,414 / George R. Briggs, Princeton, N. J. / Radio Corporation of America, a corporation of Delaware / Magnetic shift register.

3,344,415 / George R. Briggs, Princeton, N. J. / Radio Corporation of America, a corporation of Delaware / Magnetic shift register.

3,344,416 / James W. Harford, 14747 Roscoe Blvd., Panorama City, Calif. 91402 / ——— / Random access magnetic information retrieval system.

October 3, 1967

3,345,611 / Joseph J. Eachus, Cambridge, Mass. / Honeywell, Inc., a corporation of Delaware / Control signal generator for a computer apparatus.

3,345,614 / John V. Neel, Pittsford, N.Y. / Friden, Inc., a corporation of Delaware / Data translation system.

3,345,617 / Fred B. Cox, Jr., Fullerton, and Paul O. Lindfors, Woodland Hills, Calif. / The United States of America as represented by the Secretary of the Air Force / Digital data processing apparatus.

3,345,619 / Duane H. Anderson, Roseville, Royal T. McArdell, St. Paul, and Ralph W. Notto, White Bear Lake, Minn. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Data processing system.

3,345,624 / Marshall M. Brown, San Marino, Calif. / United Data Control, Inc., South El Monte, Calif., a corporation of Washington / Random access address selection apparatus.

October 10, 1967

3,346,729 / Harold R. Dell, Palo Alto, and Merrill J. Maloney, Mountain View, Calif. / General Precision System Inc., a corporation of Delaware / Digital multiplier employing matrix of nor circuits.

3,346,730 / William H. Hanson, Minneapolis, Minn. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Signed ternary carry generator using threshold logic elements.

3,346,844 / John E. Scott, Rego Park, N.Y., and Teddy R. Thomas, Houston, Texas / Sperry Rand Corporation, Great Neck, N.Y. / Binary coded signal correlator.

3,346,847 / Alfred H. Faulkner, Redondo Beach, and Seymour Markowitz, Los Angeles, Calif. / General Motors Corp., Detroit, Mich., a corporation of Delaware / Magnetic memory system.

3,346,852 / Jack C. Smeltzer, Woodland Hills, Calif. / The Bunker-Ramo Corp., Canoga Park, Calif., a corporation of Delaware / Digital computer system.

3,346,854 / Harold S. Crafts and George E. Forsen, Palo Alto, Calif. / Stanford Research Institute, Palo Alto, Calif., a corporation of California / Analog storage system.

October 17, 1967

3,347,241 / Alexander J. Hiller, Sunnybrook, and Rudolph M. Haisfield, Silver Spring, Md. / The United States of America as represented by the Secretary of the Navy / Information storing and sorting device.

3,348,064 / Robert A. Powlus, Yardley, Pa. / Radio Corporation of America, a corporation of Delaware / Flexible logic circuit utilizing field effect transistors and light responsive devices.

3,348,207 / Donald H. Malcolm, Brooklyn Center, and Frederick Marvin Green, Bloomington, Minn. / Control Data Corp., Minneapolis, Minn., a corporation of Minnesota / Data exchanger.

3,348,214 / Raymond J. Barbetta, Poughkeepsie, N.Y. / International Business Machines Corp., Armonk, N.Y., a corporation of New York / Adaptive sequential logic network.

3,348,218 / Albert W. Vinal, Owego, N.Y. / International Business Machines Corp., New York, N.Y., a corporation of New York / Redundant memory organization.

October 24, 1967

3,349,375 / Robert R. Seeber and Arwin B. Lindquist, Poughkeepsie, N.Y. / International Business Machines Corp., New York, N.Y., a corporation of New York / Associative logic for highly parallel computer and data processing systems.

3,349,376 / Claude Jean Baptiste Bouvier, Villiers sur Marne, France / Compagnie des Machines Bull (Societe Anonyme), Paris, France / Data handling automatic system.

3,349,378 / David J. Crawford, Poughkeepsie, N.Y. / International Business Machines Corp., Armonk, N.Y., a corporation of New York / Data signal sensing system.

October 31, 1967

3,350,008 / Howard W. Avery, Schenectady, N.Y. / General Electric Company, a corporation of New York / Fluid amplifier shift register circuit.

3,350,009 / Robert K. Rose, Burnt Hills, N.Y. / General Electric Company, a corporation of New York / Fluid amplifier serial digital adder logic circuit.

3,350,010 / Robert K. Rose, Burnt Hills, N.Y. / General Electric Company, a corporation of New York / Fluid amplifier serial digital complementer logic circuit.

3,350,011 / Michael John Tooze, London, England / Elliot Brothers (London) Limited, Lewisham, London, England, a British company / Data processing apparatus.

3,350,687 / Reidar G. Gabrielson, Scottsdale, and Lawrence R. Smith, Phoenix, Ariz. / Motorola, Inc., Chicago, Ill., a corporation of Illinois / Control system with time reference for data acquisition.

3,350,689 / Noel B. Underhill, Lakewood, and Fred C. Hyatt, La Puente, Calif. / North American Aviation, Inc. / Multiple computer system.

3,350,690 / Rex Rice, Menlo Park, Calif. / International Business Machines Corp., New York, N.Y., a corporation of New York / Automatic data correction for batch-fabricated memories.

3,350,691 / Donald R. Faulis, Norristown, Pa., and Robert B. Whitson, Baltimore, Md. / Burroughs Corporation, Detroit, Mich., a corporation of Michigan / Alterable read-only storage device.

WORLD REPORT — GREAT BRITAIN

(Continued from page 24)

Merger Talk

Merger talk linking ICT with English-Elliott is in the wind again, but a look at what is going on in big machines alone should enable one to shrug this off. Of course, it is an open secret that the Ministry of Technology has an idea that a single company to build business computers would be a good thing. It also believes all machines should be IBM-compatible.

Apart from size, it is hard to see what advantages a "British Computer Corporation" would have at the moment. The machine ranges it has could hardly be less compatible. But, true viability in data processing operations demands a yearly turnover of at least $300 m according to IBM. ICT is just on the $200 m mark while English has only taken $70 m of orders in two years for its new machines.

ICT expects to be at $300 m a year by 1970. English says it will catch up with ICT that year. So far it has done precious little to make good that claim — apart from spending money on vast plants.

Ted Schoeters
Stanmore
Middlesex
England

WORLD REPORT — AUSTRALIA

(Continued from page 28)

Mr. Pope says that the extent to which a court at present would be prepared to admit computer output as evidence is doubtful.

But he expects that when the need arises, it will be necessary to demonstrate that the output was produced on a specific date with acceptance of specific responsibility by some identifiable person, as part of a sequence of processing in which the relationship between input and output could be established logically, and subject to safeguards against error and falsification.

The problem, he warns, is going to become much more complex with the emergence of multi-processing centres linked on a network basis with on-line access and display. These installations might have no control over, or no record of, the contents of programs submitted for processing.

The whole question could be settled if the onus of proof would be to demonstrate that the computer output is wrong, rather than prove it is right. But Pope doubts that this view will gain support "so long as the computer remains mystifying and bewildering and not rightly understood by ordinary mortals."

W. R. Cooper
Wahroonga
Australia

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

Announcing the Bryant CPhD: 7.25 million bit capacity, no bigger than a breadbox.

No kidding. The new low-priced Bryant 10″ drum packs 192 data tracks with Read, Write, and Select Electronics. And an average positioning time of 40 milliseconds. Just right for small and medium-size data processing applications. How do we do it? With Series 9000 integrated electronics—our new monolithic circuitry that's also more reliable and economical than conventional circuits. And more flexible. The mini-giant can be interfaced to nearly any computer system (new or only a gleam in somebody's eye), with either the Bryant XLO-1000 plug-in Controller or your own controller. Sound too good to be true? Contact your local Bryant sales office or write Ex-Cell-O Corp., Bryant Computer Products, 850 Ladd Rd., Walled Lake, Michigan 48088. You'll be a "Bryant Believer" before you know it.

BRYANT
COMPUTER PRODUCTS

XLO®

EX-CELL-O CORPORATION

Designate No. 16 on Reader Service Card

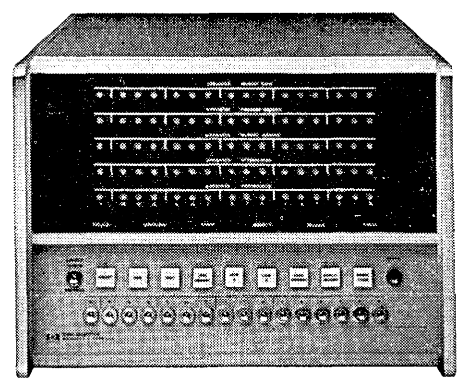
Se habla FORTRAN
Ici on parle ALGOL
Man spricht BASIC

Are we speaking your language?

Hewlett-Packard computers are multi-lingual. They speak languages like extended ASA Basic FORTRAN, ALGOL, and BASIC. You can perform scientific computations—or talk to instrumentation systems—in the language you're comfortable with.

Powerful software available for HP's computers includes FORTRAN, ALGOL and BASIC Compilers, Assembler, and Basic Control System (BCS) with modular I/O drivers for device-independent programming. Compilers and Assembler generate relocatable code—linked by BCS loader at execution time.

Two computers available—2116A and 2115A—fully software compatible. Start speaking to an HP computer now—with a call to your local HP field engineer or by writing Hewlett-Packard, Palo Alto, California 94304. Europe: 54 Route des Acacias, Geneva.



The 2115A has 16-bit words, 2 μsec cycle time, 4K memory (expandable to 8K) and a $16,500 price including Teleprinter.

HEWLETT hp PACKARD

DIGITAL COMPUTERS

Designate No. 18 on Reader Service Card