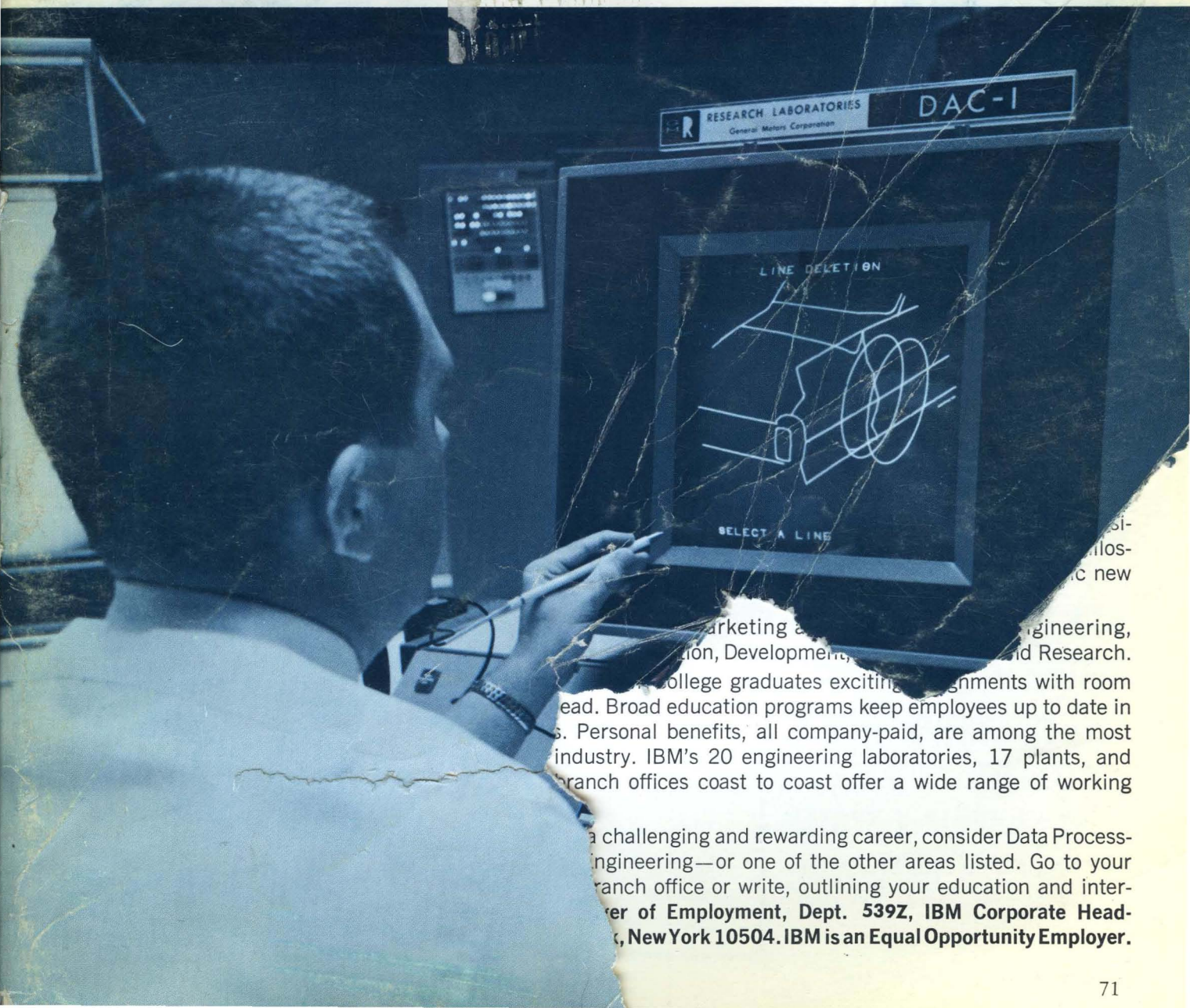
computers and automation

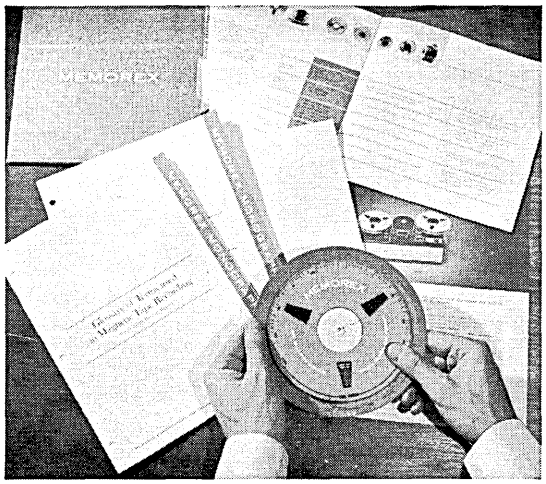
Design Automation: Positive Feedback f[illegible] a Creative Art



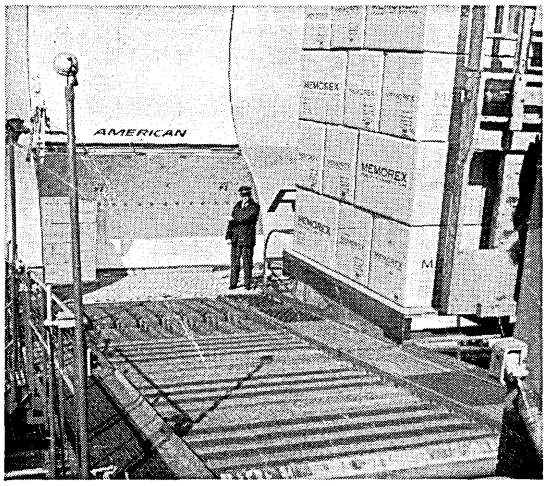
4 REASONS WHY MEMOREX LEADS IN COMPUTER TAPE

(And what it means to you!)

Premium Quality Ask the most demanding computer centers whose tape is used for their ultra-critical applications. You'll find a multi-million dollar vote of confidence placed in the integrity of Memorex products — the result of uncompromised and unvarying product superiority. With Memorex precision magnetic tape you always benefit from measurably longer tape life, freedom from rejects, greater reliability.



Extra Technical Support Authoritative technical backing is the hallmark of Memorex marketing. Manufacturing engineers and tape specialists with experience born of years solving digital recording problems offer help for the asking. Other aids to users include the Memorex Monograph series of informative literature; the Memorex tape slide rule; and technical liaison, of course. Next time you face recording problems, call Memorex!



Added Service Close attention to a customer's needs is the rule at Memorex. But not all are technical. It is important to have the right product at the right time and in the right condition. To assure timely delivery and extra care in transportation, Memorex routinely ships via air cargo at no extra cost. Packaging is more, specially designed handling methods perfect the

Continued Research Memorex Computer Tape is scientifically designed (not the result of cut-and-try methods) to meet highest standards of consistency and reliability. Intensive research in oxides, binders, and process innovations assures continued quality advances. Some results are subtle (an increase in coating durability); some are obvious (the super-smooth surface). But all improvements pay dividends in better performance to Memorex tape users.

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MEMOREX

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Yes, a Farrington Series 1P Optical Reader "reads" ordinary typewritten text and transfers it directly onto punched cards, paper tape, or magnetic tape at the rate of 225 characters per second.

Why?

To help you break the computer input bottleneck . . . eliminate costly keypunching and verification . . . increase accuracy and operating efficiency . . . ease your job training requirements and reduce personnel turnover by using typewriters instead of keypunches.

In short, to give you more computer input for less money . . . as much as 44 per cent less! Farrington Series 1P is designed for the profi[illegible]cious businessman.

Just two more points. Farrington readers proce[illegible] documents at a lower cost than any other optical reading equipment. And the Farrington system permits the preparation of input documents on typewriters at the source!

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FARRINGTON

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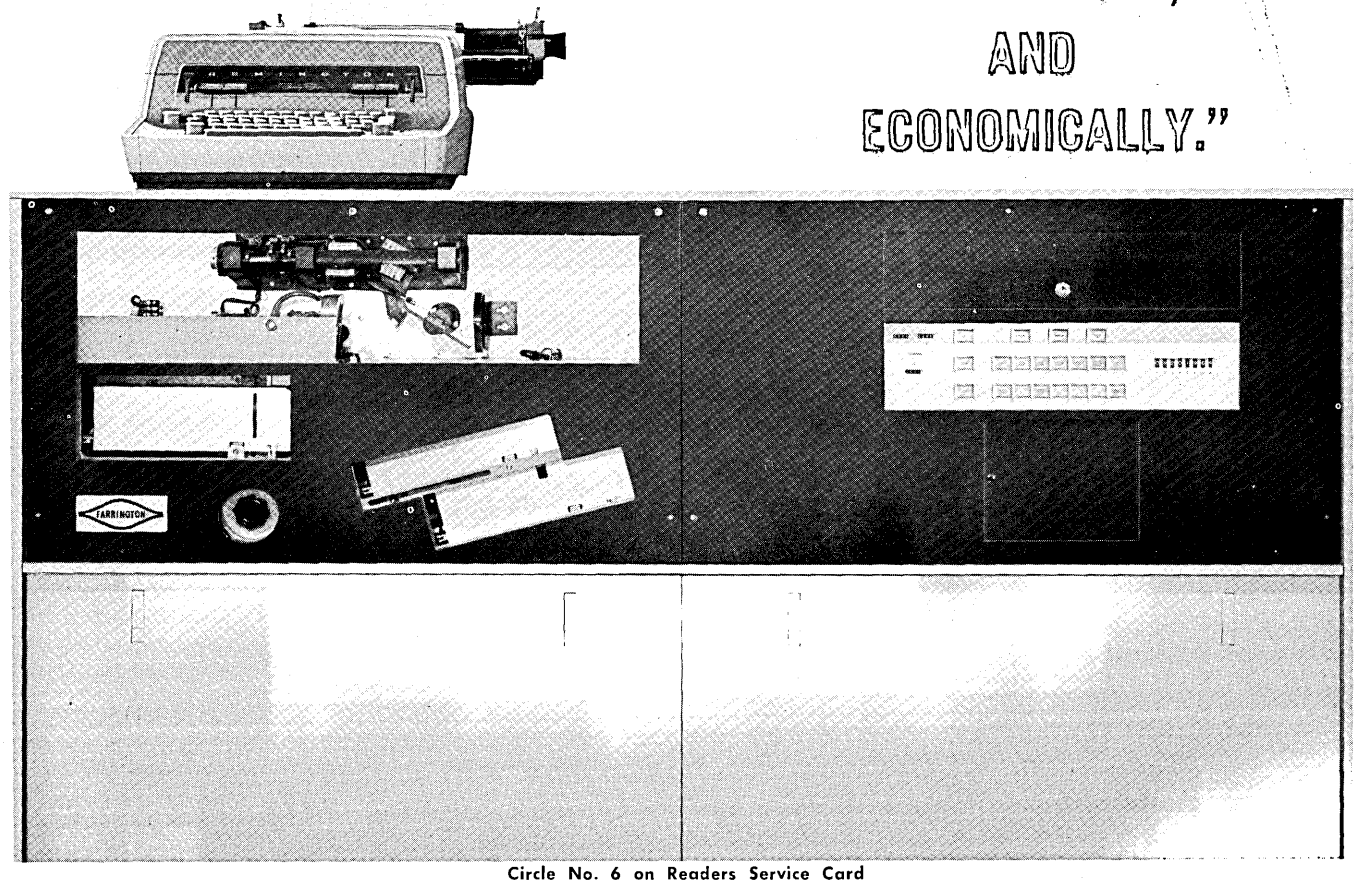
"QUICKLY, ACCURATELY, AND ECONOMICALLY."



Circle No. 6 on Readers Service Card

AN OFF... HISTORY OF MAGNETIC TAPE... #3 of a series by Computape

It's about time somebody told the truth about that Mark Antony and Cleopatra bit. Truth of the matter is, Antony did not commit suicide. He was simply surfeited with the perfumed pleasures of Cleopatra's court. It got so there was hardly anything she could do to please him.

"Mark, doll", she'd coo at him, "Didn't I go and make you a Director of the Banks of the Nile? And have you join the Tuthmosis II Pyramid Club? And don't you like throwing peasants to the lions any more? We used to do such fun things together — and now you spend all your time at that silly computer center!"

"Cleo", he would say, "You just don't understand. They've got this crazy new heavy duty computer tape down there, certified to deliver 1,000 bits per inch, with no dropout! I tell you it's incredible!"

Cleopatra's green eyes flashed dangerously. "I warn you, Mark. You go down to that computer place ONCE more and . . . "

"See you later", Mark Antony said. "They promised me they'd let me change the reels this time."

When Octavius Caesar broke into Cleopatra's camp the next day, Antony was nowhere to be seen; there was only the sullen queen and her pet lion, Amenhotep III.

"Where's Antony?" Caesar demanded.

"Ask Amenhotep, why don't you?" muttered Cleopatra.

The lion rubbed his mane against Cleopatra's gown and opened his cavernous jaws in a huge, contented yawn.

From somewhere in the depths came the faint, muffled sound of a voice,

"Friends, Romans, countrymen . . . HAAAAAAALP!"

This fascinating bit of tape history, incidentally, is presented for your edification by Computape, and the moral of the whole bit is crystal clear:

Computape is heavy-duty tape so carefully made that it delivers 556, or 800, or (if you want) 1,000 bits per inch — with no dropout.

Now - if Computape can write that kind of computer tape history — shouldn't you be using it?

COMPUTRON INC.
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COMPUTAPE — product of the first company to manufacture magnetic tape for computers and instrumentation, exclusively.

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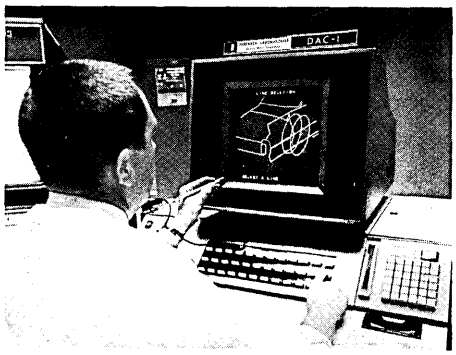

The front cover shows one of the leading applications of image data processing, the DAC-I System at the General Motors Research Laboratory. This new system aids in bringing the designer's creative ideas into direct interaction with the engineering-computation power of the computer. More details on page 33.

computers and automation

DECEMBER, 1964 Vol. XIII, No. 12

computers and data processors: the design, applications, and implications of information processing systems.

In This Issue

In Every Issue

COMPUTERS AND AUTOMATION IS PUBLISHED MONTHLY AT 815 WASHINGTON ST., NEWTONVILLE 60, MASS., 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 $1.50 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 HOLLISTON, MASS.

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Examples, Understanding, and Computers

How does a human being take in an idea and use it?

How does a human being take in ideas about computers and computer programming, and thereby understand computers and computer programs?

How do we arrange this process of understanding so that it becomes much more efficient than it used to be, and so that we overcome one of the greatest bottlenecks in the use of computers—understanding them and their programs?

Some months ago, I watched a squirrel raid a bird feeder. The bird feeder was an inverted glass cylinder, with a wide, sloping, conical lid to keep out rain, and a round base trough, into which sunflower seeds and other seeds fed slowly by gravity through openings. The feeder was tied by a short string to a pole; the pole rested in a forsythia bush projecting about two feet beyond the bush. When I first saw the squirrel, he was investigating and eating some of the fallen sunflower seeds on the ground below the bird feeder, and then he rose up and tried to reach the bird feeder from the ground; but it was too high for him, and he could not reach it. A little bit later I saw him crawling out on the pole towards the bird feeder. Then, holding on to the pole with his right hind paw only, he lowered himself slowly along the bird feeder, preventing it from swinging out with his left hind paw. He stretched his full length upside down towards the base of the feeder, got his front paws on the seeds, and proceeded to eat all he wanted for about five minutes, remaining head downward. Finally, he drew himself back up to the pole, and left along the pole through the bush.

I would say that the squirrel had a good idea, and I would say that the squirrel understood the situation!

The squirrel's idea however is not demonstrable—because I cannot look into the squirrel's mind, and of course he cannot tell me anything about what is in his mind, because we do not speak each other's language. But the squirrel's understanding is demonstrable: he showed he was able to perceive relevant features of the situation, adapt means to ends, and fulfill his goal.

Often when I have access to a computer, I am like that squirrel. I run in a program, present data, and try to get what I want out of the computer, but at first nothing desirable happens. The goal is out of reach over my head. On later trials with a different procedure I may have more success. I remember one case last spring: to make sure that I could use a certain assembly program correctly, I very carefully copied out on punched paper tape a simple symbolic example given in the published manual. But it would not assemble, on repeated efforts. Finally, somebody nearby remarked that maybe there should be a carriage return character at the end of the symbolic tape—though there was nothing whatever said about that in the manual. With that change, the symbolic example in the manual assembled immediately. My understanding remained incomplete until my sample case actually operated correctly.

To the extent that I can give the computer data regarding a situation or problem that I am interested in, and get back from the computer certain results that I want—to that extent I understand the computer. My understanding increases in terms of the quantity and variety of instances, examples, cases, problems, situations, that I can operate with. The more different kinds of sample problems I can solve on the computer, the more I understand it.

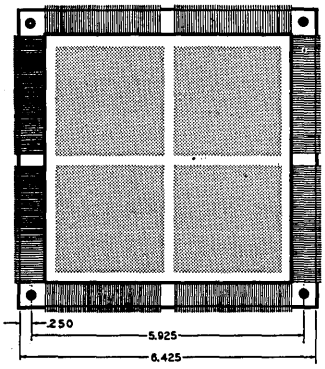
It seems to be true that animals in general take in ideas, increase their understanding, from examples, experiences. Chickens learn from examples that they are fed corn at the end of the day in the chicken yard, and they come running back from foraging to get it. Professor B. F. Skinner of Harvard trains a pigeon to peck in the pattern of a figure 8 by giving it little rewards for each increase of sample behavior towards the desired pattern.

Men have an advantage over animals in that ideas may be conveyed by language as well as examples. But over and over again men build up their understanding of ideas by means of examples, illustrations, models, rather than language. We gain a firsthand understanding of probability by experimenting with flipping coins and rolling dice. We increase our understanding of how to drive a car by dealing with many examples of driving situations in the real world, ranging from simple ones in driver training courses to more complicated ones in independent driving in difficult traffic. Certainly one of the best ways to produce full understanding of computers and computer programming would be well-designed sequences of examples from simple to complex, together with access to the computer to try them on!

Edmund C. Berkeley
EDITOR

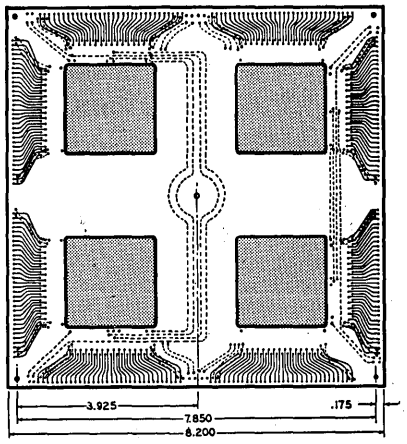
Why look further for Core Memory Frames?

One of these three Fabri-Tek standards probably will fill your need!



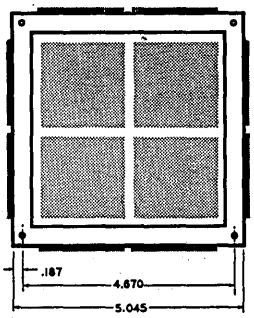
Laminated frame with dip-soldered terminations

Four quadrants of 4,096 cores each per frame • 30-mil cores on 30-mil centers • Available in choice of three core-types • We'll stack it, package it, and terminate it to fit your requirements



Printed circuit quad-frame

4,096 cores per quadrant • 30-mil cores on 30-mil centers • Available in choice of three core-types • Solid copper shielding • We'll stack any number of planes and package the way you want



Molded frame with dip-soldered terminations

Four quadrants of 4,096 cores each per frame • 30-mil cores on 30-mil centers • Available in choice of three core-types • You choose the number of planes and packaging you want

The above frames are available in these core choices. Pick the one for your application!

Core Type	Full Drive Current @ 25° C.	"One" Output (4,096 core array)	Ts (max.)	Tp	Memory Cycle Time
A	450 ma.	30 mv.	0.45 usec	0.25 usec	2.0 usec
B	520 ma.	35 mv.	0.42 usec	0.22 usec	1.5 to 2.0 usec
C	640 ma.	35 mv.	0.40 usec	0.22 usec	1.5 to 2.0 usec

If one of these three doesn't suit your requirements, we have frames, stacks, and systems that are bigger, smaller, faster and slower. In fact, anything you want in a memory that doesn't move is available at Fabri-Tek. Call, write, or wire Robert E. Rife, Fabri-Tek Incorporated, Amery, Wisconsin. Phone: COngress 8-7155 (Area 715). TWX: 715-292-0900.

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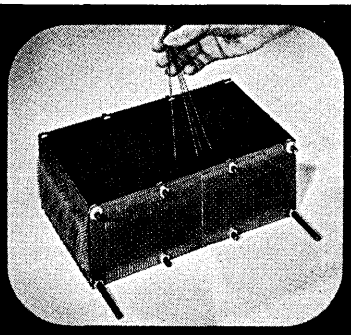

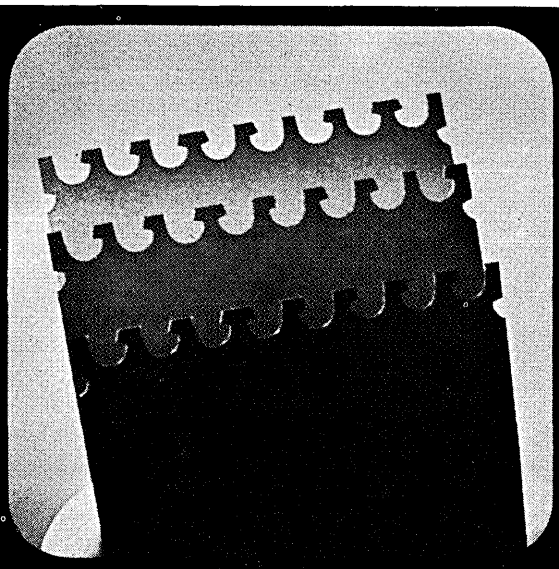

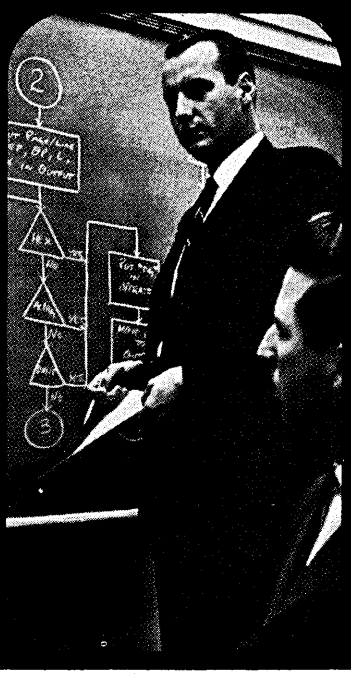

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PRODUCT ENGINEERING
- ☐ PACKAGING DESIGN
- ☐ ELECTRONIC AND MECHANICAL PRODUCT DESIGN
- ☐ COMPONENT ANALYSIS

SYSTEMS ANALYSIS
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ACM 65 CALL-FOR-PAPERS

The 20th National Conference of the Association for Computing Machinery will be held at the Sheraton-Cleveland Hotel, Cleveland, Ohio, August 24-26, 1965. Computer people are invited to contribute timely, original papers that will reflect the broadening spectrum of the computing sciences.

To meet publication deadlines, complete papers and 100-word abstracts must be submitted to the Technical Program Committee by March 1, 1965. All manuscripts will be carefully screened by a refereeing committee and final selection of papers will be made by June 15, 1965. All accepted papers will be published in a *Conference Proceedings* (copyrighted by ACM) that will be available at the meeting.

Each paper will be allocated sufficient time, not only for complete presentation, but for panel and audience discussion as well. A panel of referees will moderate discussions at each technical session.

The complete paper must be typed (double-spaced on white paper) with black ink and preferably with a pica typeface. Up to 10 published pages will be allocated to each paper in the *Proceedings*. Typed versions can include a maximum of 7,000 words without illustrations—or a corresponding reduction in text dictated by the size and number of illustrations. All drawings and photographs must be sharp and suitable for immediate reproduction, in reduced size if necessary.

Papers (with illustrations), abstracts, and a covering letter should be sent in sextuplicate to George J. Moshos, Technical Program Chairman, ACM 65 Meeting, P. O. Box 4741, Cleveland, Ohio 44126.

FLOW CHART SYMBOL CONVENTIONS STANDARD

From Vico E. Henriques
Secretary, X3, BEMA/DPG
235 East 42nd St.
New York, N. Y. 10017

In July the ASA X3.6 committee released for final consideration a document on flowchart symbols entitled, "Proposed American Standard Flowchart Symbols for Information Processing." Now the Working Group X3.6.5 is developing a proposed standard on flowchart conventions. Such conventions are specified by rules, techniques and other information used in conjunction with the symbols on a flowchart. For example, what are conventions for the identification of connectors, the striping of symbols, rules for illustrating switching, I/O, communications, etc.

To develop a standard which reflects practices of the broadest cross section of users it is important that the Working Group consider all ideas in this area. If your readers have access to information on flowchart conventions, it would be appreciated if it were submitted to me as Secretary, X3.

COMMENTS ON "THE COMPUTER PERSONNEL REVOLUTION"

I. From: William H. Kincaid

Assistant Director
Commission on Professional and Hospital Activities
First National Building
Ann Arbor, Mich.

We very much appreciate your printing Mr. Brandon's article, "The Computer Personnel Revolution" in the August issue. It is an excellent statement of the urgency of the educational problem which is already upon us.

One thing puzzles me however. I could only find a net reduction in programming requirements of 20 percent rather than the 35 percent Mr. Brandon quotes. Under automatic programming we might reduce programming requirements by 25 percent, under organization about 5 percent but we might increase the need by about 10 percent under software development. This is how I got the 20 percent reduction (including technological change) rather than the 35 percent.

If the mathematics in the article did contain this slight error, it would mean a need for something like 187,000 programmers by 1970 rather than the 145,000 contained in chart six. Did I miss something?

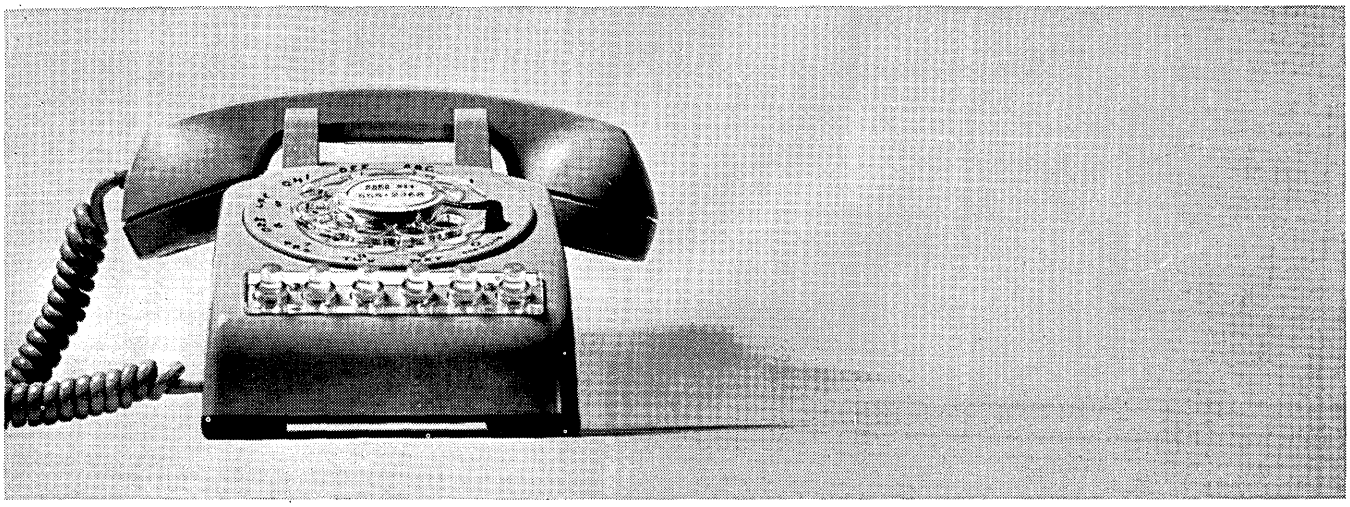
My chafing at the mathematics in no way detracts from my great appreciation for the article itself.

II. From: Dick H. Brandon

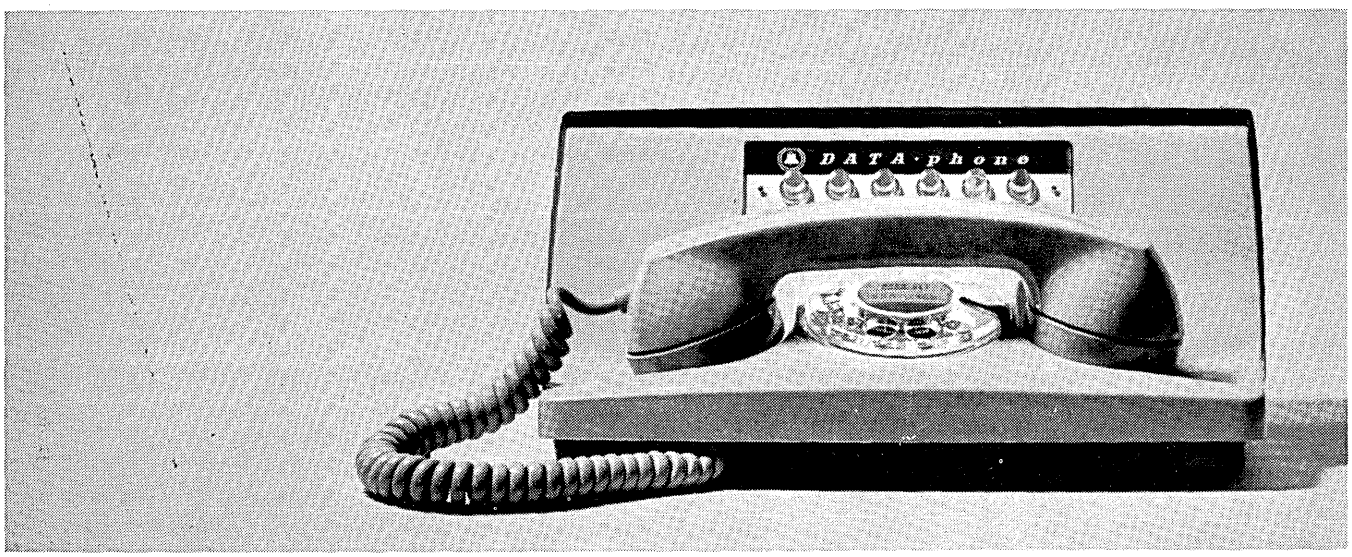
Brandon Applied Systems, Inc.
New York 17, N. Y.

Mea culpa! Apparently I am the one who missed. It is obvious that an arithmetical error has indeed occurred. This error may be a manifestation of the Brandon Com-

(Please turn to page 25)



What's the connection?



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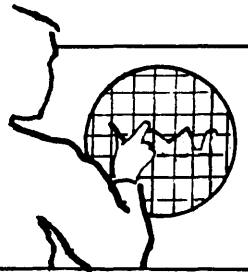

c & a EDITOR'S SCRATCHPAD

WHERE ARE WE IN THE PRODUCT CYCLE OF THE COMPUTER INDUSTRY?

One year ago this month we predicted in our "Editor's Scratchpad" that 1964 would prove to be the year of the reappearance of the cyclic gusher of new computer system announcements. We stated that 1963 was a relatively quiet year, with only 14 new computer systems unveiled. Likewise, 1962 was a year of relative tranquility for product publicists in the computer industry.

Has our prediction been sustained? It is easy to see that it has. To date, over 35 new computer systems have been announced, and the number is certain to pass 40 by the end of the year.

Why this sudden spurt in new announcement activity in the computer industry this past year? The fundamental reason for this cyclic pattern is that IBM is the common focal point of competition in the computer industry, and with over 75% of the market in its corner, IBM sets the equipment introduction rhythm for the other participants in the industry.

The metre which IBM uses in conducting, voluntarily or involuntarily, the new product development suite for the industry, is based on a measure of five years. This is the average amount of time it takes a leasing arrangement with a computer customer to pay back to IBM the effective purchase cost of the equipment, maintenance fees, interest, etc. Thus, computer systems such as the 1401, which had its most intense installation period during 1961 and 1962, is scheduled to be replaced in good numbers by System/360 units being installed in 1966 and 1967.

Since 1964 proved to be the year in which IBM advised its customers on the performance and price of the computer systems it was readying as its next generation of computers, it was also the year which established new competitive performance standards for the industry. These new standards, known to most computer manufacturers several months before IBM's actual announcement of System/360 this past April, stimulated a rash of "adjustments" in the lines of competitive manufacturers, either by price reductions, by the offering of improved memory or processing speeds via modification of existing systems, or by new product introductions.

The second major stimulant of new product announcements is that IBM, in establishing System/360 as a compatible family of computers which will be supported by IBM for a marketing life of some five to seven years, also established a set of de facto standards for the command structure of a computer system, systems design, and for the handling of information in data communication channels. This fact will certainly not go unrecognized by competing computer manufacturers, as the RCA computer announcement expected this month verifies.

We can expect to see more of the use of the same design criteria in computer systems development from at least one additional computer builder in 1965.

It is interesting to reflect on the accuracy of our predictions on upcoming new computer systems made twelve months ago. We said that Burroughs would announce an improved version of the B5000...witness the B5500. We said that Control Data would announce a computer to bridge the gap between the G-15 and the 3200...witness the 3100. We said that Honeywell would announce a new small business computer... witness the H-200. We said that IBM would announce large storage devices, new I/O gear, and the basic members of a new computer series...witness the bulk core storage unit, the numerous new I/O devices, and the basic models of System/360 introduced this year.

Not to let you think that our crystal ball is without some frost, we were also looking for an LGP-22, a Univac IV, and a new small computer from RCA. We expect RCA at least to make this latter prediction doubly true this month.

What do we expect in 1965? We expect that compared to 1964 next year will be a relatively quiet year for new computer announcements. Burroughs is likely to announce two new members of its B300 computer series; Control Data will provide firm specifications on the 6400 and 6800 computers; General Electric will introduce an ultra-large scientific computer, possibly the 645 or 655; Honeywell may introduce the big brother of the H-300, the H-3300, if H-300 sales begin to move; IBM will add to the newly shown model 20 perhaps a model 10, and a model 45 for the System/360; and Univac will be hoping to get management approval to announce a new family of computers using integrated circuits and compatible with System/360.

We also feel that in 1965 the computer user will begin to exert a more dominant role in shaping the advance of computer technology. We will look for the growing cadre of sophisticated computer users to uncover new business opportunities created by the power of the computer, and to unearth many more computer applications than were ever imagined by even the ingenious minds on the marketing staffs of the computer vendors.

In net effect, we expect that the end of 1965 will find the computer industry in a much healthier state than today, and hopefully, a more profitable one for the majority of the major companies in this glamorous industry.

Many of the outstanding achievements in science and technology during the past 10 years have been recorded, analyzed and preserved on tapes of "Mylar."* When reliability counts, count on "Mylar."

*Du Pont registered trademark for its polyester film.

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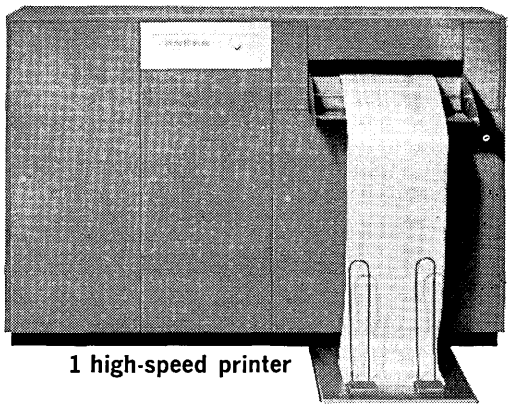

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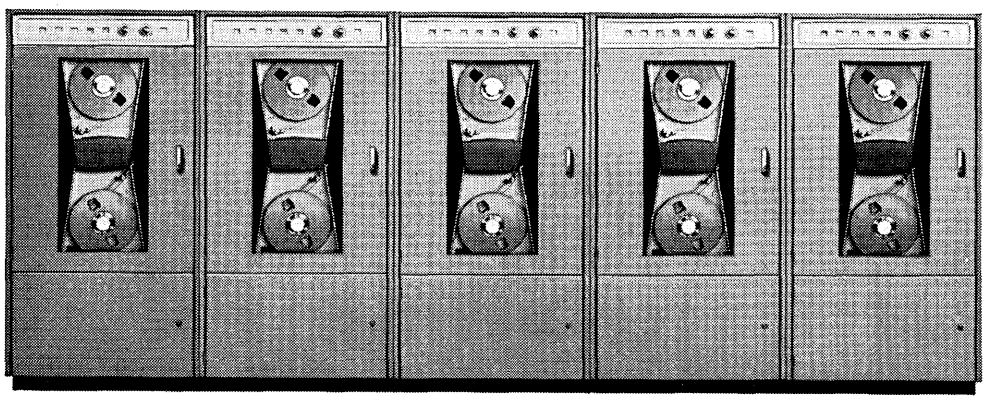
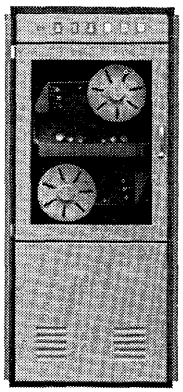
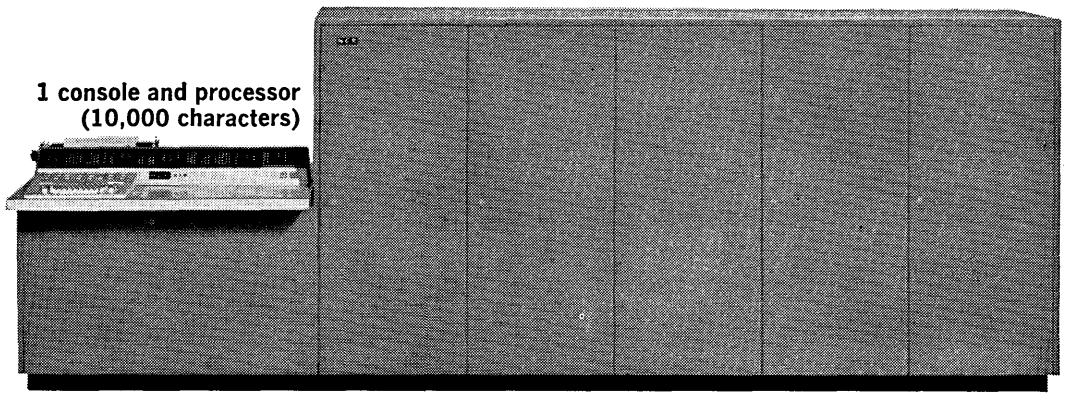


5 magnetic tape handlers



1 paper tape reader

1 console and processor (10,000 characters)



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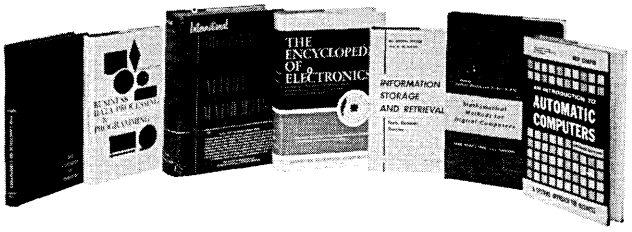

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THE UNFAVORABLE SOCIAL IMPLICATIONS OF AUTOMATION

Dick H. Brandon
Brandon Applied Systems, Inc.
New York, N. Y.

"Computers and Automation" is providing a worthwhile forum for professionals in the data processing field to discuss the social implications of automation. Unfortunately professionals tend to be defensive about their profession; usually only positive views are presented fully. The phenomenon of automation is encompassing, vital, and revolutionary, and cannot have only a positive side: it is extremely important to examine objectively the negative side.

Like the benefits of the Industrial Revolution, the benefits of automation and computers will eventually prevail. Our society as well as other societies hopefully will absorb and use properly the added output made possible by automation. As with the Industrial Revolution, however, the interim period of change will see tremendous upheavals with both localized and national impacts of significant dimensions. A number of problems will cause upheavals.

Unemployment

There is no question that automation will bring much unemployment during this interim period. Estimates of unemployment have ranged from a low of 1,000 jobs lost per week, to a high of 50,000 jobs lost per week. The U. S. Labor Department is vague since the criteria for the measurement of unemployment are not well defined. Also, seasonal adjustments and poor recording systems make it difficult to measure the actual impact accurately. However, the unemployment is real; it is real to the clerical person displaced by a computer and it is real to the factory worker whose job has been replaced by an automatic machine.

Unemployment will have a severe impact in localities with high percentages of white collar workers. Localities such as Hartford, Connecticut, the insurance capital of the United States, will have difficulty in absorbing the clerical force that will be displaced by computerized insurance applications. Similarly, the financial district of New York, the aerospace industry in Southern California, and the automotive industry in Detroit will represent areas where unemployment due to automation will become severe.

The Problems of Increased Leisure

Although usually touted as an advantage, the increased amount of leisure time made available by automatic equipment represents a serious problem. The last twenty years have seen a reduction in the work week and an increase in leisure time. At the same time, however, this period has seen equivalent advances in leisure technology: the development of television on a large scale; increase in sports; and other leisure activities both physical and mental. However, many of these activities are subject to increasing boredom: bowling is no longer as popular; the average hours of TV watched per capita have been reduced sharply. Increased automation and a further reduction of the work week will prevent as rapid a solution to the leisure problem as in the past. As a result, the average worker in the United States will have a notable problem in adjusting to his increased leisure time.

Popular Attitude Towards Automation

The popular image of automation is not attractive. Automation has created a spectre of unemployment, rightly or wrongly. A negative attitude on the part of the majority of employees towards automation may create significant morale, emotional, and psychological problems.

Education for an Era of Automation

Our massive education system is responding too slowly to the need for higher orders of mathematical and mechanical skills required by the new technology. Therefore, the average worker will not be immediately qualified to enter into new training programs. A significant number of people being graduated today will have to be retrained,

regardless of their capacities, within the next ten to twenty-five years.

Wider Divergences in Income

Although most people would regard increases in income as a significant benefit, it may bring problems. Increases in income would certainly favor the new skills and would be discriminatory. A discriminatory increase sharpens economic and social distinctions, and is unfair to people living on retirement income, social security benefits, or other fixed incomes.

Changed Techniques in Business

Increased automation and increased skill requirements by business will alter many business concepts. The concept of management will be changed; organizational structures will be changed substantially; management of creative people will become commonplace; increased centralization of organizations will reduce the amount of middle management. These factors will alter the way in which Americans do business. In addition to the workers directly displaced by automation, a number of workers now employed in business will no longer be adequate to fulfill the functions for which they will become responsible. This group, middle and top management, will suffer significant changes as a result.

These are among the negative points of **Computers and Automation.** No matter what we do, no matter how we try to avoid facing them, we must recognize them and attempt to mitigate their effects upon our society. Society will face a difficult period of adjustment. Previous technological and economic revolutions have involved wars, social revolutions, and other major disorders. We may face a more severe problem, particularly because the weapons of disorder are so much more destructive.

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SOME EFFECTS OF ELECTRONIC DATA PROCESSING ON MANAGEMENT IN LIFE INSURANCE COMPANIES

Walter Klem
Senior Vice President and Chief Actuary
Equitable Life Assurance Society of the United States
New York, N. Y.

The Use of Computers to Assist Management

Much has been written in the last few years about the ways in which computers can be used in direct support of managerial activities. It is not unusual, in fact, to read that the use of computers to aid decision making, to improve planning, to help in the over-all control of an organization's activity, is *the* profitable use; that simply carrying out what used to be clerical functions by means of electronic data processing is unimaginative and often not even particularly worthwhile from the standpoint of cost reduction.

In the life insurance business, though, we have concentrated on uses that are primarily concerned with clerical kinds of work—uses that are often referred to as being in the "cost displacement" category. There is a slowly growing number of "management-oriented" EDP applications in life insurance; but we have not been in the forefront in claiming major management advances through such developments as computer-based simulation or computer-supported decision making and control. Yet the life insurance industry was among the first to see the possibilities of computers for business uses; we have certainly devoted a great deal of attention to them; and they have already brought about major changes in the organization of our work and the activities of our offices.

Our Office is the Factory

For good reasons, the computer has had its initial value for our business in clerically-oriented rather than management-oriented functions. In the first place, when we apply any sort of automatic equipment to the processing of files, papers, or information generally, we are "automating" our production line. Our "office work" is not a supporting function backing up the factory, as in the case of the typical manufacturing industry—our office *is* the factory, engaged in writing policies, computing dividends, sending out premium notices, and so on. On these functions we spend by far the largest part of our administrative expense dollar; hence it is natural that we looked to these functions first when automation began to seem a possibility for our kind of work. This is not only common sense, but also happens to fit the historic pattern of bringing automatic devices to bear first on the production line, then on the processes that control the production line, and finally on the underlying decision processes that guide a company's basic policy-making.

The decision-making environment in a life insurance company is different from what it is in the industries in which computer-aided decision-making has made the most progress. Many of the most successful uses of computers to aid management have dealt with problems that are common to many manufacturing companies, but that do not arise in life insurance. We do not have production scheduling problems, or product-mix decisions to make, or (except in a very trivial way) problems of maintaining optimum inventory levels, or distribution problems of the kind in which the costs of transportation and materials are among the key determinants. Put differently, we do not have the problems associated with production and distribution of physical goods. These also happen to be problems which are not too difficult to state, and for which there is considerable experience from which managers can establish criteria to judge the solutions in quantitative terms. Finally, they are areas in which the use of analytical planning techniques is not a new idea.

A Well-Understood Mathematical Model for Decades

In a life insurance company, actuarial work represents an activity in which the mathematical formulation of basic problems—pricing, distribution, valuation and so on—is traditional. One would expect to find computers used for non-clerical actuarial work, and one does. It is common practice today to evaluate in some detail a number of alternative dividend scales, or premium rate and non-forfeiture value structures, where in pre-computer days an actuary would have made the decision on the basis of much less information. This hasn't produced startling effects, or led to much new theoretical work, probably for several reasons. We have had, for decades, a well formulated, thoroughly understood mathematical "model" for our management decisions of an actuarial nature. We do not have problems, in this area at least, for which refinement in the available techniques of solution produces a dramatic shift in the "right" answer. With more power to our analysis we may get a better answer, but we are not likely to get an almost completely different answer as has sometimes happened when computers were put to work in other fields.

Solutions to Management Problems

There are other ways in which the machines are helping us to deal with management problems in the life insurance business. Let me illustrate by mentioning a few examples from my own company; other companies, of course, could cite other examples:

- We are routinely preparing, for our agency officers, a much more extensive analysis of the source and nature of our Individual insurance new business production than could conceivably have been made in the days before EDP equipment was available.
- To sharpen our budgeting techniques, we are using the computer to analyze payroll changes from calendar quarter to calendar quarter—pointing up for each budget area the effects on payroll of turnover, staffing changes, merit and promotion increases, and so on.
- Our economists are using time-series analysis techniques to study a variety of data, both internal and external to the company, in order to help management in its evaluation and projection of the company's progress.
- We are constructing a "mathematical model" of certain aspects of our agency force operation, for use in helping us to understand better the likely future results of various alternative courses of action in agency recruiting and other aspects of agency management.

These examples, and others that could be supplied, indicate that life insurance companies are indeed using computers in applications directly related to the work of managers, as well as for more routine "cost displacement" purposes.

We are undoubtedly just scratching the surface in management-oriented uses, however. It is not particularly risky to predict that there will be increasing use of computers to digest, evaluate and edit information in two ways that are of great importance to managers:

- To highlight what is going on in the organization—not in terms of masses of data that report everything, but in terms of limited data reporting the variations from what was planned or what was expected.
- To help portray the probable outcomes of various alternative courses of action, so that we can have a better sense of what is involved in the various possibilities before we choose among them.

Let's look at a little greater length at each of these.

Knowing What is Already Happening

The first deals with the need to know what is already happening, so that we may have the information we need to correct trends that seem to be going wrong or to make new plans for the future. With the speed of the computer, we can expect to get this kind of information much more quickly than in the past—in fact, given the possibilities inherent in "real time" systems, we can go as far in the direction of "know it as it happens" as we care to pay for. Here, however, there is a real danger of our being flooded with too many reports, in too much detail. This suggests that the power of the computer to analyze may be more important than extremes of speed: why should we have to study a report to separate what is interesting in it from what is routine? The computer can do this—*if* we can stipulate in advance what are our criteria for "interesting" as against "routine." (Out of the technological developments of the next few years there may come the possibility of relaxing this requirement that our criteria of choice be spelled out in detail in advance, but at present it is a strict requirement and one that inhibits progress in quite an important way.)

Selection of Significant Information

The development of very large, readily accessible data storage devices at reasonable cost will also have a considerable effect on how we use computers to keep us abreast of what is going on in the organization. Today, in addition to the tendency to print voluminous reports because we can't tell in advance how we will go about separating the significant from the routine, there is the tendency to print everything because a part of the detail will actually be needed and we do not know in advance which part this will be. Perhaps, for example, we assemble individual agents' production information once a month: knowing that we shall want the record for a few particular men, we find that we have to print the whole set of data and circulate a bulky report, so that the few lines of information actually required will be available to those interested. It should be economically feasible in the future for each manager to get direct, immediate access to the information he wants without having to deal with all that he doesn't want, and without regard to whether his colleagues want the same or different information.

Technologically, this approach to managerial reports is already feasible—in fact, fairly easy. There are still questions of cost and value to be resolved before extensive use of it will be made in our companies, but these are essentially questions of system design and evaluation rather than matters awaiting a "breakthrough" in hardware (or even software) development.

The Manager's Planning Function

In the manager's planning function, the computer's role is to provide answers to types of questions like "what would happen if . . .?" rather than "what has happened?" or "what is happening?"

The life insurance business is built upon the idea that a mathematical model of past events can be used to determine realistic courses of action for the future. What else is the actuary's mortality table and its uses? Thus the idea behind "simulation" for business planning should hardly be a strange one to us. But whereas the mortality table, and the actuarial concepts built upon it, had to be formulated in a way that kept to a minimum the amount of calculation needed to arrive at usable answers, the power of a computer makes it possible to carry out simulation with very much less regard to the amount of computation it will entail.

Computer-Based Simulation

We have many kinds of problems in the operation of our business to which I would expect the technique of computer-based simulation to be applied in the future as a matter of routine. If we can isolate several significant variables affecting a problem, and can identify the kind of effect that each variable has on the outcome as a whole, a computer can evaluate the combined effects by running through large numbers of trials with different specific values given to the individual variables. The formulation isn't generally very easy, and it may take a good deal of high-level technical analysis and a considerable period of rather frustrating trial-and-error activity before any useful results emerge; but where the potential payoffs are high enough this can be well worthwhile. We can undoubtedly expect within a few years to see a number of practical, working examples of simulation in such areas as personnel, investment, and agency planning, as well as in connection with the design phases of large-scale system planning for administrative functions.

If such developments as these are, in fact, feasible and worthwhile, why is there still something of a flavor of

unreality about them? Partly, of course, just because the ideas and concepts are very new. Partly, because they are still very much in the realm of development and experimentation, even where they have been proven to be technologically feasible. Beyond these general reasons, however, there are at least three important specific reasons for what is still a fairly slow rate of progress.

Practical Reality

One is that these ideas are not easy to translate into practical reality. They need skilled, imaginative and creative people with both a deep understanding of our business and a thorough technical grasp of what can and what cannot be done. There is an acute shortage of such people. We have had a natural—and I think correct—tendency to use them first in the development of computer-based administrative systems where the cost reduction possibilities are large, clearly attainable, and already well understood. We cannot, after all, be sure just what the more subtle, highly sophisticated ideas for computer-assisted management decision-making will contribute to over-all success in our companies, no matter how successful work of this kind appears to be in other environments. But it is clear enough what each dollar of administrative cost saving will do.

Well-Defined Structure

Second, and perhaps considerably more important for the long run, is the absence of what might be called "well-defined structure" in many of the problems that we deal with as managers. If two men cannot agree on the exact nature of a problem, let alone on the best approach to solving it or on the criteria by which alternative solutions are to be evaluated, a tool as rigid as the computer is today won't help very much. To make more use of computers, we shall have to find better ways of formulating our problems, our objectives and our criteria for evaluation—a development, incidentally, which may prove eminently worthwhile even without any role for the computer. Some problems, of course, will seem to defy all attempts at being formulated in well-structured terms; many would cost more to formulate in a precise way than they are worth (an imperfect answer may be much less costly than the effort needed to improve the answer); but it will be both possible and worthwhile to formulate more precisely at least some of the problems that the typical manager now deals with in a rather vague way. Until we learn better how to do this, however, there is an inherent limitation to how far we can use computers as aids in the job of managing.

Communication between Tool and Tool-User

The third point grows out of the second. There is need for better communication between the manager and the computer. Today, even after the problem and the data required for its solution are completely agreed upon, a programmer—whose activities are slow and time consuming—must intervene, in effect, between the question and the answer. There has been talk of a man-machine language that would permit direct "dialogue": the user, without detailed technical training, would be able to ask questions of the computer in everyday language and would be able to follow them up with other questions based on the answers to the first—all without a programmer or any other third party intervening. Rudimentary versions of this kind of arrangement exist today. Probably no "hardware" barrier exists to its becoming much more sophisticated quite rapidly; there is, though, an immense amount of work to be done in the "software" area before such systems become realistic for widespread management use.

Hardware Developments Not Needed

From the standpoint of what "hardware" developments are needed to make the computer more useful for direct management uses, I think I would have to say: not many. The main physical requirements for large-scale automatic or semi-automatic management information systems, in our business, are: machine-accessible files of very large storage capacity, fast central computers, and convenient input and output devices that can be located away from the central computer installation. All of these requirements can be met in systems that are already in the standard product lines of the major equipment suppliers. I am sure there will be improvements, and that costs will come down—but we shouldn't allow ourselves to think that awaiting new hardware developments is going to solve our problems. If I had to rank the barriers to effective use of computers for management purposes, I would put our own limitations as users first; machine language, or software, problems second; and hardware considerations a distant third, well behind the others.

One common statement of the manager's job is that it consists of planning, directing and controlling so as to accomplish, through other people, the work of the organization being managed. If computer systems will really help managers to do these things better in the life insurance business, their cost will probably seem small in the long run in relation to the benefits they produce for more effective over-all operation. And it seems reasonable to suppose that computers will prove themselves increasingly valuable in support of planning and control functions. Both depend heavily on information, properly extracted, summarized and evaluated. The computer is the most efficient device yet developed for reducing large masses of information to significant form.

The Effects on Management of Using Computers

Much as I think the manager of the future is going to benefit from the kinds of development I have been discussing, I also think that the main impact of computers on management, in the life insurance business, will be the indirect one that flows out of the familiar more routine machine functions. We have been forced to plan, to project, to handle widespread change in our administrative operations at a quite new tempo. The work of large numbers of people has been affected, and large investments of both talent and money have gone into the development of new ways to process our work more effectively and more economically. In the process, I submit, management effects have gone well beyond the boundaries of work in which the computer itself is central.

Careful Advance Planning

Those who have been directly concerned with the transition from clerical operations to EDP systems have learned—sometimes the hard way—that to get the job done properly without an immense amount of careful advance planning is practically impossible. They have learned that "playing it by ear" won't work in this situation. Hence they have found substitutes for that time-honored way of doing things—and they have found that the substitutes often have something quite worth carrying over into other contexts. In many ways they have had to think more broadly: to plan over longer time spans, to assess effects over wider spans of function and organization, to think in terms of people-machine interaction instead of concentrating on personnel or on machinery as essentially separate responsibilities.

Stretched Minds

All of this has stretched minds, opened up new horizons and brought new insights into the work of many people in computer-affected areas. It has rubbed off on their management style and perspective as applied to other problems, as well as on others in the organization whose responsibilities do not relate as directly to areas affected by the computer. Isn't it fair to say that this can significantly affect the quality of management?

Organization Structure

Several other indirect but substantial effects of this kind can rather easily be recognized.

One effect has to do with organization structure. Considerations growing out of computer installations—but not limited to computer-oriented work—have led to greater recognition of the importance of "production" management as an important activity in its own right.

The clerical functions of a life insurance company often grew up as the adjunct of professional, technical, sales or other specialist activities, with their management a secondary concern of people whose primary interest lay in their own fields of specialty. Machine developments have required a unified perspective in looking at the "production" functions—and have shown that, with or without machines, the man responsible for, say, getting out premium notices has more in common with the man whose job is, say, to pay group commissions than either has with the actuary, the accounting officer, or the sales specialist. Of course, effective management of production-oriented activity cannot be a part-time, secondary responsibility; I suggest, however, that one of the real advantages of automation has been to impress the fact upon us and give us the impulse and opportunity to act upon it.

System Concept

Another indirect effect has been the development of the "system" concept as one of the significant ways of viewing our operations.

There are many perspectives from which to see a life insurance company, and each of them contributes to over-all management by supplying insights that would not be likely to arise from the point of view of the others.

The actuary, for example, will tend to see the company in terms of structural relationships between one part of the business and another at any given time, and in terms of future consequences of current trends: his benchmarks are long-term financial adequacy and equity.

The lawyer will start from an orientation that emphasizes the remarkable legal structure that enables us to handle with little difficulty a product in which the sale we make today may easily result in delivery of the "proceeds" fifty or more years hence, in a totally different environment.

The investment man builds his conception of the company from its position as a major element in the financial community; the agency officer sees first the face of the company as it appears to an agent; and so on.

We are now seeing the addition of a new view: that which emphasizes what the observer sees when he looks for the flow of work (generally administrative) across functional specialties. The "system" concept sees, for example, one process in the agent's taking of an application for new business, his submitting it to his local office, its handling there and in the administrative, underwriting, and perhaps medical functions at the home office, the writing of the policy, its return to the field for delivery, its establishment in force through collection and reporting of the first premium, and the preparation of all the records to be needed subsequently for its maintenance. This way of analyzing the company's over-all operation is certainly no more significant than the other, perhaps more familiar concepts; but it does add to our understanding, and improve our grasp, as managers, of the total environment. Again, its recognition has been due largely to work stimulated by the advent of the computer, but its effects have gone beyond the computer's boundaries.

More Need for Brainpower

The computer's advent is helping to bring about another change which may ultimately have very substantial effects on the management of our companies. We have—to put it bluntly—more need for brainpower, and more good uses for people of superior intellectual qualifications at the starting end of the career ladder, than we have ever had before. Further, these people are doing work that exposes them to a broad spectrum of our operations, and which is of a kind that may serve well as one part of "management training." Many of them, of course—probably most—will follow a technically-oriented career path, but some proportion should move towards managerial development and others should, in time, become influential in relation to management even if not directly a part of it.

Selection and Training of Managers

This suggests that the base for selection and training of managerial people is being broadened, in terms both of the number of gifted people joining our ranks and of the work opportunities for management development. Nor is this simply a matter of a large number of computer specialists, systems design people, and other specialists. The line responsibilities in the "using" departments that are dependent upon large-scale, integrated, computer-based systems demand people with a much broader grasp of environment than was needed in the old time supervision of separated functions.

On the other hand, of course, is the fact that some of the channels for developing supervisors by long experience in a particular area, and then building upon this base to find and develop higher-level managers, are becoming more limited. Organization that is geared to computer-based systems tends to need fewer layers of responsibility; its pyramid shape tends to become a good deal narrower and sharper. Both of these are changes that are quite profound in terms of the managerial atmosphere which has been traditional in at least the larger life companies.

Absence of Exceptions

One more point that seems much more trivial but which has appealed to me rather strongly is one of the valuable side effects of the computer. Computers, I think, are a significant force on the side of keeping things simple! Just because a computer system can't easily provide for an exception here and a special case there, while people can (or think they can), we are being forced to recognize that complexity costs money. I think it might be most uncomfortable to know the total cost in our operations of all of the little things we do on the grounds that "it's just for a few special cases—it's worth it!"

Finally, it does seem certain that changes in management practices and techniques will continue to occur, probably at an increasing pace, as new technology both changes the environment and adds new tools for the manager's direct use. And while they occur, managers are going to continue to be very much occupied with managing the changes taking place in the organization. The ability to manage change is going to have to be one of our main strengths for a long time to come.

Based on a talk before the Life Office Management Association, Sept. 30, 1964, New York.

CALENDAR OF COMING EVENTS

Dec. 26-31, 1964: Symposium on General Systems Knowledge, AAAS Meeting, Montreal, Canada; contact Omar Wing, Dept. of EE, Columbia Univ., New York, N. Y. 10027.

Feb. 2-4, 1965: Symposium in On-Line Computing Systems, Schoenberg Hall, UCLA Campus, Los Angeles, Calif.; contact UCLA Engineering Extension (GRanite 8-9711, Station 3721), Los Angeles, Calif. 90024.

Mar. 22-25, 1965: IEEE International Convention, Coliseum and New York Hilton Hotel, New York, N. Y.; contact IEEE Headquarters, E. K. Gannett, 345 E. 47th St., New York, N. Y.

May 10-12, 1965: National Aerospace Electronics Conference (NAECON), Dayton, Ohio; contact IEEE Dayton Office, 1414 E. 3rd St., Dayton 2, Ohio.

May 13-14, 1965: Symposium on Signal Transmission and Processing, Columbia Univ., New York, N. Y.; contact Dr. L. E. Franks, Bell Tel. Labs., No. Andover, Mass.

May 19-21, 1965: Power Industry Computer App. Conference (PICA), Jack Tar Hotel, Clearwater, Fla.; contact G. W. Stagg, American Elec. Power Serv. Corp., 2 Broadway, New York, N. Y. 10008.

May 24-29, 1965: IFIP Congress '65, New York Hilton Hotel, New York, N. Y.; contact Evan Herbert, Conover Mast Publ., 205 E. 42 St., New York 17, N. Y.

June, 1965: Automatic Control in the Peaceful Uses of Space, Oslo, Norway; contact Dr. John A. Aseltine, Aerospace Corp., P. O. Box 95085, Los Angeles 45, Calif.

June 21-25, 1965: San Diego Symp. for Biomedical Engineering, San Diego, Calif.; contact Dean L. Franklin, Scripps Clinic & Res Found., La Jolla, Calif.

June 22-25, 1965: Sixth Joint Automatic Control Conference (JACC), Rensselaer Polytechnic Institute, Troy N. Y.; contact Prof. James W. Moore, Dept. of Mechanical Engineering, Univ. of Va., Charlotteville, Va.

June 29-July 2, 1965: Data Processing Management Association 1965 International Data Processing Conference and Business Exposition, Benjamin Franklin Hotel and Convention Hall, Philadelphia, Pa.; contact Data Processing Management Association, 524 Busse Highway, Park Ridge, Ill.

Aug. 23-27, 1965: 6th International Conference on Medical Elec. & Biological Engineering, Tokyo, Japan; contact Dr. L. E. Flory, RCA Labs., Princeton, N. J.

Aug. 24-27, 1965: WESCON, Cow Palace, San Francisco, Calif.; contact IEEE L. A. Office, 3600 Wilshire Blvd., Los Angeles, Calif.

Sept. 20-23, 1965: Second Systems Engineering Conference & Exposition, McCormick Place, Chicago, Ill.; contact Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y. 10017.

Oct. 4-7, 1965: 20th Annual ISA Instrument-Automation Conference & Exhibit, Sports Arena, Los Angeles, Calif.; contact Public Relations Dept., Instrument Society of America, Penn-Sheraton Hotel, 530 Wm. Penn Pl., Pittsburgh, Pa. 15219.

Oct. 10-16, 1965: 1965 Congress of the International Federation of Documentation (FID), Sheraton Park Hotel, Washington, D. C.; contact Secretariat, 1965 FID Congress, 9650 Wisconsin Ave., Washington, D. C. 20014.

CHOOSING A SERVICE BUREAU

Arnold P. Smith
Special Assistant to the President
The Service Bureau Corporation
New York, N. Y. 10022

With the great number and variety of service bureaus available today in the United States, choosing the right one to handle your computing needs now is a more difficult and time-consuming job than it used to be. To the buyer, however, this competitive situation offers obvious advantages in choice of prices, capabilities, added services, and schedule.

Below are some specific points one should consider in choosing a service bureau.

Programming Projects

The number of programmers available in the U. S. is not sufficient to meet the demand for these highly trained persons. Therefore, companies with special problems such as no programming staff, or a programming staff which is overloaded, should consider using a service bureau.

If your company is in one of these positions, you should proceed with the following steps.

(1) Define your problem as well as you can (documenting it, if possible) before you begin the search for a service bureau. If this is impossible (if you are starting with only a concept, for example), assign someone to work as a coordinator with the service bureau in defining the problem. At any rate, all projects must start with either a problem definition or detailed specifications. Once you have this, you can begin to discuss pricing, schedule, changes, and other factors which involve your job.

(2) Figure out what you expect from a service bureau in terms of finished reports, responsibility, and integration into your company's activities. This is necessary in order to determine the relative merits of different service bureaus and the value of their services to you.

(3) Get competitive bids. Names of service bureaus and their locations can be secured from: the classified advertising telephone book; the Association of Data Processing Service Organizations (ADAPSO), Abington, Pa.; or **Computers and Automation's** annual "Directory and Buyer's Guide." In terms of personnel, experiences, and prices, service bureaus are all different. Securing competitive bids will help you obtain the right bureau for your needs.

(4) Set up a committee within your company to evaluate the service bureau proposals. The committee should represent the purchasing and management areas of your business as well as the project area itself. The proposals must be reviewed for technical competence, price and schedule, legal commitments, and completeness.

(5) Investigate your bidders. Their references should be checked; their technical reputation should be considered. To protect yourself and your firm, it is worthwhile to assemble a file containing this type of information.

(6) Compare the services offered. Will the service bureau supply the entire project itself, or will part of it be subcontracted? Do you want this? What other auxiliary or additional services will you want? Will this service bureau be able to provide them? When you are ready for extensions or changes, will this service bureau be able to assist you? Is a competent sales representative assigned to your account? Will he be responsive to your needs and requests?

(7) Consider your responsibilities in the project. The service bureau will require your cooperation in providing to its personnel time, data, source information, and decisions. Make sure that you and the service bureau agree on all such points.

(8) Be certain that you have a similar agreement on what is expected of the service bureau—context and format of reports, rates, schedules, methods to be used, personnel commitments, and lines of responsibility. This information should be detailed in the contract.

(9) Read carefully the terms and conditions of the service bureau contract. Have your legal department do so also. Know what the clauses mean. And if you don't know—ask.

(10) Examine the types of contracts available. The three most common are: fixed price; time and materials; and cost plus fixed fee or percentage. Specify allowable and non-allowable costs (i.e., sales travel, telephone, supplies, and administrative expenses). In most cases the best business contract for both parties is the fixed price type. Everything is known in advance, and only mutually agreed upon changes or additions can alter the initial agreement. If the problem is not defined fully or is of extreme magnitude, however, the fixed price contract is probably not feasible at first. Nevertheless, one usually can be developed during the course of the project.

(11) Interview the service bureau personnel who will be working on your project. Do they show knowledge of *your* problem? Do they have good computing and application experience? How do they handle projects? What are their lines of responsibility? What reporting do they have? What billing information will you receive?

(12) Remember it is not always wise to choose the lowest bidder or the service bureau with the prettiest proposal. Various technical, administrative, and procedural considerations are just as important as price and appearance. Is the service bureau responsive to your needs and does it offer *a real service?* Does it have the necessary experience, personnel, and operating procedures to handle your project?

Computer Time Rental

Many companies and organizations rent computer time from service bureaus. Time is purchased from hundredths of an hour up to entire shifts on the computer. The market of computer time by service bureaus consists of: (a) companies whose computer needs are not sufficient to justify their own installation; (b) firms whose own installation is overloaded; (c) firms which prefer the use of larger equipment for a specific load.

With a service bureau, you are really renting more than just an increment of computer time. Here are some of the extras and services you can expect:

(1) *Choice of systems.* All standard systems, with the latest corrections, are available. Several service bureaus have built additional features or have programmed speed-saving devices into the standard systems.

(2) *Operational assistance.* A staff of operators assists each customer in readying his data for the computer, loading tapes, running the computer, and printing output.

Often, computer processing runs are left with instructions for the operational staff to handle the entire assignment on their own.

(3) *Work space.* To save travel time to and from the computing center, work space is usually provided by a service bureau. In this way, the customer will be able to make more test runs and process more data in less time. The space, desks, telephone service, chairs and writing materials are usually provided at no additional cost.

(4) *Scratch tapes.* Intermediate or final results may be stored on magnetic tapes assigned by the service bureau. There is normally no charge for use of this tape. Only if the tapes are held out of circulation for an extended period of time is a nominal charge made. For normal processing, a complete set of magnetic tapes is provided with the computer.

(5) *Turn-around time.* The normal turn-around time for processing runs, which use less than 15 minutes of computer time and which are left at a service bureau, is less than two hours. Extra long computer runs or printing requirements obviously increase this span. An important consideration for minimum turn-around time is the number of off-line card readers and printers available for the flow of data to and from the main computer.

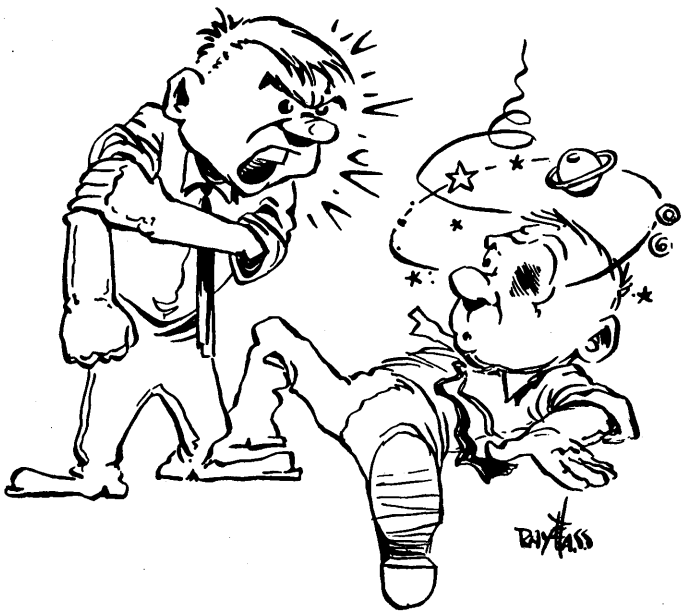
An efficient IBM 7094 operation demands at least two IBM 1401's for the flow of data. Monitor runs at set times of the day for short processing runs, assemblies, and compilations will also minimize turn-around time. An efficient scheduler, controlling the flow of traffic on and off the computer, can also reduce congestion and increase the computer load. In many cases, the service bureau will provide pick-up and delivery services. It is to a service bureau's advantage to minimize turn-around time. Consequently, this area usually is well controlled.

(6) *Cards and paper.* Reasonable volumes of these are provided to the customer at no additional charge. Large quantities of cards, paper, or magnetic tape always can be purchased directly by the customer.

(7) *Invoices.* Detailed billing information—a listing by day, time in and out, and an identifying code for each job number—is standard in the industry.

(8) *Responsiveness.* A smooth functioning operation hinges on (a) the ability of a service bureau sales representative to understand your needs and special wishes, and (b) the ability of the operation team to process your work efficiently.

HYBRID COMPUTER EMPHASIS



"Yes, I know how to program a hybrid computer — no, I am not a hybrid programmer!"

(Continued from page 9)

puter Syndrome: a decided atrophying of arithmetic capability after extended reliance on large-scale computers; other recognizable symptoms are: program coding in ink; dictating block diagrams; and failure to file income tax returns. You are of course right in saying that the need is more likely 187,000 programmers in 1970.

Thank you for the kind comments, and for bringing this to our attention.

COMMENTS ON "PEOPLE WHO DO NOT WORK WELL"

I. From: Harry R. Hein

Supervisor, Guidance, Counseling, and Testing Department of Education
State of West Virginia
Charleston 5, W. Va.

Your editorial on "People Who Do Not Work Well" in the October issue is precise and hard hitting.

May I have your permission to reproduce this material, with appropriate credit, in our Guidance Servicer? This publication has a circulation of approximately 1,200 copies. It is read by educators at both the public school and college levels.

II. From the Editor

We are happy to give you permission to reproduce the editorial as you request, subject to acknowledgement as follows: "Reproduced with permission from **Computers and Automation,** October, 1964, published by Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160."

COBAL GLOSSARY SUPPLEMENT

James M. Cannon
Caracas, Venezuela

I was amused by the glossary of droll definitions, COBAL, published in your May, 1964, issue, page 38. Here are a few more definitions for the COBAL language—viva COBAL!

Record scatter	Debris from a teen-age dance
Table argument	Dinner time discussion
Read head	Place to enjoy the morning paper
IOCS	Bagel companions
Program interrupt	A commercial
Execution phase	Period after revolutionary takeover
Execution sequence	Order of shooting hostages
Select stacker	High priced bra
Hardware	What my kids' shoes receive
Software	Nylon panties
Console	What the computer never does
Byte	What the computer manufacturers put on their customers
Pert	Describing that keypunch doll
Carriage control	Pram guidance
Transistors	Daughters of a Vietnamese general
Inter-record gap	What, behind the Russians again?

IBM reports to the industry

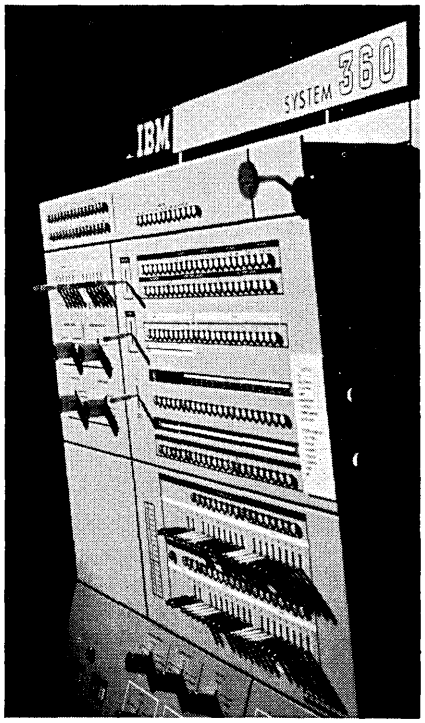
IBM SYSTEM/360 offers modular data communications

IBM's all-purpose SYSTEM/360 offers the widest range of data communication capabilities available.

It can be expanded, in stages, to take input from one to 256 communication lines. You may start with only one line and add as many as you need.

The system allows message data to arrive simultaneously while normal processing operations are underway. Its fast, multiple interrupt plan minimizes the time needed to make a program switch, identify the interrupt, and act on it. Control programs automatically relocate programs when necessary.

Now, data communications with IBM SYSTEM/360 makes advanced management information systems practical for a wide range of businesses. You can tailor your data communications system to fit your problem precisely.



IBM introduces new Graphic Data Processing System

Now you can store maps, charts, graphs, and engineering drawings in your data processing system and reproduce them instantly in their original form.

IBM's new Graphic Data Processing System scans graphic information, converts it into digital form and then stores it. When needed, the data is reconverted to graphic form and displayed on the console screen.

Four units of this new system provide these data communication capabilities. The 2280 Film Recorder takes data from the computer (for example, a digital description of an engineering drawing), and reproduces it in graphic form on 35 mm film. Up to 20,000 lines of alphameric information per minute can be reproduced by the Film Recorder.

The 2281 Film Scanner can scan microfilm images and transmit them, in digital form, to a computer. The 2282 Film Recorder/Scanner combines the functions of recording and scanning in one unit.

The 2250 Visual Display Unit lets you view graphic information on a TV-like screen. With a light pen, available with the unit, you can delete, change or add to the information on the screen. The computer calculated adjustments are displayed while you watch.

New keyboard provides more efficient computer data entry

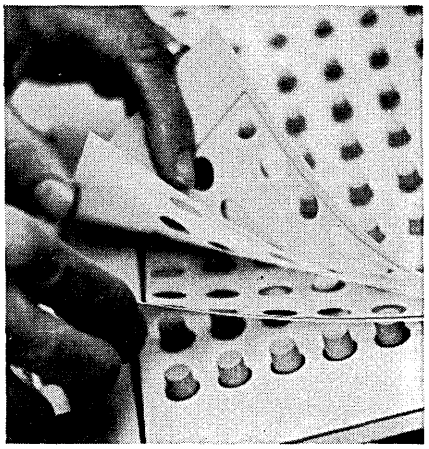
The IBM 1092/1093 Programmed Keyboard comes with unmarked keys—100, 150 or 160 of them, depending on the model.

Over the blank keyboard, you place a keymat. Words printed on the keymat match your business language and your application.

Each key illuminates when you press it...giving you instant visual verification of the data entered.

Attach the 1092 or 1093 to an IBM 1050 Data Communications System and you can transmit data to a remote 1050 or a computer. For operation without a 1050, a 1092 must be connected to a 1093. The 1092 thus connected, or a 1093 used independently, can then be attached to a telephone subset and transmit data to a modified 24/26 Card Punch.

The 1092/1093 is easy to learn and easy to operate. It's especially suitable for these major applications: hospital information systems, bulk station marketing in the petroleum industry, reservation systems, sales order entry, and remote inquiry to processor files.



New unit plots graphs for scientists and engineers

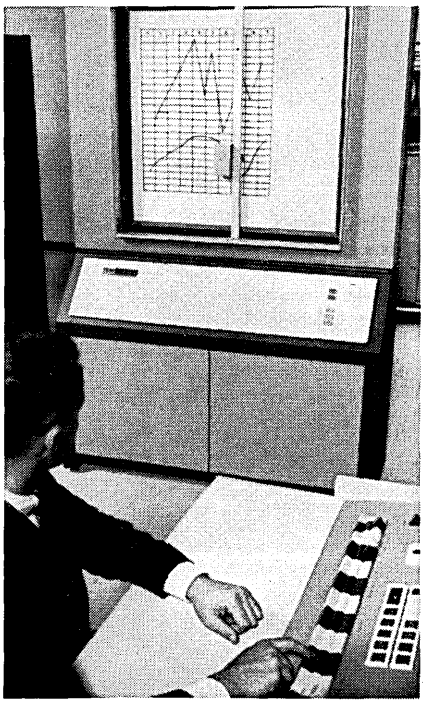
The new IBM 7404 Graphic Output Unit automatically plots graphs, maps or diagrams from computer generated information.

Particularly suited to producing graphic displays of scientific computations and engineering design data, the 7404 may be used in either of two configurations: linked to a computer (the IBM 7040, 7044, 7090, 7094 or 7094 II) or used alone with an IBM 729 or any of the 2400 series magnetic tape units.

It plots points, prints symbols or draws lines (at a rate of up to 280 inches per minute) on a 29" square surface.

In science and engineering, it can be used to evaluate results of wind-tunnel tests, prepare census and weather maps, draw portraits of underground petroleum fields, simulate and test piping networks—and many more.

It can also be used for visual presentation of management data.



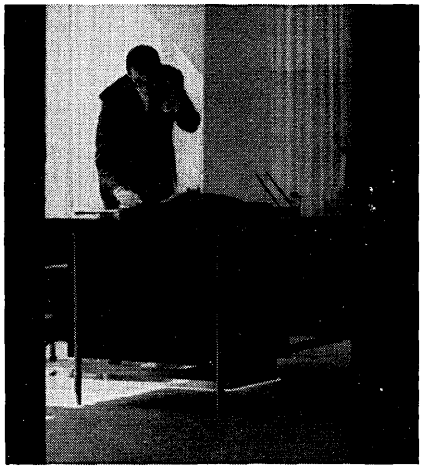
Audio Response Units give spoken replies to inquiries

Pick up a telephone. Dial an inquiry. In seconds, you receive a spoken reply from your computer—via an IBM 7770 or 7772 Audio Response Unit.

With an Audio Response Unit, you determine what it can say by choosing from a wide selection of vocabularies designed to meet your business needs. And you can choose any number of communication lines to fit your exact needs.

These new devices eliminate manual record searching, provides a direct link to vital stored information and greatly reduce the time required to handle business transactions.

These units can be attached to the IBM SYSTEM/360, as well as to any of IBM's 1400 series of computers.



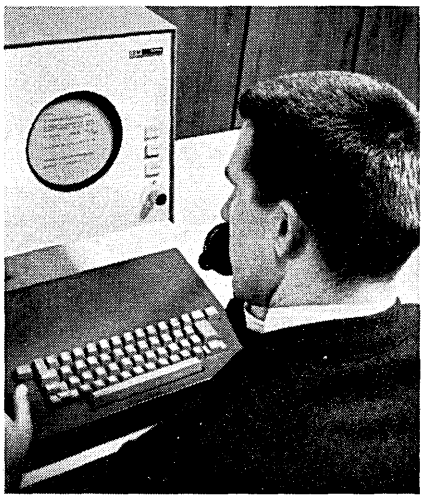
IBM 1015 Terminal to be available to 1410 or 7010 users

It's the IBM 1015 Inquiry Display Terminal that was announced last April as part of the all-purpose SYSTEM/360.

In mid 1965, this same visual communications terminal will be available to users of 1410 or 7010 systems. A new adapter feature for the 1414 I/O synchronizer (model 4 or 5) makes this connection possible. Up to 60 display terminals can be connected to either system.

The 1015 rapidly displays keyboard inquiries and computes replies on a circular viewing screen. By pressing a button, the operator may clear the screen.

The IBM 1015 Terminal is ideal for such uses as information retrieval, inventory and production control, credit checking and customer record status reporting—wherever quick response and much data is needed to answer inquiries.

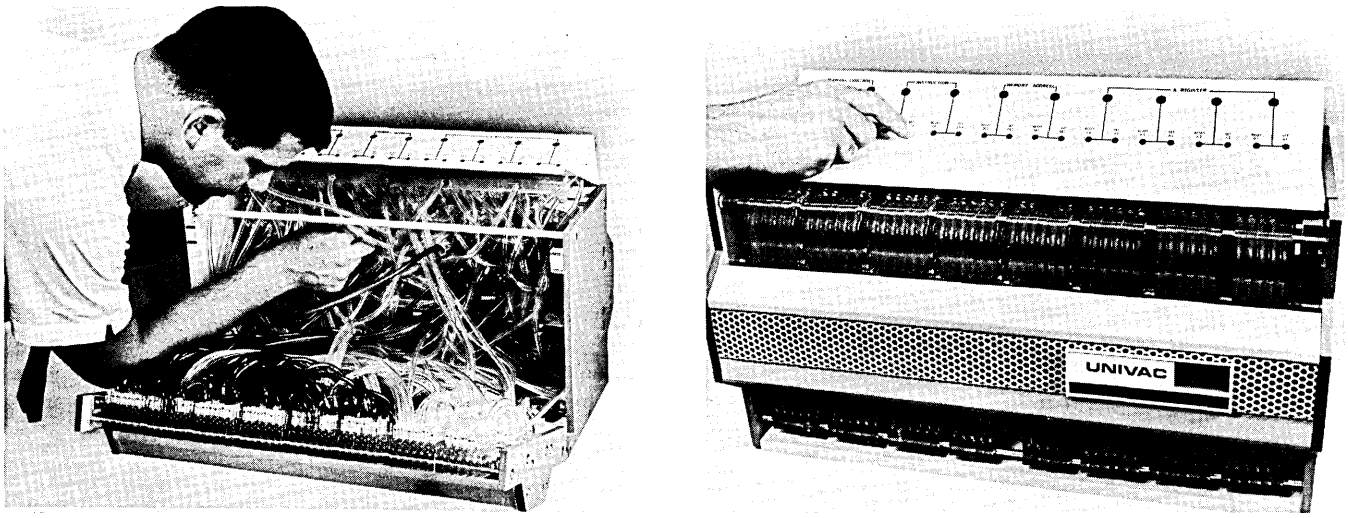


Circle No. 17 on Readers Service Card

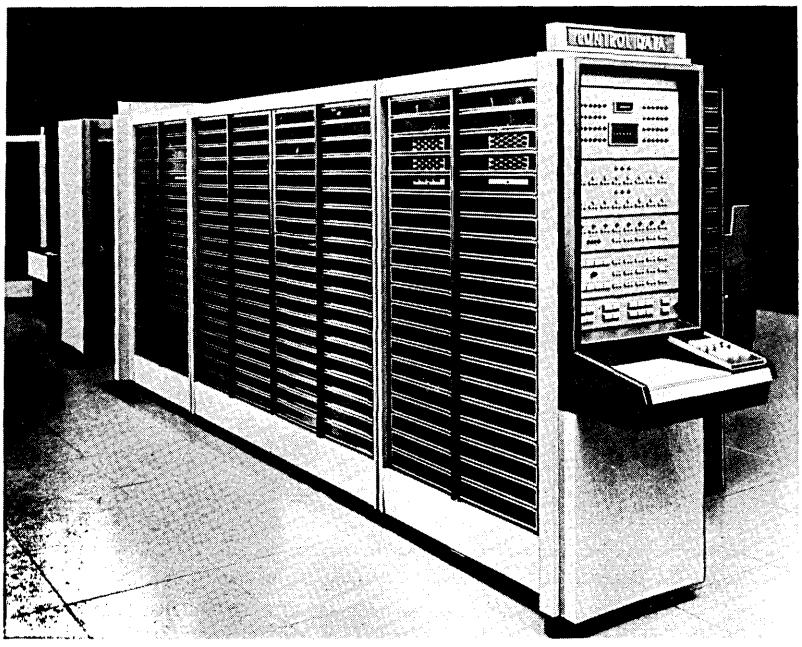
IBM®
DATA PROCESSING

Annual Pictorial Report

DIGITAL COMPUTERS

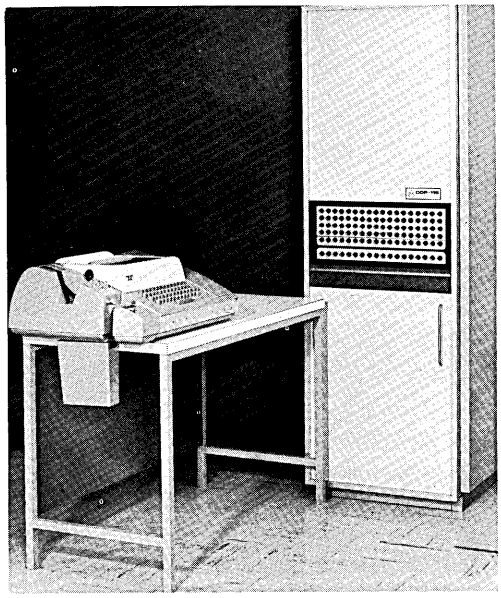


UNIVAC FLUID COMPUTER / UNIVAC Division, Sperry Rand Corporation — This system is an experimental general-purpose, air-operated digital computer. It performs — on a small scale — basic functions of conventional electronic computers. Plastic tubing is shown being attached (above, left) to one of the switching elements in the computer. The device has no moving parts and is operated entirely by air flowing through plastic channels and elements. Programs and operating instructions are fed into the computer by covering appropriate openings on the panel board (above, right). This results in pressure changes in elements adjacent to the openings. Read-out is provided by larger openings along the top of the panel board. A register indicator (extreme right, top) counts up to sixteen in binary. This experimental system has shown that in applications where high speed processing is not a critical factor, fluid-operated circuits could perform the same computing and control functions for a small fraction of the cost of conventional electronic circuits. (For more information, circle 44 on the Readers Service Card.)

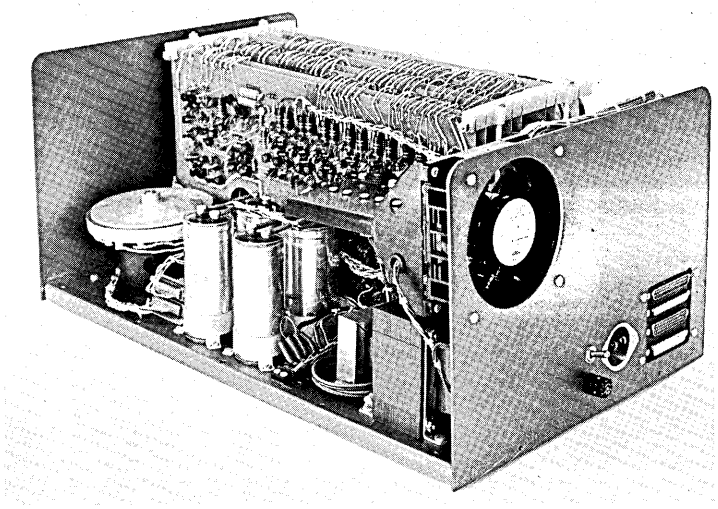


CONTROL DATA 3100 COMPUTER SYSTEM / Control Data Corporation — Part of the Control Data 3000 line of computers, the 3100 is at the low end of the Series. It offers a combination of real-time, scientific and data processing capability not previously available in comparably priced computers. It has a 1.75-microsecond total cycle time, with storage access time of 1.0 microsecond; high-speed index registers, single and double precision arithmetic, indirect addressing and a parallel operating mode. The 8000-word memory is expandable to 32,768 24-bit words. (For more information, circle 46 on the Readers Service Card.)

D26J-1 / Autonetics Division of North American Aviation — The 13-pound D26J-1 digital computer is the smallest of the MONICA computer family. It is adaptable to many guidance, armament, flight or radar-scan control functions. The compact computer measures 5 x 6.5 x 13.5 inches, requires approximately 50 watts of power, and has a minimum 1024-word random access memory. The multilayer circuit board with semiconductor integrated circuits mounted on both sides (held by Carol Lee), contributes to the compactness of the computer. Circuits, containing as many as 45 discrete components, are condensed into a .04 square inch area. (For more information, circle 57 on the Readers Service Card.)

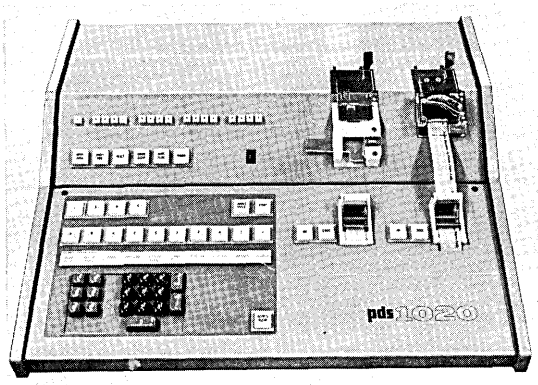


DDP-116 / Computer Control Company, Inc. — This low cost, 16-bit digital computer has indexing, multi-level indirect addressing and priority interrupt. It performs up to 294,000 computations per second. Basic memory cycle is 1.7 microseconds; add time is 3.4 microseconds; and the memory is expandable up to 32,768 words. The DDP-116 is designed for both open-shop scientific applications and real-time data processing. (For more information, circle 49 on the Readers Service Card.)

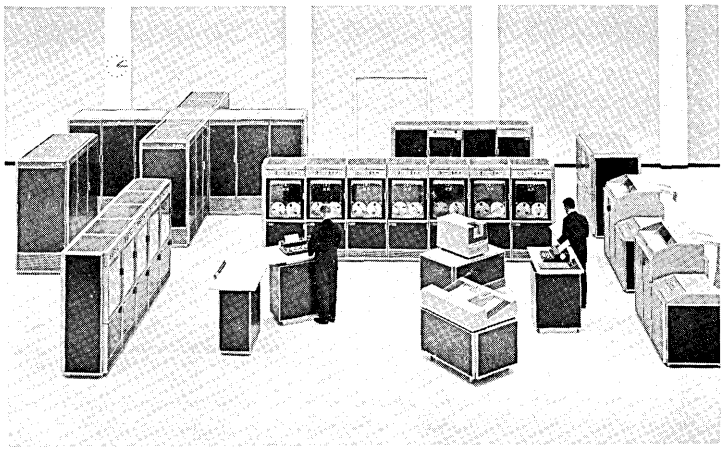


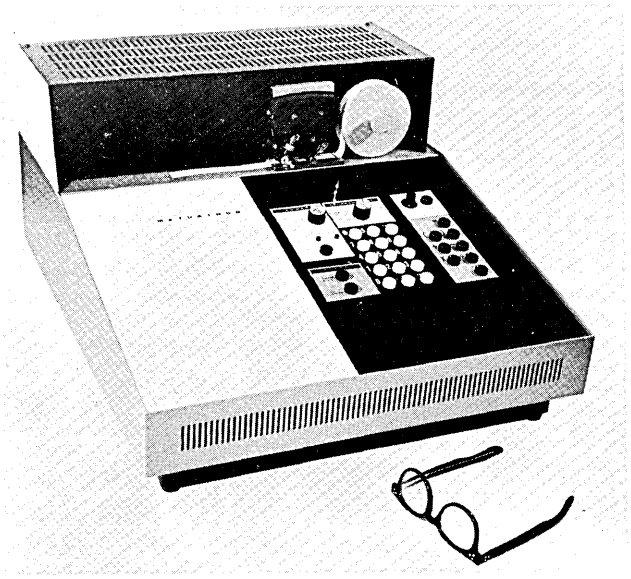
ARITHMETIC PROCESSOR / Wyle Laboratories — The Arithmetic Processor, an outgrowth of the Wyle "Scientific" electronic calculator, is a high-speed, solid-state device. Its capabilities range from single instruction arithmetic operations to complex function sub-routines. The device has 3 arithmetic registers, 3 memory registers, and an optional keyboard and CRT display which can be remotely located. The Processor is specifically designed for use as the arithmetic element of on-line systems in applications where larger scale computers are economically impractical. (For more information, circle 52 on the Readers Service Card.)

pds 1020 / Pacific Data Systems — This computer is designed for direct use by engineers and scientists. By using familiar terms (not machine language) all instructions and data can be quickly and easily entered at the keyboard. The device consists of a 50 cps paper tape I/O, 15 cps typewriter output and a keyboard with six operation keys and 10 special function keys which permit commonly used functions to be performed merely by pushing the appropriate key. The pds 1020, a decimal machine, has a basic capacity of 2048 words, expandable to 4096 words; word lengths are 4, 8, 12, 16, 20, 24 digits plus sign; arithmetic speeds are 9.2 milliseconds for add and subtract (average), and 45.2 milliseconds (average) for multiply and divide. (For more information, circle 54 on the Readers Service Card.)



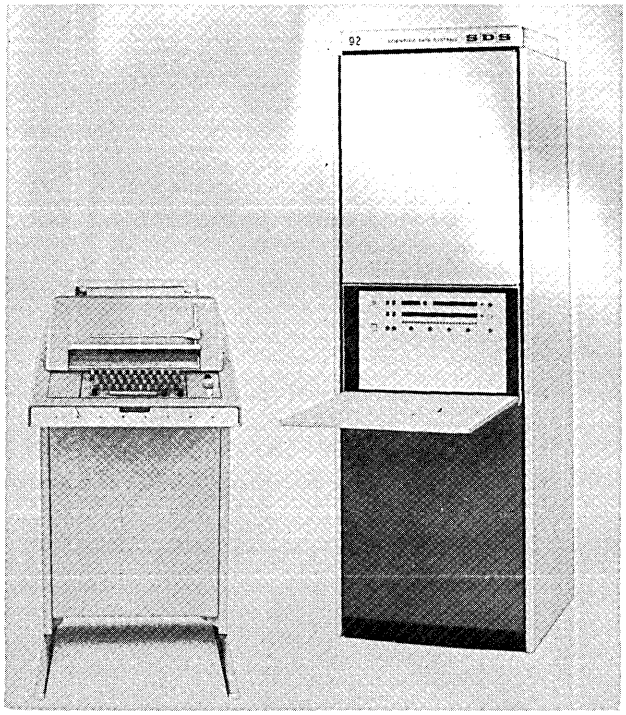
GE-635 / General Electric Company — This member of the Compatibles/600 has a one-microsecond memory and can add well over a half-million numbers per second. GE's other entry this year into the large-scale computer market was the GE-625 which has a two microsecond memory. These memories are directly addressable and are available in sizes up to 262,144 words. (For more information, circle 50 on the Readers Service Card.)





MATHATRON / Mathatronics, Inc. — This desk-top computer/calculator includes a ten-key direct input keyboard, storage registers, ferrite-core program memory storage, solid-state computer logic, and printed output. Extra storage registers, program memory storage, constants and special pre-wired programs may be added to suit individual computing needs. (For more information. circle 53 on the Readers Service Card.)

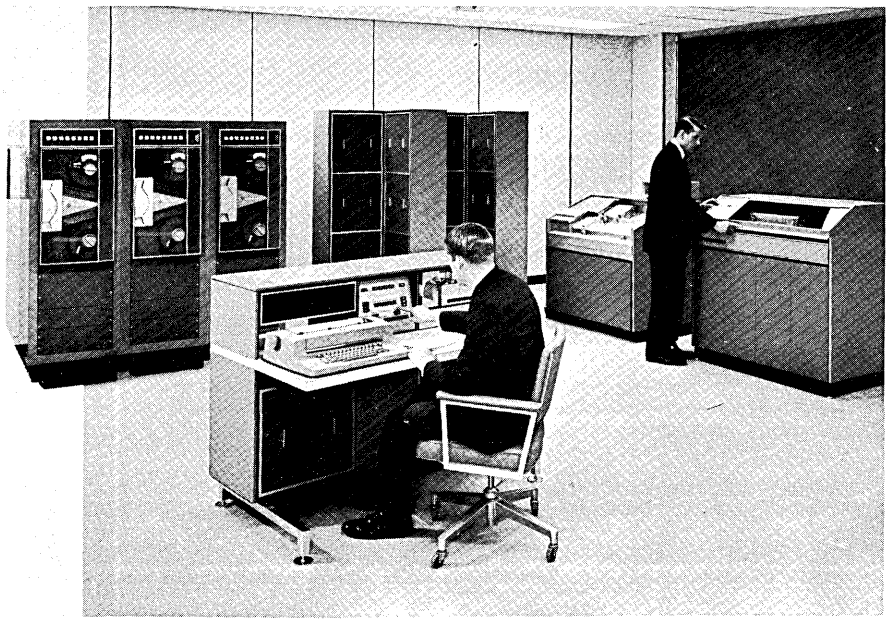
FRIDEN 6010 ELECTRONIC COMPUTER / Friden, Inc. — This computer is no larger than a standard office desk, yet is able to multiply 8 digits by 8 digits in 50 milliseconds. In addition to making logical decisions and solving problems involving addition, subtraction and multiplication, the machine can be programmed for divisions and difficult square root calculations. It works automatically through coded input by punched paper tape, edge-punched cards or tabulating cards and can be operated manually by means of a standard electric typewriter keyboard. (For more information, circle 45 on the Readers Service Card.)



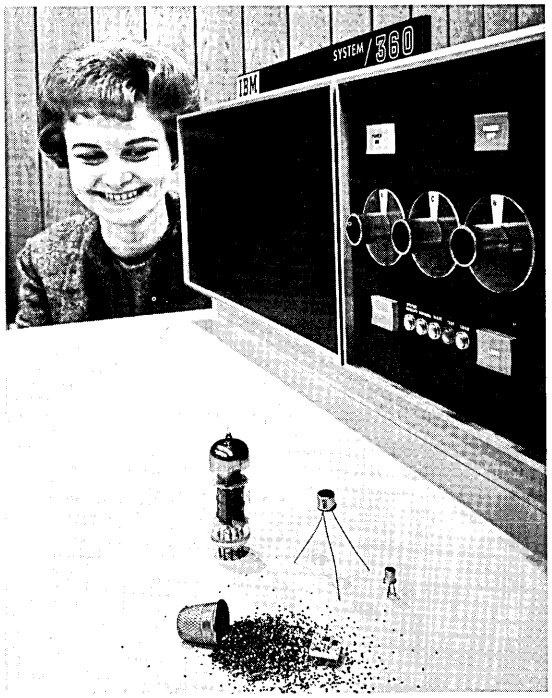
SDS 92 / Scientific Data Systems, Inc. — The SDS 92 is the first commercial computer using integrated circuits. The computer is a low-cost, high-speed general purpose device designed for many applications including real-time system control, direct digital control, data communication systems and repetitive, high-speed computation. It has a 1.75 microsecond memory cycle time and an input/output transfer rate of 572,000 words per second; core memory is expandable to 32,768 words. (For more information, circle 56 on the Readers Service Card)

NCR 395 / National Cash Register Company — The 395 performs many computer operations including sort runs, yet is almost in the accounting machine price class. This desk-size business system uses computer addresses and instructions and has a magnetic disc memory of 120 14-digit words which can be accessed by multiple read-write heads at the rate of 29 times a second. The entire memory can be cleared in 4 seconds, or read and printed out in less than 50 seconds. There are approximately 250 logic modules produced by a programmed wire-wrap technique which eliminates soldered connections and increases reliability. An NCR 304 computer system helped design the 395 by determining optimum wire paths and fixpoints. (For more information, circle 48 on the Readers Service Card.)

EAI 8400 DIGITAL COMPUTER / Electronic Associates, Inc. — This digital computer is intended for general purpose scientific and engineering computation, digital or hybrid simulation and complex online monitoring and control applications. It is a high-speed, 32-bit digital computer with up to 65,536 words of core memory capacity. Floating-point operation times are as fast as 2.75 microseconds for addition, 5.5 microseconds for multiplication, and 8.75 microseconds for division can be achieved. (For more information, circle 55 on the Readers Service Card.)

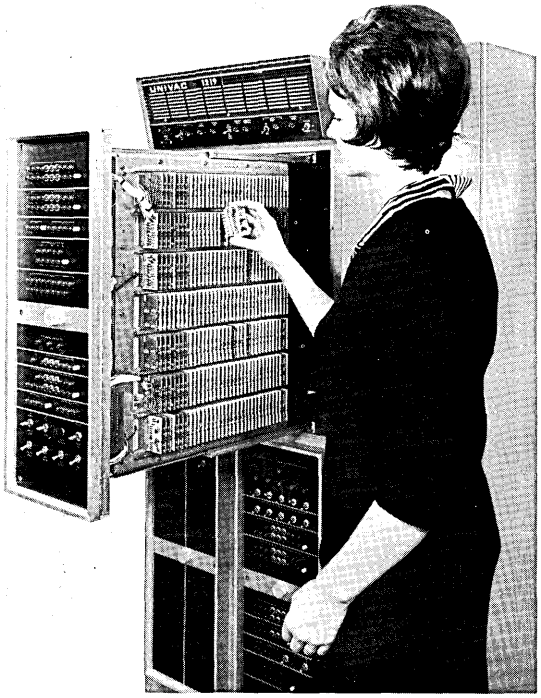


UNIVAC BANK PROCESSOR IV / UNIVAC Division, Sperry Rand Corporation — This high-speed, automatic check handling equipment for demand deposit accounting includes a MICR document sorter, a UNIVAC 1004 Processor and a Card Punch. The combination permits a full-fledged data processing system handling all accounting for small to medium-size banks. There are numerous features and peripheral devices that can be added to make it a full expandable bank system. UNIVAC's Molly Haskell holds checks which can be processed by the new system at the rate of 1200 per minute. (For more information, circle 59 on the Readers Service Card.)

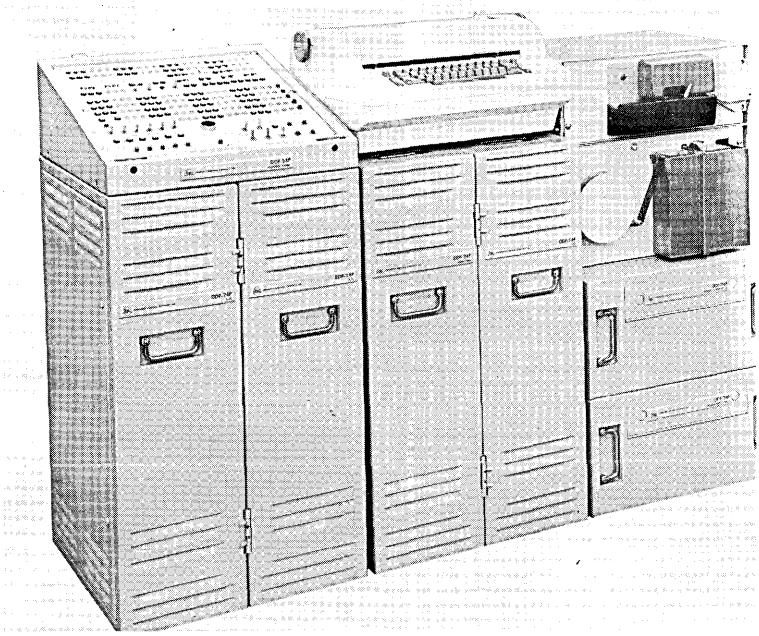


IBM SYSTEM/360 / IBM Corporation — System/360 is the first commercially available data processing system whose design is based on the use of microelectronic modules. On an IBM System/360 console, representative elements of 15 years of electronic history are displayed. Thousands of vacuum tubes (left) were used in the first commercial computers. Present equipment employs the individual transistors shown standing beside the tube. System/360 employs the minute transistor chips in the foreground — 50,000 of which will fill the thimble. In use, the chips are mounted on a Solid Logic Technology module (standing among the chips). Other elements of the module contributing to miniaturization are diode chips and printed resistors and circuit patterns. These logic circuits operate at speeds ranging from 300 down to six billionths-of-a-second. (For more information, circle 47 on the Readers Service Card.)

HONEYWELL 1800 MULTIPROCESSOR SYSTEM / Honeywell Electronic Data Processing — This huge Honeywell 1800 multiprocessor system is capable of handling incoming and outgoing calls from 60 Metropolitan Life Insurance Company field offices at the same time. It is the heart of Metropolitan Life's new computer communications system, developed by Honeywell. The computer, controlled by four complex programs running in its 32,000-word memory simultaneously, will poll more than 900 Metropolitan Life offices in the United States and Canada each day to automatically process life and health insurance information for the 44 million persons insured by the company. (For more information, circle 51 on the Readers Service Card.)



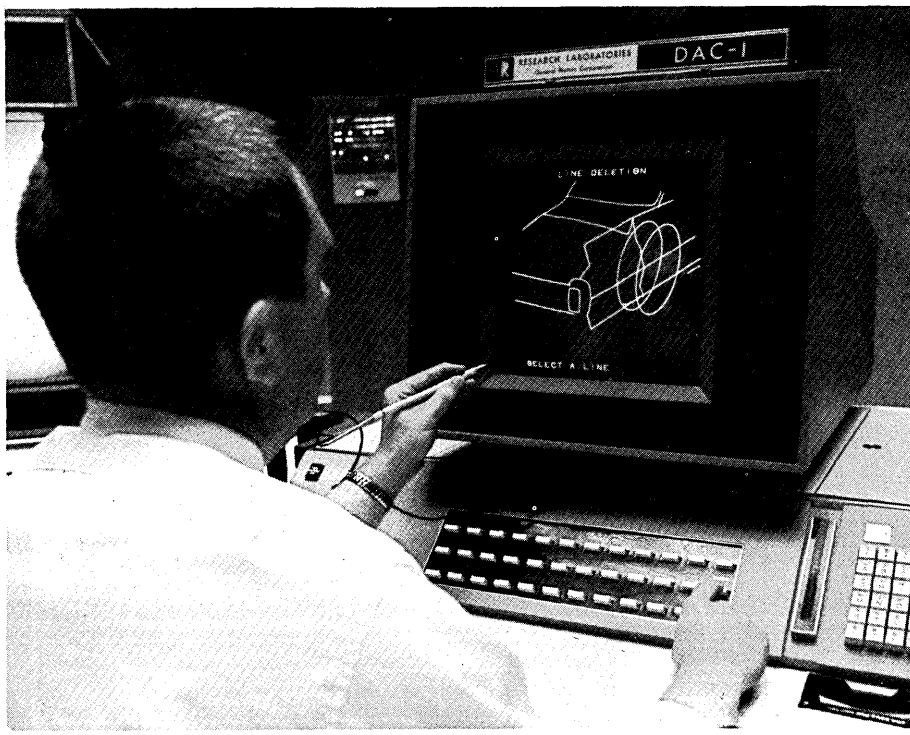
UNIVAC 1219 MILITARY COMPUTER / UNIVAC Division, Sperry Rand Corporation — The 1219 advanced military computer, designed to withstand severe environmental conditions, is contained in a single cabinet occupying less than five square feet of floor space. One of several hundred circuit modules is shown being placed in the arithmetic section. Modules such as these, combined with a thin film control memory allow transfer of up to nine million bits of information per second. (For more information, circle 106 on the Readers Service Card.)



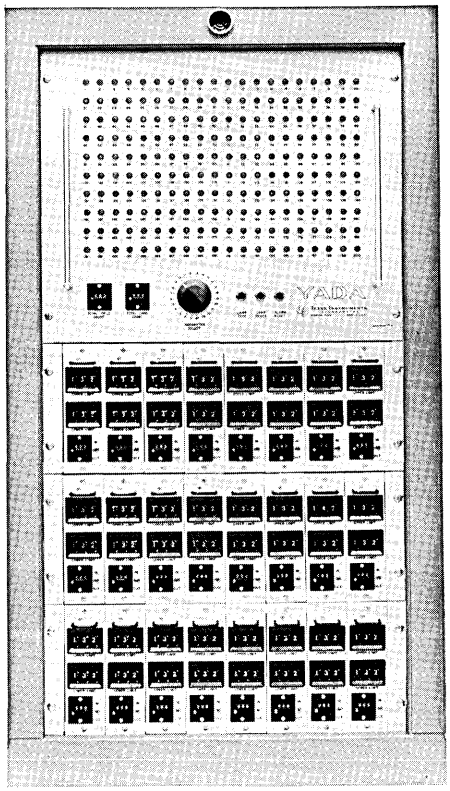
DDP-24P / Computer Control Company, Inc. — The purpose of this solid state digital computer is experimentation with and demonstration of new concepts for submarine data-processing and display, aboard submarines at sea. Its component parts can fit through a submarine hatch and be distributed throughout the ship where space is available. The computer has 4096 (24 bit) word-storage (magnetic core); a memory cycle time of 5 microseconds and analog/digital capability. This Subic Sea System includes the central processor, a 17" cathode ray display, an input-output typewriter, a paper tape reader and paper tape punch. (For more information, circle 58 on the Readers Service Card.)

FRONT COVER STORY

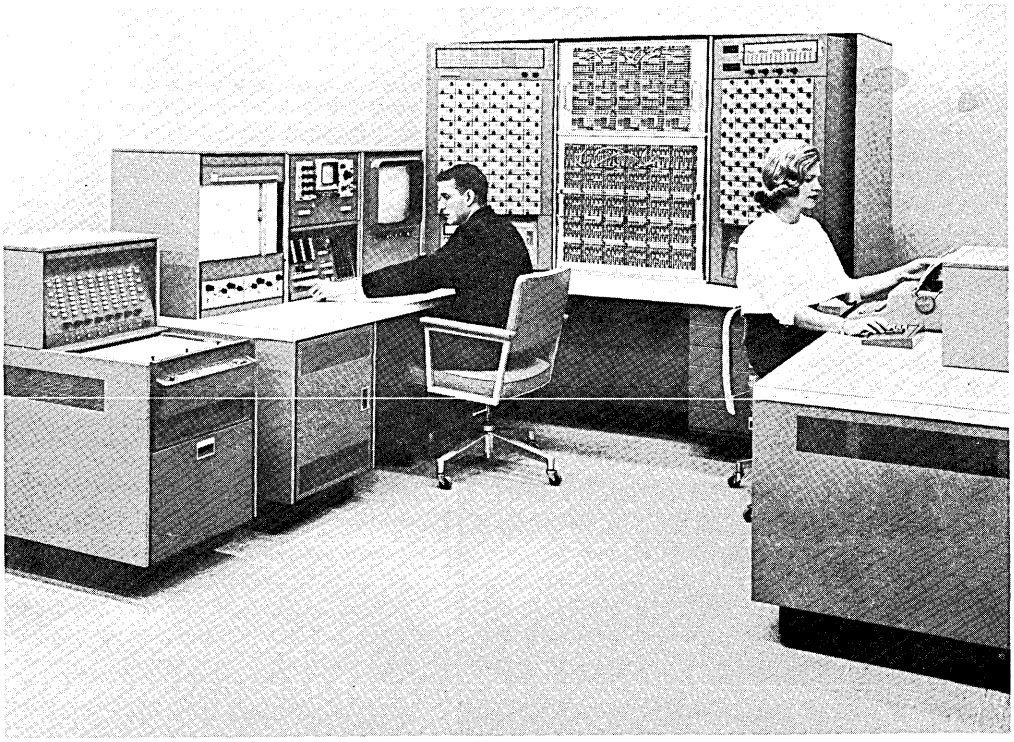
DAC-I SYSTEM / General Motors Research Laboratories — Experiments in the communication of automotive design information between man and computer are being conducted using the new GM DAC-I system (Design Augmented by Computers). In its present form, the DAC-I system consists of a large scale IBM 7094 computer, a man-computer communication console, and special image-processing equipment (IBM 7960) which enables the computer to read and generate drawings. In addition, GM researchers have developed a large library of computer programs (more than 3/4 million instructions) to enable the designer to use his equipment effectively. In the picture, a research engineer is shown at the graphic console of DAC-I as he checks out a computer program that allows him to modify a design "drawing". A touch of the electric "pencil" to the tube face signals the computer to begin an assigned task, in this case, "Line Deletion", where indicated. The man may also instruct the computer using the keyboard at right, the card reader below the keyboard, or the program control buttons below the screen. At any design stage the designer may request a permanent photographic copy of a new drawing using the special image processor. (For more information, circle 74 on the Readers Service Card.)



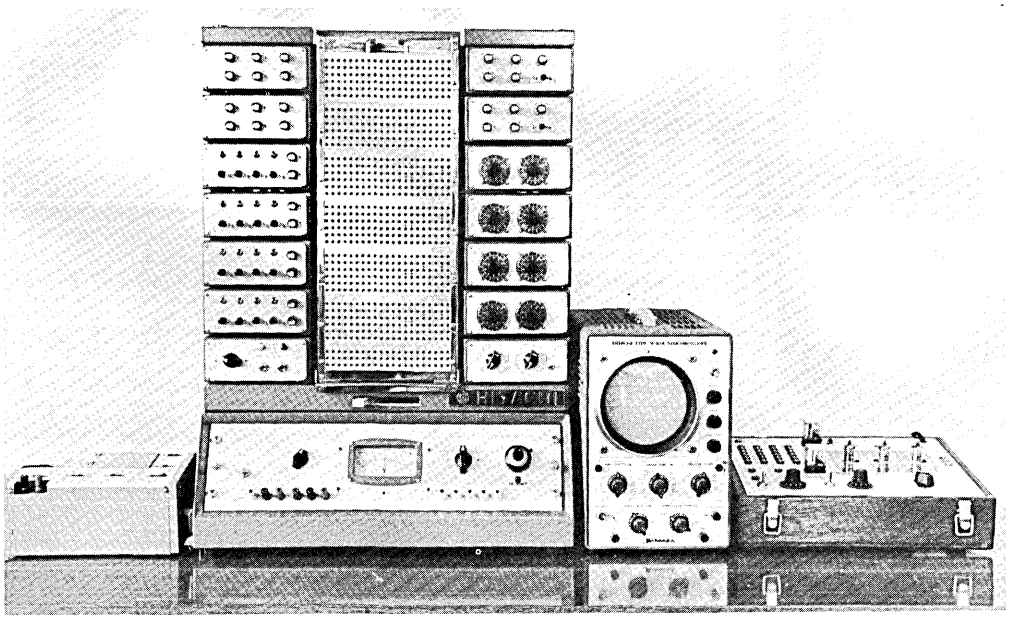
ANALOG COMPUTERS



YADA, MODEL 858 / Texas Instruments, Inc. — Yield and Distribution Analyzer (YADA) Model 858 for punched card data analyzing quickly summarizes data which pass within preset limits compared against preset upper and lower values. A yield counter totals the units passing; a device counter totals units compared. The 858 analyzes three or four digit parameters and will read and compare 72 columns of an 80 column IBM card simultaneously. (For more information, circle 62 on the Readers Service Card.)



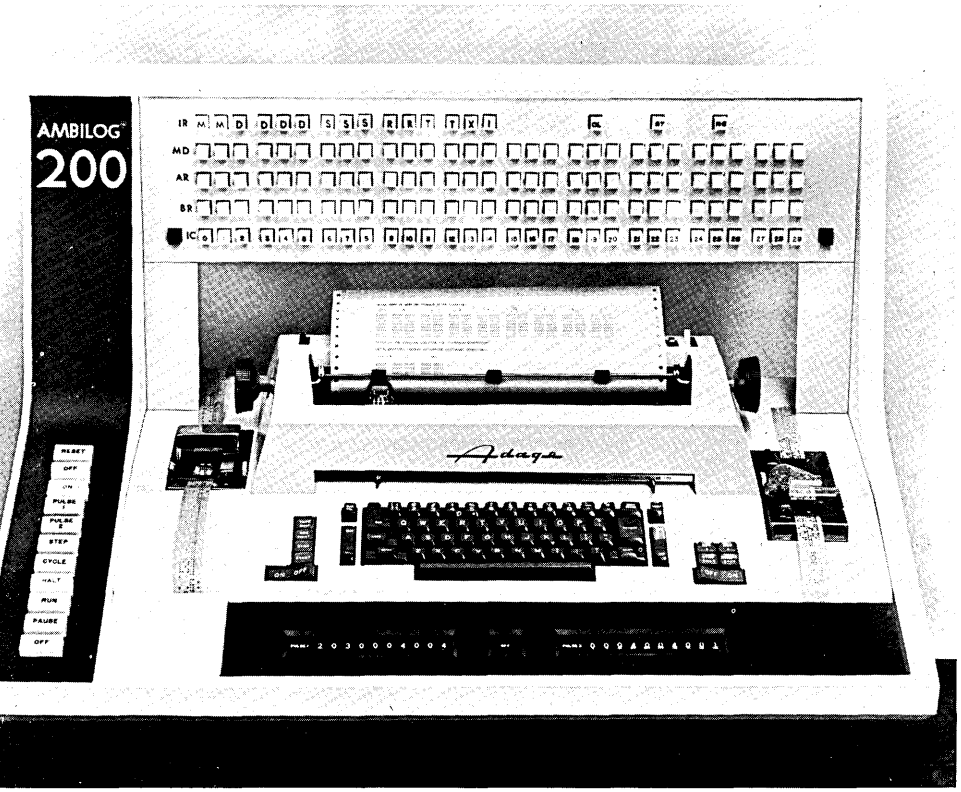
EAI 8800 ANALOG COMPUTER / Electronic Associates, Inc. — This analog/hybrid computer has high-performance analog and digital computing components, a stored-program input/output computer and a complete complement of readout and other peripheral devices. The digital input/output computer automates analog problem preparation, setup and checkout procedures; and provides digital control and monitoring — including hard copy documentation. (For more information, circle 61 on the Readers Service Card.)



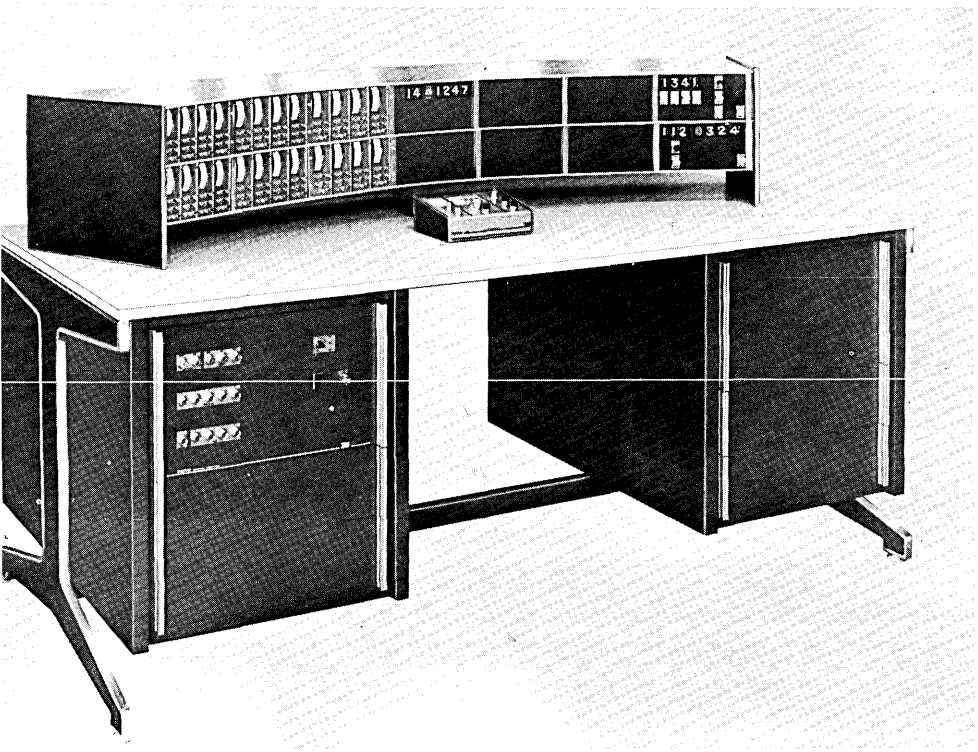
SERIES WAC-3030 ANALOG COMPUTER / Hatachi — The desk-top ±50 volt Analog Computers, Series WAC-3030 are designed for educational use but can be used on a variety of other applications. Configurations are available with 4 to 24 amplifiers. The picture illustrates the 24-amplifier computer Model WAC-3030-42, with pen writing, single channel recorder; oscilloscope; and linear computing element demonstrator. (For more information, circle 60 on the Readers Service Card.)

DIGITAL-DIRECTED, ANALOG COMPUTER CONTROL SYSTEM / Leeds & Northrup Company — This system, installed at the Detroit Edison Company, employs the concept of linking the "brain-power" of the digital computer with the speed of the analog computer control to provide economic and efficient generation of power. It regulates power from 37 generating units supplying 1,297,188 customers and facilitates interconnections to neighboring utilities in the United States and Canada. One of the Central System Supervisors at Detroit Edison is shown using the analog control computer console in the utility's load dispatching office in downtown Detroit. (For more information, circle 63 on the Readers Service Card.)

HYBRID COMPUTERS

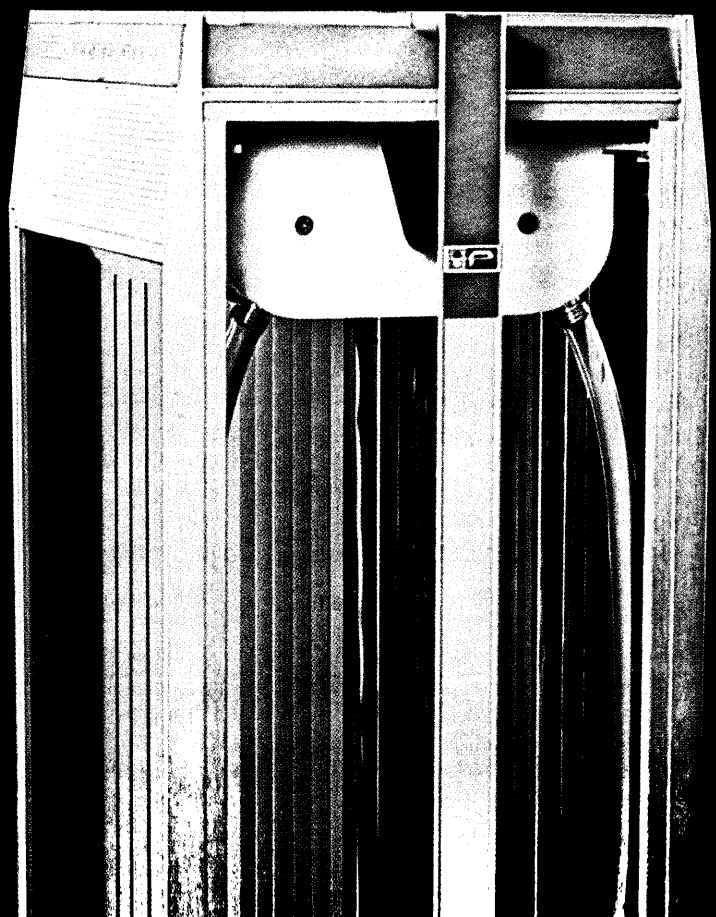


AMBILOG 200 STORED PROGRAM SIGNAL PROCESSOR / Adage, Inc. -- The AMBILOG® 200 computer is designed to exploit the best of both analog and digital techniques. It combines parallel hybrid arithmetic with stored-program sequential operation. The operator's Control Console (shown in picture) is connected to the rest of the system by a 25-foot cable, permitting it to be located in any convenient nearby location. Complete control of all internal and input/output operations is provided from the console, which includes displays of the principal digital registers, and houses a low-speed photoelectric punched-tape reader, an input/output typewriter, and a paper-tape punch. Word length is 30 bits; memory cycle time is 2 microseconds. Memory sizes from 1024 words to 32,768 are available. (For more information, circle 65 on the Readers Service Card.)



DIGITELE DIRECT DIGITAL CONTROLLER / 3M Company — This desk console computer/controller is one compact unit providing 24 loops of direct digital indicating control, computer capability for data formatting, logging and set point calculation, alarming and manual operation of all controls, readouts and adjustments. These direct digital controllers accept digital or analog inputs, including millivolt signals, and provide standard 1-5, 4-20 or 10-50 m.a. output control signals. Overall accuracy is ±0.25% and resolution is ±0.1% of full scale. For more information, circle 64 on the Readers Service Card.)

Announcing a major breakthrough in random access memory!




new from POTTER
THE
RAM®
RAM TAPE-PACK
POTTER RANDOM ACCESS MEMORY

...a completely new concept in random access memory

TWICE AS FAST

DOUBLE THE CAPACITY

COMPLETE DATA SECURITY

LOWEST PRICED UNIT AVAILABLE TODAY

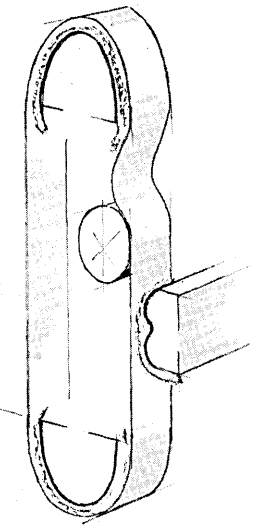
A random access memory unit that costs *less* than competitive equipment is news in itself. But when you add to it doubled bit capacity, immediate check-read-after-write capability, and complete data security, you begin to realize what new — *new from Potter* — really means.

The RAM* is a fast access, infinitely-expandable cartridge-loaded memory device. Its revolutionary new drive system permits using high density magnetic tape loops in random access memory applications for the first time. Still another revolutionary development — a read-after-write head — permits a complete write and check read operation in less than 90 milliseconds. The fastest available!

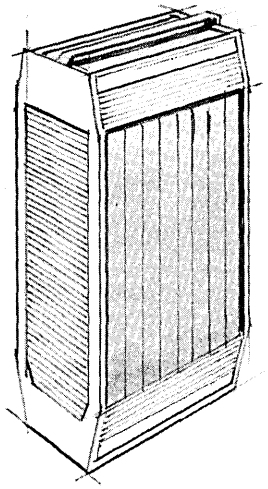
Potter's unique Tape Pack cartridge is another feature that really sets the RAM apart. Tape Pack cartridges need no more special handling consideration than a brief case. Even if a cartridge is accidentally dropped to the floor, data remains secure. And because critically fabricated disks are eliminated, Tape Packs are less than half the cost of disk packs.

But these are just the highlights of this remarkable breakthrough in random access memory equipment. Get the full details on the new Potter RAM for yourself. Write or wire Potter today.

FLEXIBLE TAPE LOOP STORAGE MEDIUM



tape loops float over stationary bearings on cushions of air... "fly" past write/read head without making physical contact. Years of trouble-free operation are assured.



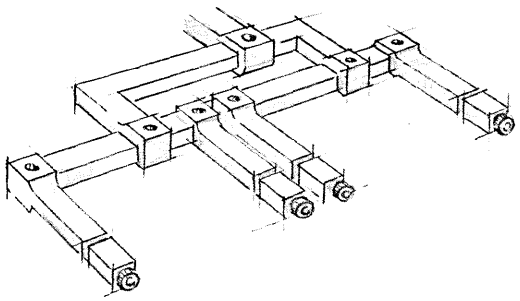
UNIQUE TAPE PACK CARTRIDGES

rugged plexiglass and aluminum cartridges protect tape during both storage and operation. Dirt, dust and contamination are sealed out.

POTTER

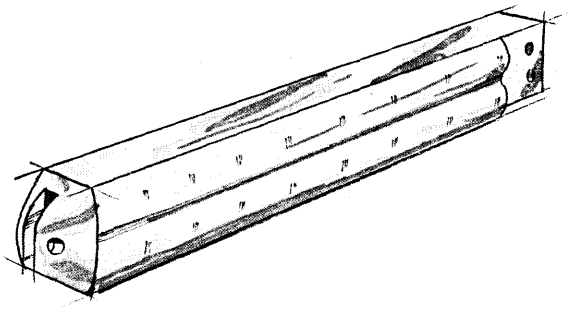
INSTRUMENT CO., INC.

*Registered trademark of Potter Instrument Company, Inc.



SIMPLE CONSTRUCTION

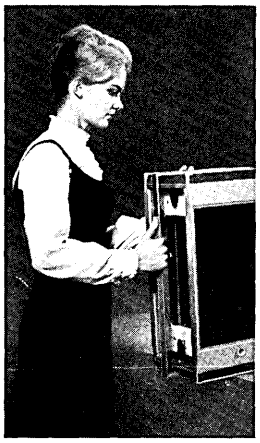
rugged "whiffletree" binary head positioning mechanism combines simplicity with precision . . . eliminates complex servo mechanisms.



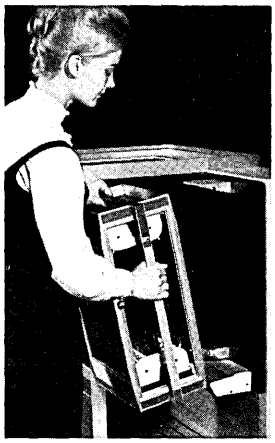
MINIMUM MOVING PARTS

single write/read head post assembly is positioned by simple linear movement.

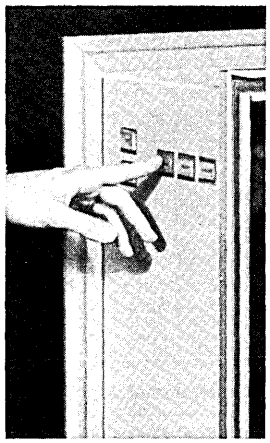
EASY TO OPERATE — INFINITE CAPACITY



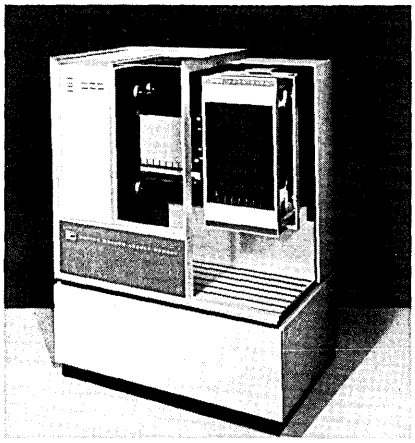
operator selects proper Tape Pack



latches Tape Pack into RAM



touches start button



loading operation is completed automatically. RAM capacity is infinitely expandable. Each cartridge adds 50 million bits of memory.

SUMMARY SPECIFICATIONS

Cartridge Capacity	50.3 million bits
Average Head Positioning Time	62.5 ms
Average Latency Time	25.0 ms
Average Access Time	87.5 ms
Check Read Delay	1.7 ms
Check Read-After-Write Cycle Time	89.2 ms
Data Transfer Rate (Bits)	600 kc/s

POTTER

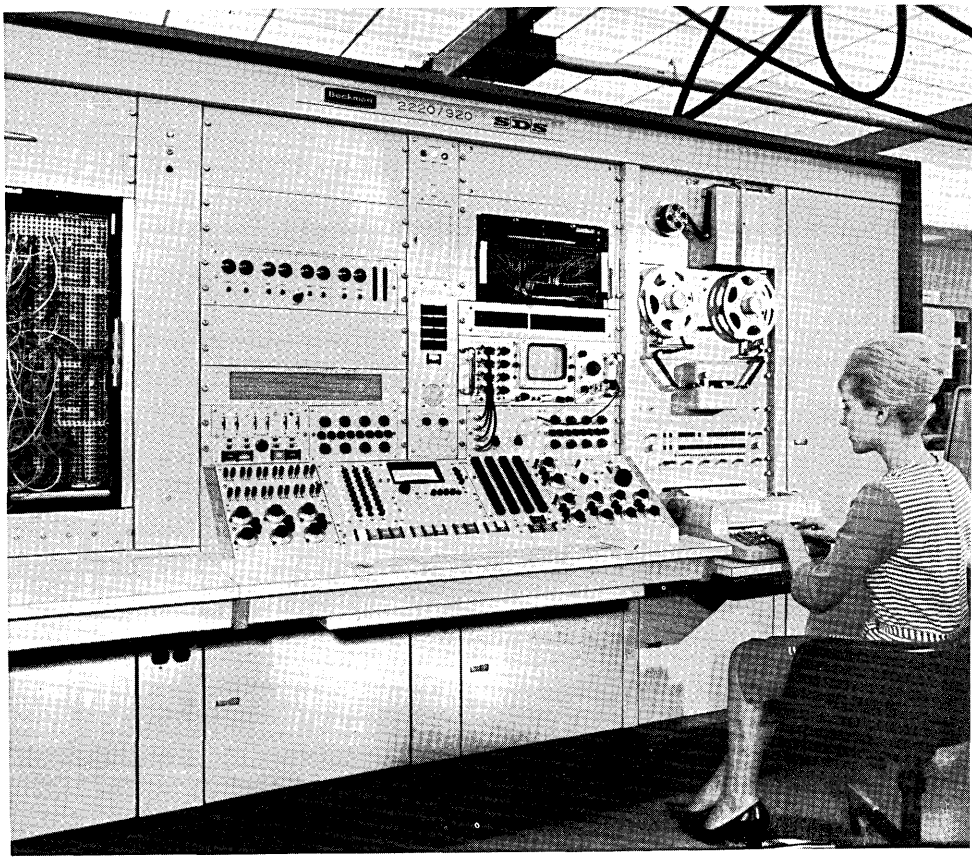
INSTRUMENT CO., INC.

151 Sunnyside Boulevard
Plainview, New York (11803) 516-OV-1-3200
Cable: PICO TWX: 516-433-9320

THE LEADER IN EDP EQUIPMENT

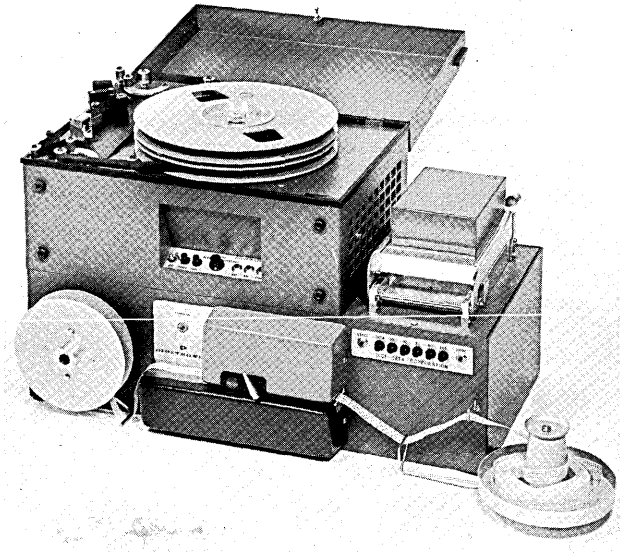
HYCOMP 250 ANALOG/DIGITAL COMPUTING SYSTEM / Raytheon Computer (formerly Packard Bell Computer) — The HYCOMP 250 digital computer and data conversion package includes a PB 250 digital computer, a Flexowriter electric input/output typewriter, and 64 channels of analog-to-digital and digital-to-analog conversion. The system in the picture shows the PB250 computer (left) and the T-50 desktop analog computer manufactured by Computer Products, Inc. The PB250 supplied with the HYCOMP package is equipped with 2320 words of memory; has 51 commands; and provides 12-microsecond addition and subtraction with correspondingly fast execution speeds for other functions. The HYCOMP 250 package permits moving up to hybrid analog/digital computing at a fraction of the cost of large-scale hybrid computing systems. (For more information, circle 109 on the Readers Service Card.)

BECKMAN/SDS INTEGRATED COMPUTER SYSTEM / Beckman Instruments, Inc. and Scientific Data Systems, Inc. — This system is said to be the first computer with capabilities for solving separately and in combination the advanced analog and digital problems formerly requiring the use of two computers. It is offered in a series of eight standard models using one of two Beckman analog computers and any of four SDS digital computers. The picture shows a Beckman 2200 analog computer and an SDS 920 digital computer linked together in an integrated system with standard interface. The system is particularly suited to real-time problem solving and simulation in major aerospace and industrial process control applications. (For more information, circle 110 on the Readers Service Card.)

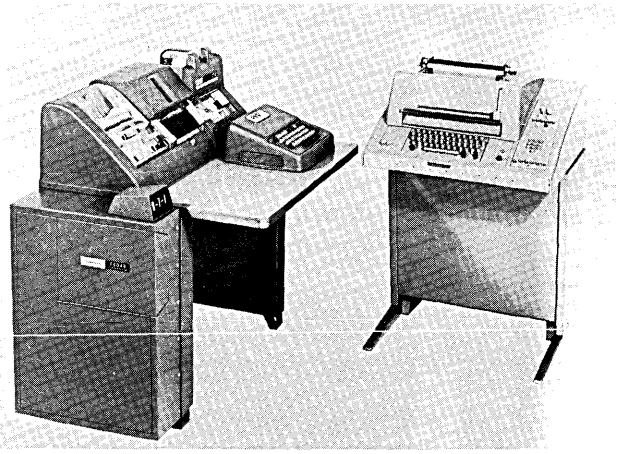


DATA TRANSMITTERS AND CONVERTERS

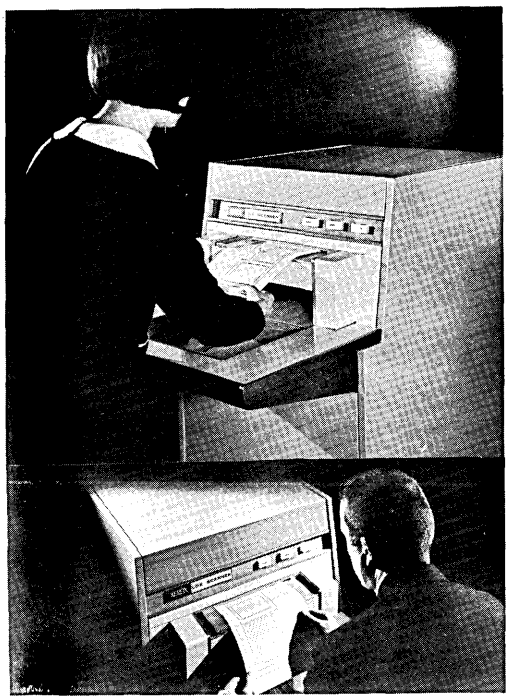
TELEQUOTE III / Bunker-Ramo Corporation, Teleregister — This small desk-top console linked with a computer center in New York City is the successor to the brokers' chalk board of yesteryear (background). A video screen on the device provides instantaneous market information at the push of a button. Data is available at speeds up to 2400 bits per second over high speed trunk lines. A desk model tape read-out unit is available instead of the small video screen, giving a permanent record of questions and answers. (For more information, circle 72 on the Readers Service Card.)



MODEL 1720 PAPER TAPE TO MAGNETIC TAPE CONVERTER / Digi-Data Corporation — This unusually small device has a high reliability rate coupled with ease of service. Its' broad programming capabilities are by means of a plugboard. Use of this system makes a typewriter or add punch into an effective computer entry device. (For more information, circle 66 on the Readers Service Card.)

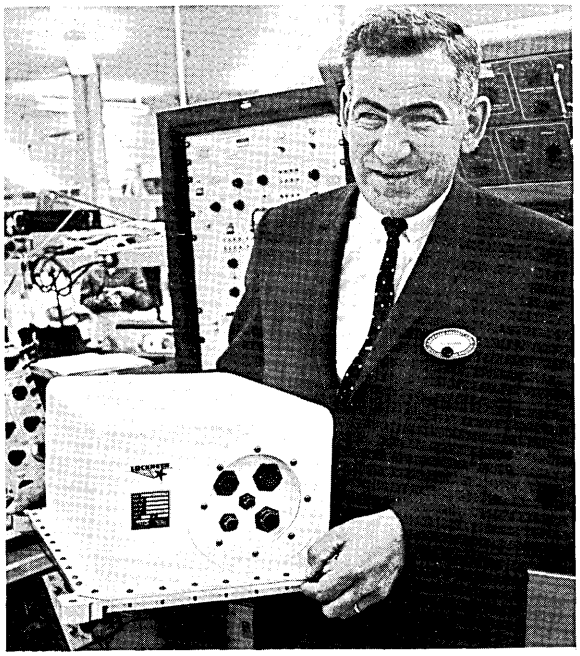


TELEPUNCH, DATA TRANSMISSION TRANSLATOR SYSTEM / Systematics Division of General Instrument Corporation — Systematics TELEPUNCH models include: a Card Transmitter (Model T588) which connects any standard IBM 24 or 26 card punch to a Model 35 Teletypewriter; and a Card Receiver (Model T8048) which mounts on the end of any IBM 24 or 26 card punch (shown in photograph). The equipment permits rapid, automatic exchange of IBM punched card information, via Teletypewriter, between central data processing offices and any number of branch offices. Both devices operate at 100 words per minute and have programming flexibility. (For more information, circle 73 on the Readers Service Card.)



LDX TRANSMISSION SYSTEM / Xerox Corporation — Anything written, typed, sketched or printed may be transmitted electronically between two distant points, in seconds, using the LDX (long distance xerography) System. The system consists of a document scanner on the sending end, a broadband transmission link (microwave channel, coaxial cable or special telephone lines) and a document printer at the receiving location. A document is fed into the scanner (top of photo); the copy is "read", translated into electronic signals and sped over the transmission link. At the receiving end, signals are decoded and reproduced by the LDX Printer (bottom of photo) on ordinary bond paper or offset stock. (For more information, circle 67 on the Readers Service Card.)

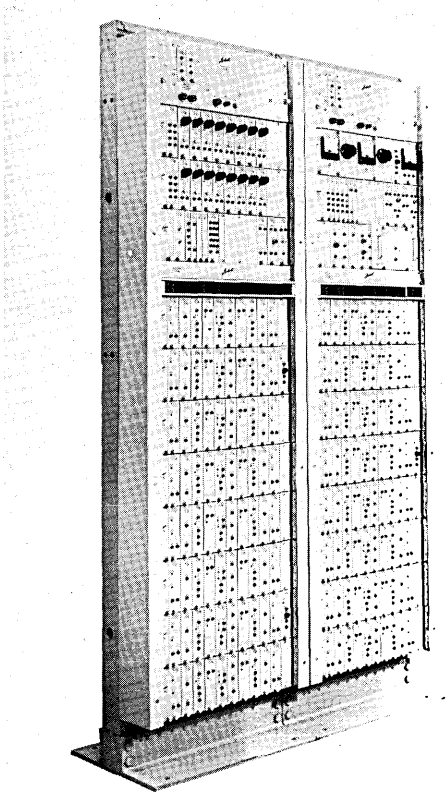
KLEINSCHMIDT MODEL 321 / SCM Corporation — This electronic data transmission system combines a high speed fully transistorized data printer, a photo electric reader and a tape punch in one compact unit. The printer component has a speed range of from 60 - 400 words per minute plus solid state logic and controls. The high speed punch and photo-electric - mechanical sensing reader also will handle input and output data at speeds from 60 - 400 words per minute. Transmission can be made from the keyboard or tape reader while simultaneously receiving on punched tape or page copy from a distant location. (For more information, circle 68 on the Readers Service Card.)



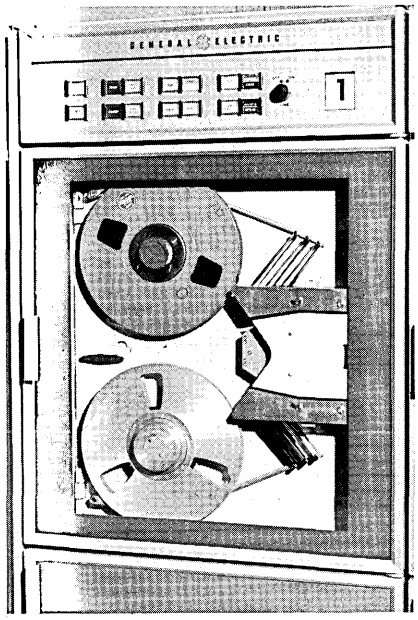
DATA COMPRESSOR / Lockheed Missiles & Space Company, a Division of Lockheed Aircraft Corp. — Daniel Hochman (Manager of Information Technology at Lockheed Missiles and Space Co.) holds Lockheed-developed Data Compressor. The device, designed to be placed on a satellite, cuts out unnecessary data and transmits only significant facts, thus conserving power, saving data processing costs, and improving transmission capability. The miniaturized data compressor, in addition to other components, contains 24,000 magnetic memory elements and 467 micro-miniature circuits in less than a cubic foot. (For more information, circle 70 on the Readers Service Card.)

DATA STATION / Honeywell Electronic Data Processing — Several input and output devices are combined into this single remote communications terminal that can be linked to a distant computer over telephone lines. The modular terminal (left to right above) can optically scan bar-coded documents, read paper tape, print at high or medium speeds, read punched cards (unit behind operator), and punch paper tape depending upon the devices connected to it. The most unusual element in the Data Station, is the optical scanning device (shown in picture at upper right) that can read documents encoded in a special bar code, at a 50 character-per-second speed. The device can read either lithographed or computer-printed bar codes at speeds of 30 to 45 documents per minute. As it scans, it transfers the encoded data to a buffer for direct transmission or to punched paper tape and printer for pre-transmission editing. Remote Data Stations can be installed in any normal office environment. They can be linked as single remote units or as multiple stations to one or more Honeywell computers, using conventional voice-grade telephone lines. (For more information, circle 69 on the Readers Service Card.)

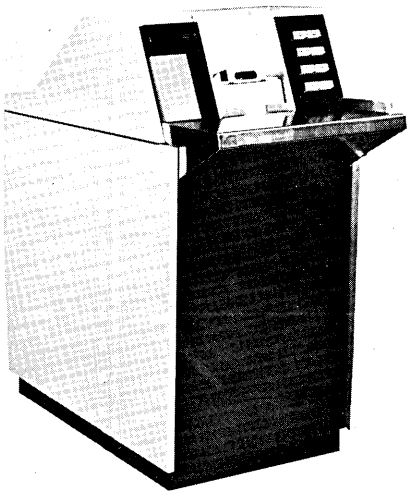
27A DUOBINARY-DATATEL® TRANSMISSION SYSTEMS / Lenkurt Electric Co., Inc. — The 27A is capable of sending and receiving 2400 bits per second over high frequency radio links. In the system, the transmit terminal accepts synchronous data at 2400 b/s. The serial-to-parallel converter separates the serial data into 16 channels, each operating at 150 b/s. The outputs of the separate channels are applied to 16 oscillators. The duobinary wave outputs from the 16 frequency-shift oscillators are then frequency-multiplexed into a 3 kc bandwidth (170 cycle per second spacing). In the receiving terminal, diversity reception is used to combat selective fading of HF transmission. The 27A permits several channel and bit-rate combinations. (For more information, circle 71 on the Readers Service Card.)



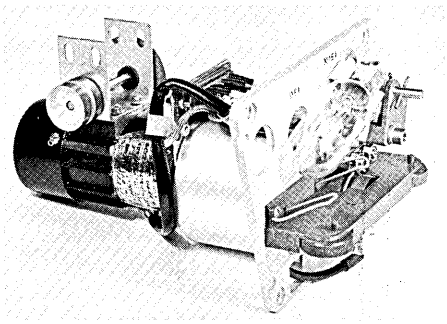
INPUT-OUTPUT EQUIPMENT



GE-210/400 MAGNETIC TAPE SUBSYSTEM / General Electric Company — GE-210 computer users can keep pace with today's increasing data-processing speeds through the new GE-210/400 magnetic tape subsystem. It permits using magnetic tape interchangeably between the GE-210 banking computer and the GE-400's. (For more information, circle 95 on the Readers Service Card.)

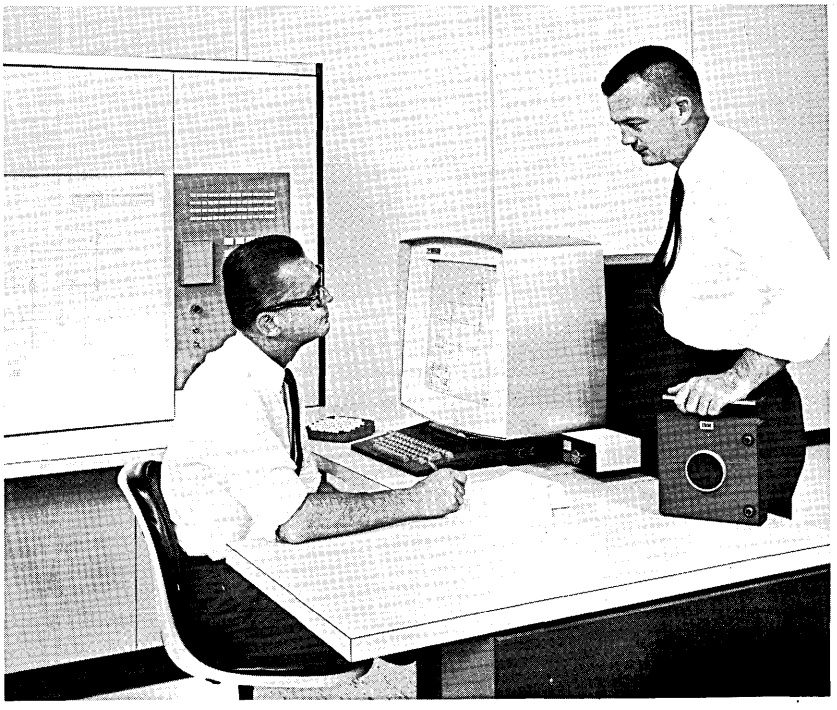


415 HIGH SPEED CARD PUNCH / Control Data Corporation — The 415 has a speed of 250 cards per minute, a 1200 card capacity input hopper and 1500 card capacity output stacker. The device includes punch ready, and check-read ready stations, plus an offset mechanism activated by any comparison error detected. This horizontally shifts the card to an offset position in the stacker. Pick, punch and check-read operations are completed in 240 milliseconds. (For more information, circle 90 on the Readers Service Card.)

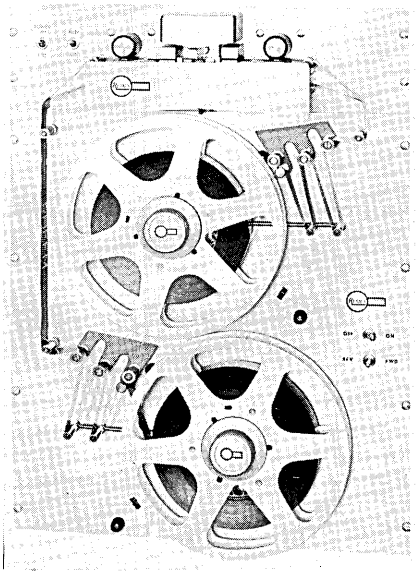


TYPE 422 MILITARIZED TAPE READER / Ferranti Electronics Division of Ferranti-Packard Electric Ltd. — This bi-directional tape transport incorporates the new "Ferranti" disc drive, solid state circuitry, photoelectric sensing system, built-in test facility and malfunction indicators. The picture shows drive unit, tape platform, and illimination as well as tape adjustment controls for different tape widths. The device accomodates 5, 6, 7 and 8 channel tapes and operates at 300 and 600 characters per second. (For more information, circle 101 on the Readers Service Card.)

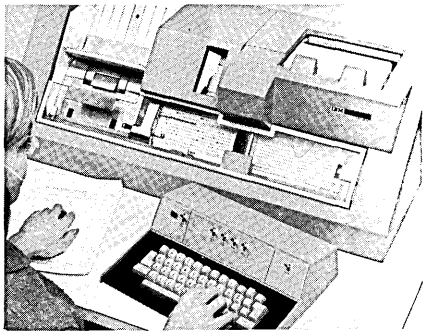
GRAPHIC DATA PROCESSING SYSTEM / IBM Corporation — A computer-controlled system makes it possible for engineers using an electronic "light pen" to modify drawings such as the electrical schematics shown in this photo. The data for the drawing can be stored digitally in an IBM System/360 or entered for the first time on the program function keyboard of the IBM 2250 display (center). Once entered or modified, the image — within seconds — can be recorded on microfilm and displayed for viewing on the rear-projection screen of the IBM 2280 film recorder device (left). The engineer at the right is holding a cassette containing microfilm which can be loaded into the film recorder. (For more information, circle 93 on the Readers Service Card.)



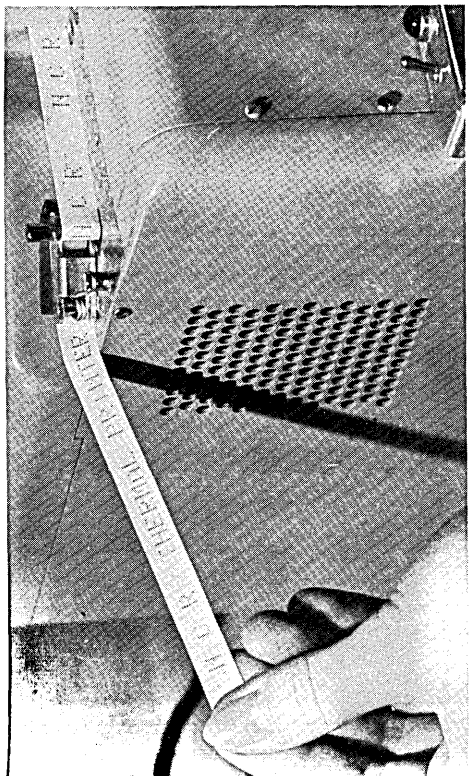
GE COMPUTER TAPE SUBSYSTEMS / General Electric Company — The first of GE's new 160,000-characters-per-second high-performance computer tape subsystems is shown undergoing inspection and test. Two basic tape-handling mechanisms are represented in the line of six new units introduced by the company: a single-capstan, low-inertia drive for 7500 to 80,000 characters-per-second; and a multiple-capstan, constant-speed drive for up to 160,000 characters-per-second. The devices are available with 7 or 9-channel heads, for up to 800-bits-per-inch density. Both designs accommodate ½-inch-wide tape and record in standard computer formats. The new tape units will operate with G-E Compatibles-400 and Compatibles-600 computers. (For more information, circle 94 on the Readers Service Card.)



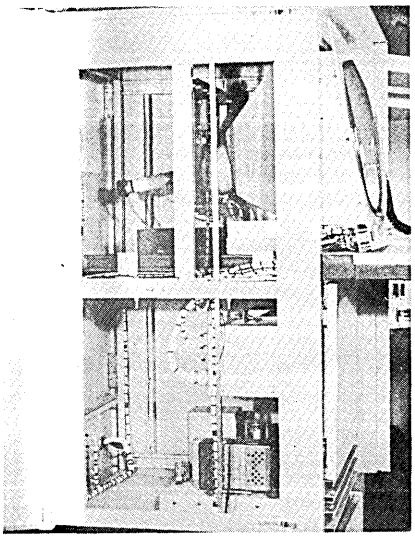
PUNCHED TAPE SPOOLER, MODEL RS-502-10½ / Rheem Electronics — This model spooler has 10½" diameter reels and is offered with and without reel overhang. Application and operation range have been extended by the addition of new features, including high speed bi-directional rewind at 200" per second, self-adjusting electric brakes, no-tape and broken-tape sensing, and electronic noise suppression. (For more information, circle 97 on the Readers Service Card.)



IBM 29 CARD PUNCH / IBM Corporation — The IBM 29 card punch (shown in photo) and its companion, the IBM 59 card verifier, are used to record and check information in cards. Cards then are read and processed by a computer or an accounting machine. The new devices can store two different punching formats as a standard feature. Both devices have 64-character sets (a 48-character set also is available). (For more information, circle 92 on the Readers Service Card.)

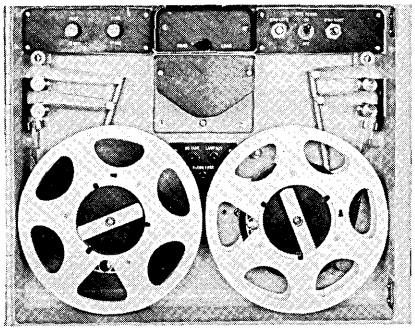


"THERMAL" PRINTING DEVICE / National Cash Register Company — A new printing concept may provide noiseless desk-top computer printers for data output to management in remote locations. The experimental "thermal" printing device is equipped with a keyboard and single printing head. Design of the device is based on a newly developed principle to convert electrical signals directly into characters and symbols. The only moving parts are in the paper transport. 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. NCR pointed out that the new printing concept is applicable to various military and space programs in which high reliability is of prime importance. (For more information, circle 108 on the Readers Service Card.)



COMPUTER CONTROLLED DISPLAY, TYPE CM10028 / RMS Associates, Division of Information Displays Inc. — This view of the IDI Computer Controlled Display shows the lack of interior crowding. All parts are readily accessible for easy maintenance. The display is completely solid-state (except for CRT) and includes provisions for plotting points and writing characters. Approximately 20,000 points per second or 9000 characters per second (or a combination of) can be plotted with this system. A light pen also is included. The display device is designed to operate with a Computer Control Company Inc. DDP-24 system. (For more information, circle 99 on the Readers Service Card.)

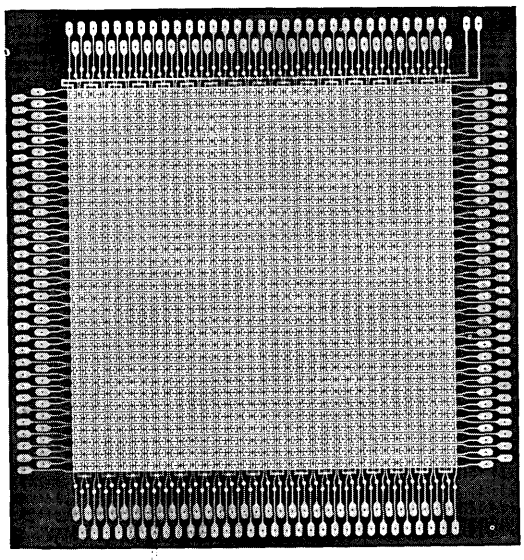
AUTOMATIC CARD READER (ACR) / Friden, Inc. — This auxiliary unit automatically feeds standard Hollerith coded punched cards from a 200-card capacity hopper to reader. The device reads coded punched cards at 572 codes per minute and skips designated portions at a rate of 80 columns per second. The ACR control cylinder can be programmed to accommodate up to four separate programs, and it is possible to automatically switch from one program to another. The device was designed for use with three Friden business machines: the Flexowriter, the Computyper; and the Friden 6010 computer. (For more information, circle 91 on the Readers Service Card.)



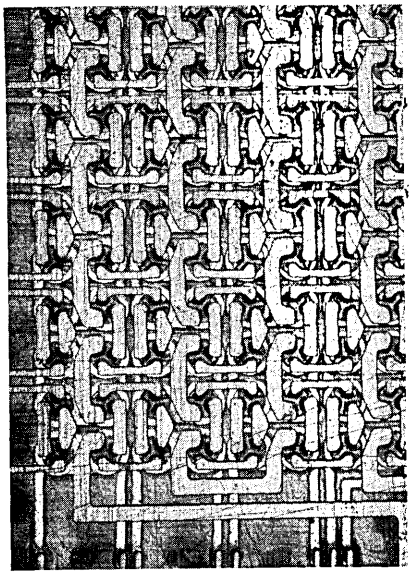
500RM TAPE READER / Photocircuits Corporation — The reader utilizes a printed motor direct capstan drive for tape transport, completely eliminating pinch rollers, brakes and clutches. The 500RM will read at speeds up to 500 characters per second and will Wind/Search at 1000 characters per second. The device will accommodate 5, 6, 7 or 8 level tape and has 8 inch reels. Optional polarities for input and output are available. (For more information, circle 98 on the Readers Service Card.)

S-C 4400 DOCUMENT RECORDER / Stromberg Carlson, division of General Dynamics Corp. — The S-C 4400 was developed as an efficient link in high-speed microfilm storage and retrieval systems. The recorder accepts information from a computer and translates and records it on microfilm at 62,500 characters per second. It is capable of producing a minimum of 50,000 filmed documents in one eight-hour working shift. The device accepts information from magnetic tapes as well as operating directly on-line with a computer. (For more information, circle 96 on the Readers Service Card.)

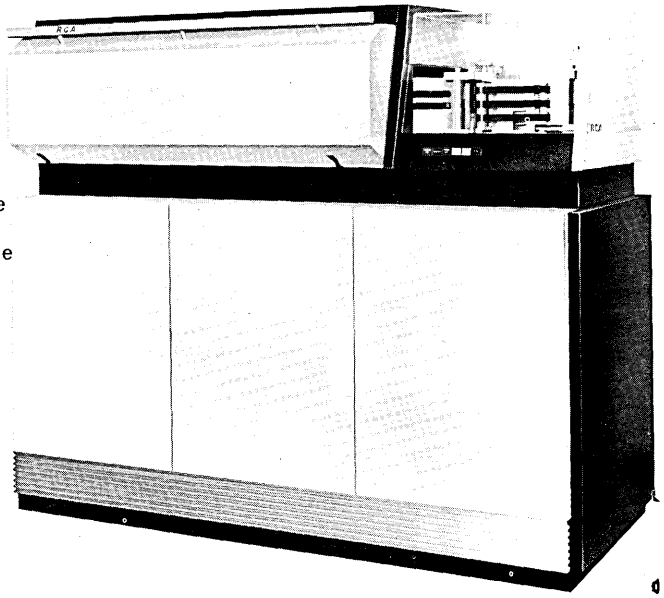
MEMORIES



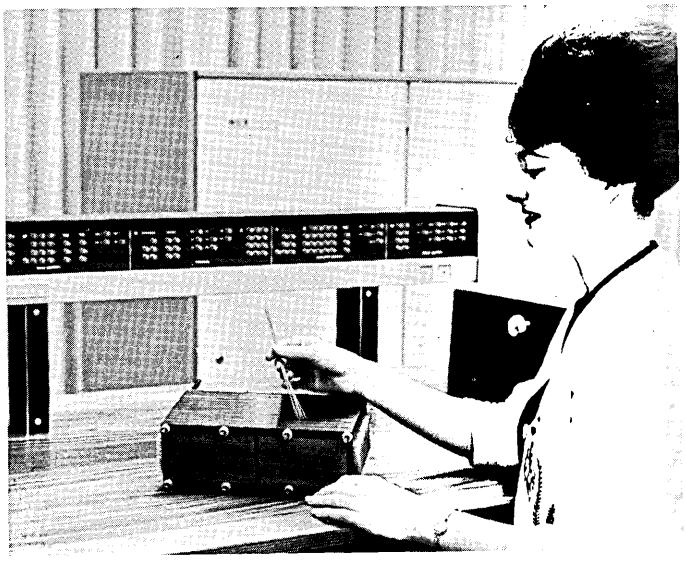
BATCH FABRICATED MEMORY PLANE / LFE Electronics, a Division of Laboratory for Electronics, Inc. — The picture (at the left) is a composite made up of the masters used to produce a batch fabricated memory plane. Four patterns are superimposed: 1) a bottom wiring pattern, 2) a feed-through wiring pattern; 3) a toroid pattern (storage elements), and 4) the top wiring pattern. This configuration provides three conductors through each toroid, a sense-inhibit wire threading all toroids, plus X and Y selection lines. (The photograph shows the pattern at considerable magnification.) The picture at the right is a section of a batch fabricated plane made using wiring patterns like those illustrated in the composite. The storage elements are on 0.025" centers. A complete plane of 4096 elements is 1.6 inches square and has a thickness determined mainly by the supporting substrate (typically 0.010 to 0.062 inches). For more information, circle 89 on the Readers Service Card.)



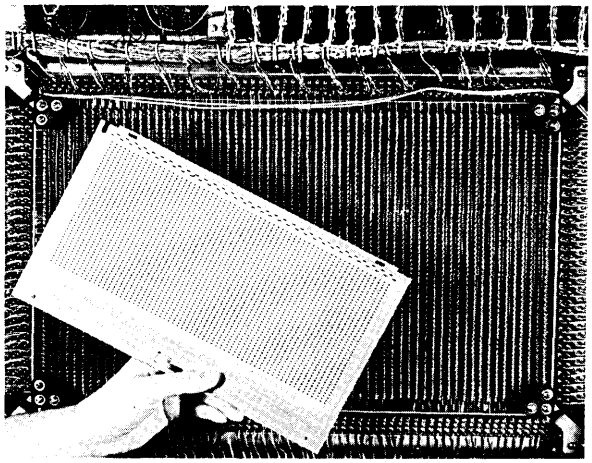
RCA 3488 RANDOM ACCESS MEMORY / Radio Corporation of America — This random access computer equipment can retrieve any one of 5.4 billion facts or figures in a fraction of a second, at one-tenth the cost or less of previous devices. The equipment operates under the command of the RCA 3301 Realcom computer or the smaller RCA 301. The memory consists of a bank of removable magazines each holding 256 flexible magnetic cards on which information is recorded. A single card contains 166,000 characters of data on a flat magnetic surface 16 inches long and 4.5 inches wide. The card has 128 recording channels, separated into addressable blocks. Each card is distinctively edge-notched for purposes of selection. Specific records are called for by a computer-command specifying the appropriate magazine, card, channel and block. There are from one to 16 interchangeable magazines per read-write station, and from one to eight units per total system. (For more information, circle 77 on the Readers Service Card.)



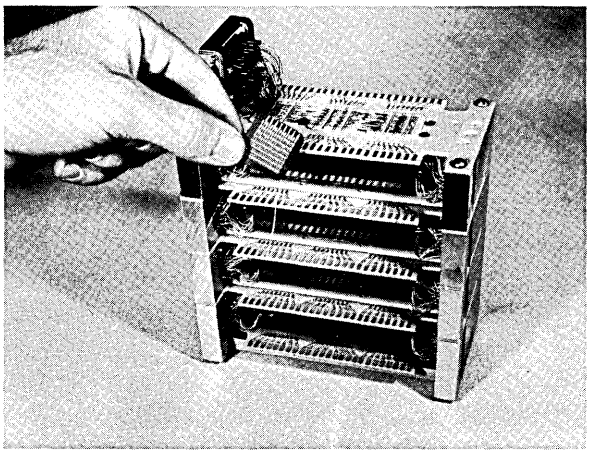
NCR 315 RMC (ROD MEMORY COMPUTER) / National Cash Register Company — The cylindrical thin films, used in the NCR 315 RMC, represent the first commercial application of thin-film technology to a computer's main memory. Data is stored on tiny wire Rods plated with a magnetic thin film. In the picture, Miss Marie Coates displays several of the hair-like Rods which — inserted through a stack of solenoid coil planes — form a memory module (shown on the desk top). The new computer memory can store up to 240,000 decimal digits (4 data-bits each) or 160,000 alphanumeric characters (6 bits each). The basic cycle time is 800 nanoseconds, an entire order faster than conventional microsecond computer memories. (For more information, circle 79 on the Readers Service Card.)



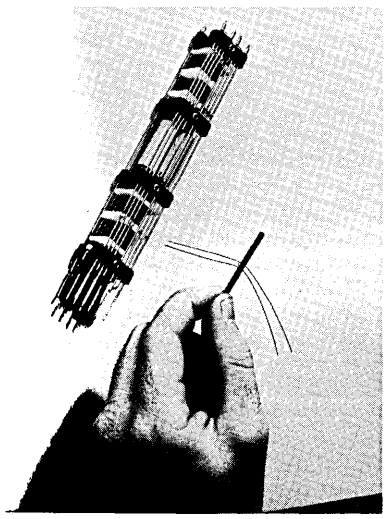
ELECTRONIC SWITCHING SYSTEM NO. 1 (ESS) / Bell Telephone Laboratories & Western Electric Company — An electronic telephone switching system, ESS No. 1, soon will replace present-day electromechanical systems in Bell Telephone central offices. The system will offer a variety of new services and have flexibility for providing additional services yet unthought of. This is possible because the new system uses "stored program control" (instructions are stored in large capacity temporary and semipermanent magnetic memories). Major sections of the system include: the central control which coordinates and commands all system operations; the program store which contains the information the system needs to switch calls and provide services, as well as maintenance instructions; the call store which, among other duties, keeps track of the status of lines, trunks, etc., and registers digits being received and transmitted; the switching network which connects one telephone line to another; and the line scanners which determine whether a phone is on or off the hook. Among the possible services which ESS No. 1 can provide are: Abbreviated dialing — frequently called local or long distance numbers can be reached by dialing two to four digits instead of the usual seven or ten digits; Dial conference — a caller can set up a telephone conference by dialing the other conferees in turn; Add on — a third party can be brought into a conversation in progress by dialing him; Variable call transfer — a person who leaves his phone can dial a code and the number of another nearby telephone which will cause incoming calls to be transferred to the second telephone; Fixed call transfer — a party can arrange to have all incoming calls switched to an alternate nearby telephone; and Call waiting — the system can signal a customer who is using his telephone that another call is trying to get through. (For more information, circle 87 on the Readers Service Card.)



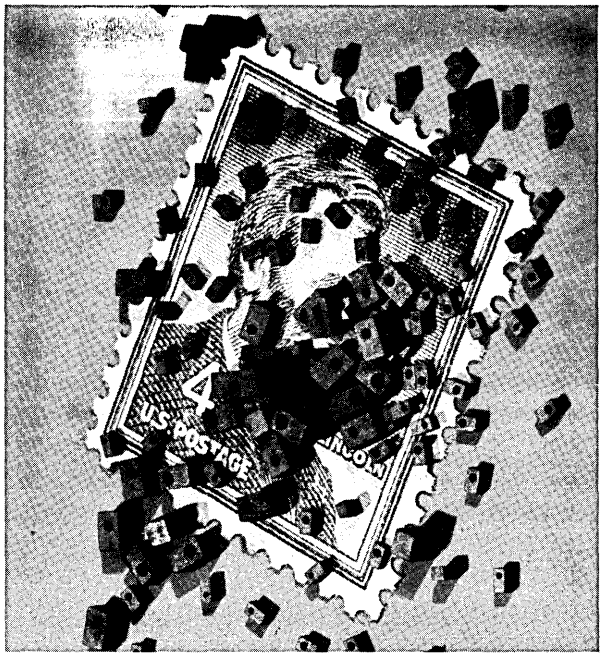
Information ESS No. 1 needs, in order to switch calls and perform other services, is stored on this aluminum card which is inserted between folds of stacked twistor memory planes. A card contains 2816 vicalloy spots arranged in a 64 x 44 array. There are 128 cards in a twistor module and 16 modules in a Program Store. From two to six Program Stores form the semipermanent memory in an electronic central office.



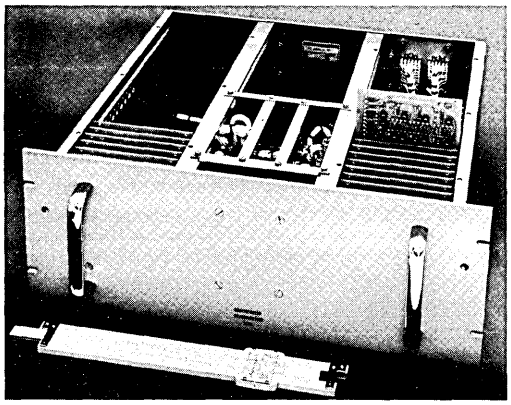
This one-inch square ferrite sheet, perforated with 256 tiny holes, is part of the Call Store temporary memory. The ferrite around each hole acts as a "core" and stores one bit of information. Three wires are threaded through the holes and a conductor is plated onto the sheet. The assembly is used to write information into and read it out of the memory. Sheets are stacked in a module and four modules make up a Call Store, each holding 196,608 bits of erasable information.



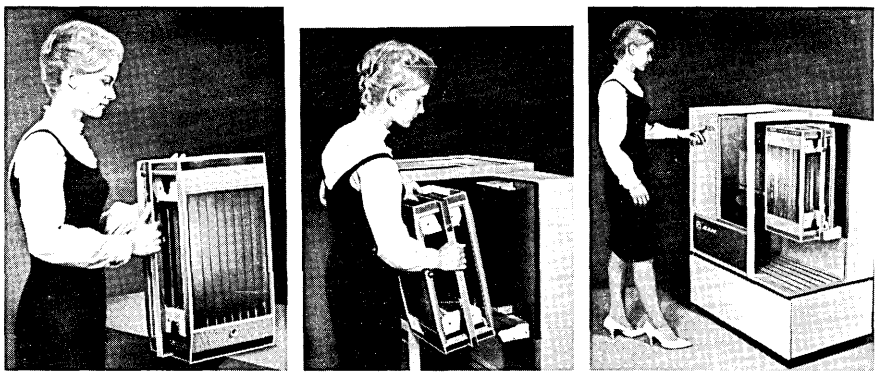
The ferrod (shown at the left), a magnetic current sensing device, is the building block for the scanners used in ESS No. 1. It consists of a ferrite stick around which is wound a pair of solenoid coils. Two wires threaded through holes in the stick carry interrogating and read-out pulses. Two sensors are combined into one unit. Sixteen ferrods may be interrogated simultaneously and their output is sent to Central Control.



MICROBIAX ELEMENTS / Aeronutronic Division, Philco Corporation, a subsidiary of Ford Motor Company — Small MicroBIAX elements are shown here with standard BIAX memory elements, of which they are a microminiature version. Spacecraft and satellite electronic memories no larger than a pair of dice, yet able to contain thousands of bits of information, now are possible with the use of these tiny electronic memory storage elements. They retain the same operationally-proven performance of the BIAX elements in a package only one fifth the size. Perhaps the most important feature of the MicroBIAX is a new two-wire array which yields packing densities of 2000 bits per cubic inch in production hardware. Arrays are available in sizes up to 4096 words. (For more information, circle 80 on the Readers Service Card.)



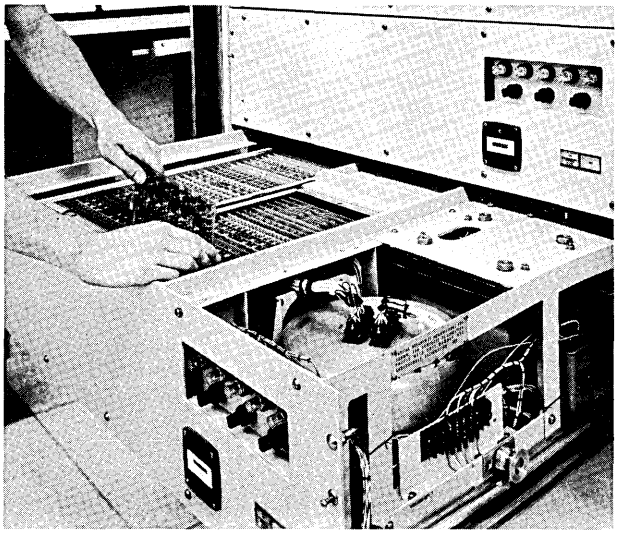
SEMS-4R CORE MEMORY / Electronic Memories Inc. — This high-speed core memory, operating at temperature ranges as wide as -40°C to +85°C, is a printed circuit, rack mounted version of miniature high reliability core memories developed for military applications by this company. The SEMS-4R is designed for shipboard, ground, mobile and industrial applications. Access time is 1 microsecond. Cycle time is 4 microseconds. The 40 pound system has a capacity of 8192 words of 40 bits. (For more information, circle 83 on the Readers Service Card.)



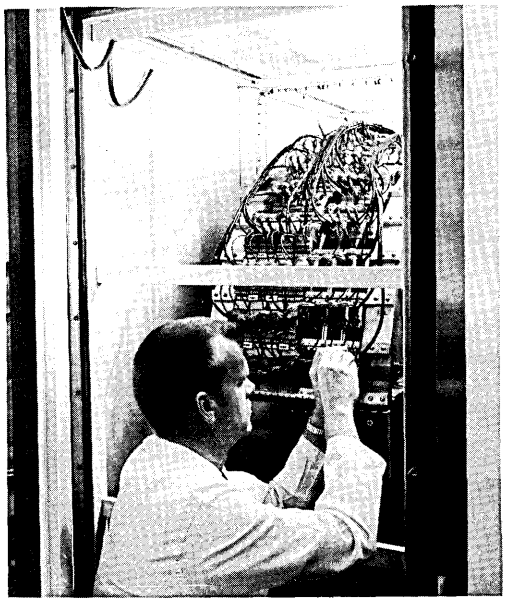
RAM® RANDOM ACCESS MEMORY DEVICE / Potter Instrument Company, Inc. — Over 50 million bits of digital information can be stored in the 16 endless tape loops which make up the Tape Pack cartridge (Model ACC-8606) used in this new random access memory system. Cartridges are interchangeable permitting processing of many different files on one machine. The picture shows the simplicity of the loading operation. The cartridge is placed on the machine carriage; a latch snaps it secure. From this point everything is automatic. The operator simply presses the "LOAD" pushbutton and walks away, leaving the machine to load the cartridge, start up automatically, and signal the "ready" condition, all within a few seconds. RAM provides a check-read-after-write capability. Addressing at random with this capability averages under 100 milliseconds, 20% faster than presently available systems. (For more information, circle 78 on the Readers Service Card.)

6018 MAGNETIC DISC FILE / Friden, Inc. — Unlimited alphanumeric off line storage is available in the Friden 6010 computer through the addition of the Friden 6018 Magnetic Disc File. Each side of the easily removable standard record size magnetic disc provides for a total storage of 61,440 characters in 120 tracks of recording space. Random access speeds range from 6 to 360 milliseconds with an average of 180 milliseconds. Complete interchangeability of discs in any 6010/6018 combination permits compatability of business systems at widely separated points. (For more information, circle 76 on the Readers Service Card.)

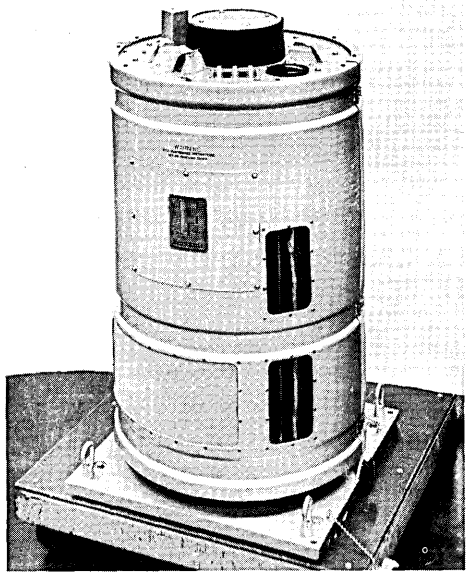
L-119 BUFFER PROCESSOR / General Precision, Inc., Librascope Group — A technician is shown inserting a circuit board into the logic section of the L-119 Buffer Processor, a key element in the AN/FYQ-11 Data Processor Set for USAF's 473L command-and-control system. The circular unit in the cabinet (at right) is the cover on the buffer processor's disc memory. The buffer processor links the U. S. worldwide military communications network with the 473L system. (For more information, circle 82 on the Readers Service Card.)



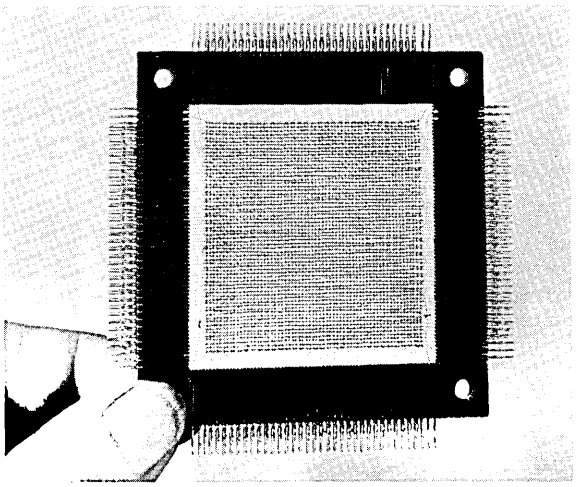
CORE PLANE / IBM Corporation — The core plane resembling a small screen door (foreground) helps make the unparalleled core storage memory power of the IBM System/360 possible. Arrays of these planes are mounted in units (at right in picture) which provide up to two million characters of information. Multiple units can be linked to System/360 to put each of more than eight million characters at the direct command of a computer programmer in eight-millionths of a second. (For more information, circle 88 on the Readers Service Card.)



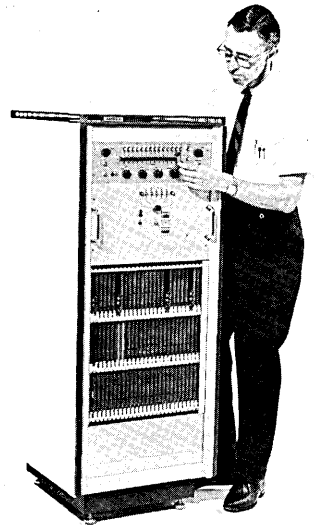
DISC MEMORY / General Precision, Inc., Librascope Group — The mass-storage device of the AN/FYQ-11 Data Processor Set for USAF's 473L command-and-control system is checked and adjusted before installation in console cabinet. The memory system is built around six 48-inch discs that revolve at high speeds. Information is entered and retrieved electrically from the surface of the discs, which are coated with a magnetic coating. Each disc system can store up to 120 million bits of information. (For more information, circle 81 on the Readers Service Card.)



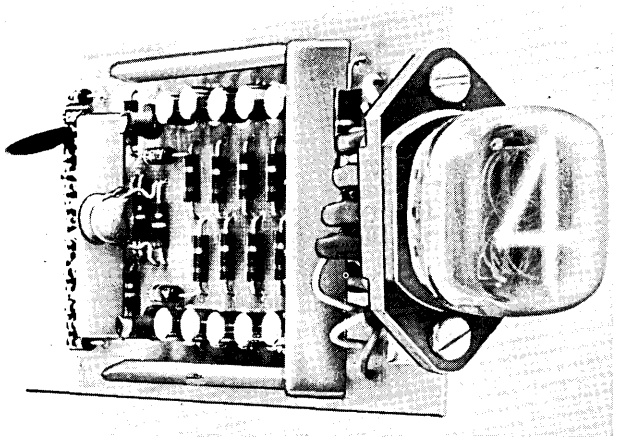
TYPE 371-14 MAGNETIC MEMORY DRUM / Ferranti Electronics Division of Ferranti-Packard Electric Ltd. — The 371-14 magnetic memory drum is capable of storing up to 6.4 million bits at 425 bits per inch on 480 tracks. Error rates are less than 1 in 10^{11} bits transferred. The complete drum system consists of the drum, drum controls, read amplifiers, write amplifiers, track selection circuitry and power supplies. (For more information, circle 86 on the Readers Service Card.)



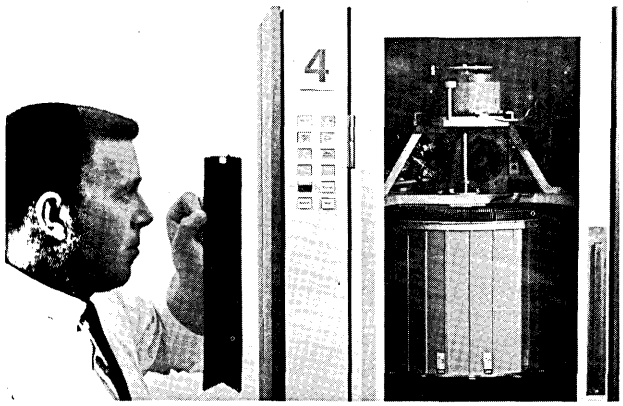
20 MIL FERRITE CORES / Ferroxcube Corporation of America — To meet the increasing demand of high speed memory systems, ferrite core planes and stacks are being produced which make 1 microsecond cycle times for coincident current memory systems possible. These new devices have 20 mil diameter cores with 180 nano-second switching times. They are available in various bit and winding configurations. (For more information, circle 107 on the Readers Service Card.)

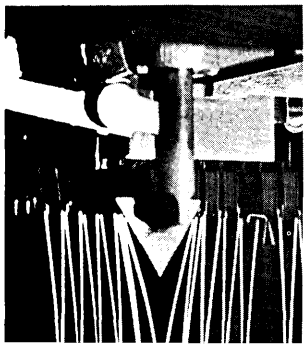


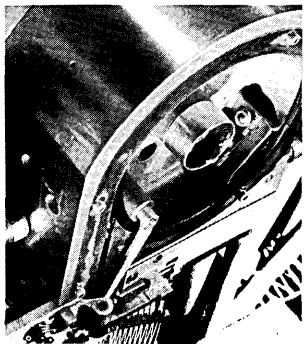
RS COINCIDENT CURRENT CORE MEMORY / Ampex Corporation — The RS provides 1 microsecond operation with storage capacities to 16,384 words by 8 to 56 bits. It is designed for a wide range of computer applications, including automatic control, digital data communication, analog to digital conversion and military checkout programs. Operation modes of the RS are read-restore, clear-write and read-modify. Control signals are read-request, write-request and read-modify-write. A 16,384-word memory requires 61.25 vertical inches of rack space and a 8192-word memory 47.25 inches of rack space. (For more information, circle 85 on the Readers Service Card.)



READOUT MEMORY / Burroughs Corporation, Electronic Components Division — In the binary-coded-decimal to decimal decoder readout driver with memory, the flip-flops have been replaced by silicon controlled switch latches. Each SCS replaces 2 transistors, 4 resistors and several diodes and capacitors per memory element. In a typical readout memory this means elimination of almost 100 components. The devices accept information in forms ranging from DC levels to 100 microsecond pulses. Standard modules use 12 volt logic levels and trigger inputs; these can be modified to suit system requirements. (For more information, circle 84 on the Readers Service Card.)

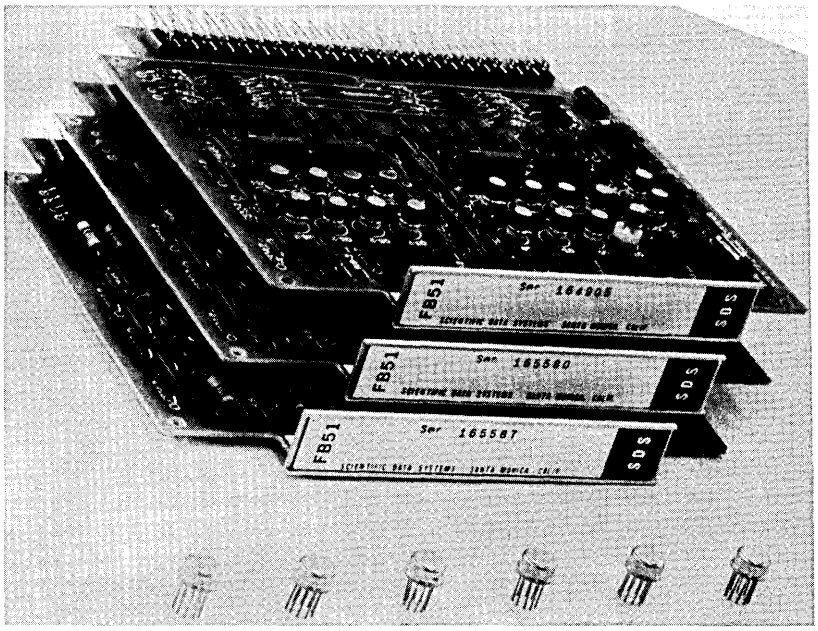




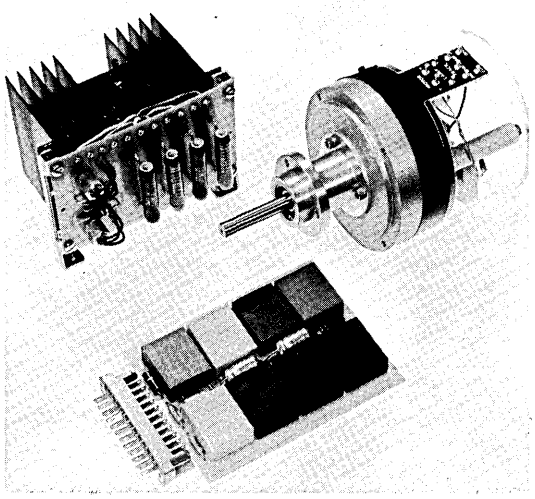


IBM 2321 DATA CELL DRIVES / IBM Corporation — As part of IBM's System/360, these new devices can provide storage of billions of characters of information available in any sequence. Eight of the new units, storing up to 6.4 billion digits, can be linked to one control unit within a single configuration. In the top panel of the picture, an engineer holds a magnetic tape strip on which approximately 200,000 characters of information can be stored. Two hundred such strips are contained in a data cell and ten interchangeable cells can be mounted in the vertical drum seen in the drive, at right of top panel. The file's positioning system rotates the drum to place a desired set of magnetic strips beneath an access station. When the drum is in position, an access device (panel at the lower left) selects the proper strip from a data cell. Each strip has a coding tab which identifies it among the 200 strips in the cell. The strip then is moved over a revolving cylinder (panel at lower right) and past a read/write head. This device retrieves information from the strip for entry into the computer, or records new data on the strip. The magnetic strip then is returned to its original location in the cell. (For more information, circle 75 on the Readers Service Card.)

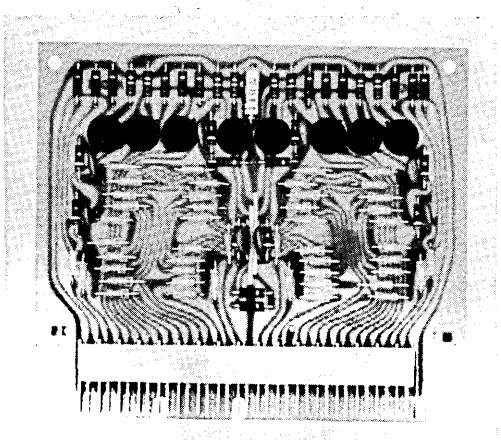
COMPONENTS



INTEGRATED CIRCUITS / Scientific Data Systems, Inc. — The six little cans with leads (shown at the bottom of this picture) are integrated-circuit flip-flops, which, along with other related components, are mounted on a single printed circuit card in the new SDS 92 computer. They are the equivalent of the three printed-circuit cards (shown at the top of the picture) if conventional circuit elements were used. (For more information, circle 104 on the Readers Service Card.)

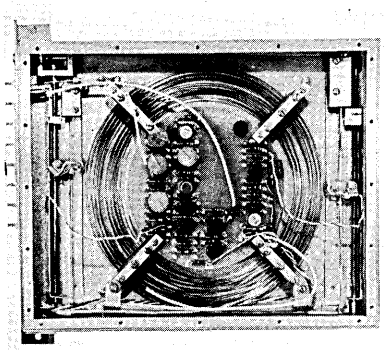


S-1 SERVO SYSTEM / Photocircuits Corporation — This system is finding wide use in peripheral equipment where precise speed control is required. It is a synchronous phase lock servo which consists of a printed circuit motor with an integral optical tachometer and associated solid state amplifiers. Motor speed is locked to a reference frequency which can be fixed or variable. Speed accuracy can be .005% with a crystal controlled reference. (For more information, circle 105 on the Readers Service Card.)

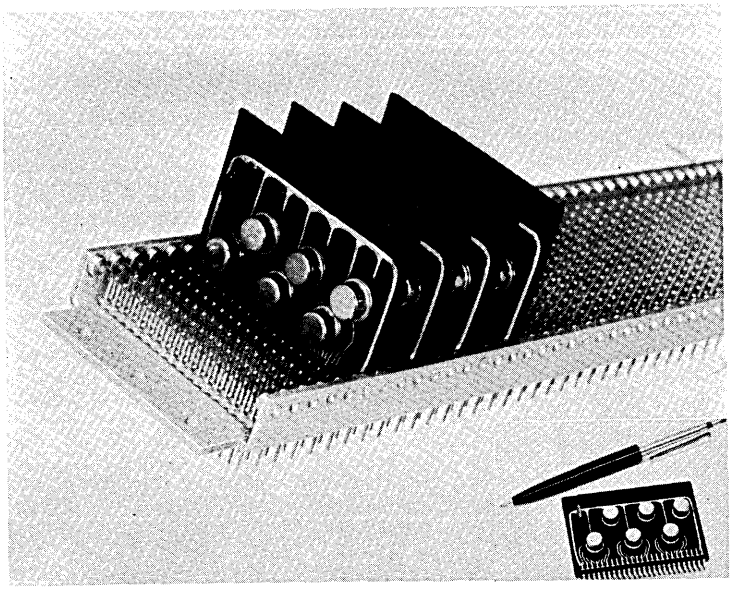


DIGITAL LOGIC CARDS / Computer Logic Corporation — The MD series of digital logic cards are for use as binary-to-octal decoders, as part of binary-to-decimal decoders, or as special matrix decoders. Each card contains eight gates, with six input diodes per gate. Three diodes of each gate are permanently connected for octal decoding; two diodes per gate are individually available for higher-order decode bits, or for special decoding inputs. Three models are available: MD-1, with frequency range from DC to 300 KC; MD-1A, to 2 MC; MD-2, to 5 MC. (For more information, circle 112 on the Readers Service Card.)

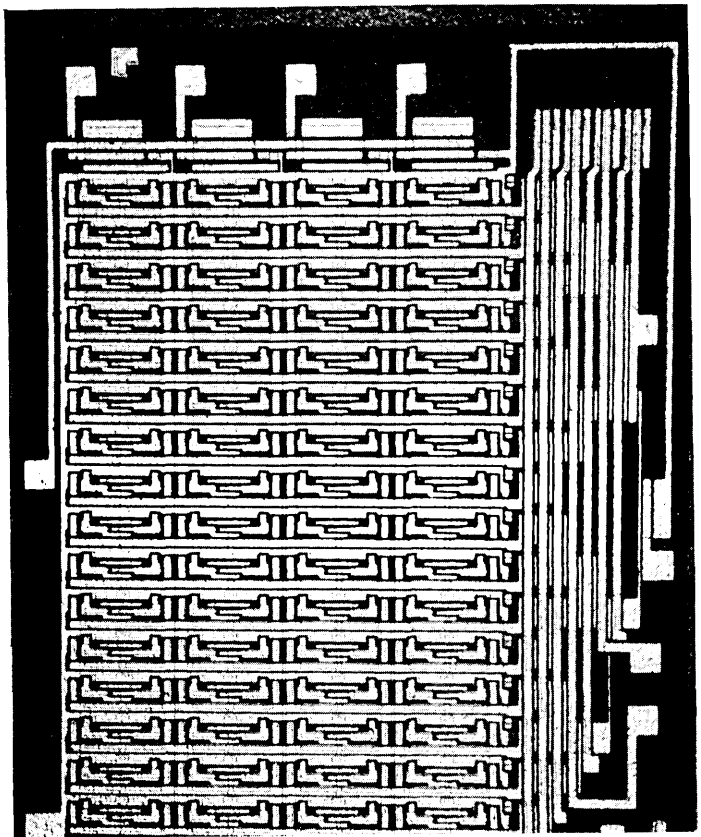
FM-4000 SERIES, MAGNETOSTRICTIVE DELAY LINES / Control Electronics Co., Inc. — This series of magnetostrictive delay lines has fixed delays to 5000 microseconds in one package. Each unit of the FM-4000 Series is offered with standard or special delay times available. Two types are offered — one with signal return to zero, the other with signal not returned to zero. Repetition rate for the latter class of delay lines is 3 Mc/s. (For more information, circle 113 on the Readers Service Card.)



INTEGRATED CIRCUIT MODULES / Abacus Incorporated — This line of integrated circuit modules has been designed to perform all logic functions in seven basic plug-in modules, thus simplifying checkout and maintenance. The modules permit system speed to 5 mc, have noise rejection margins in excess of one volt, and can drive, typically, 12 NAND gates and 200 pf of stray capacitance. The line incorporates packaging, interconnection and interfacing techniques. (For more information, circle 103 on the Readers Service Card.)

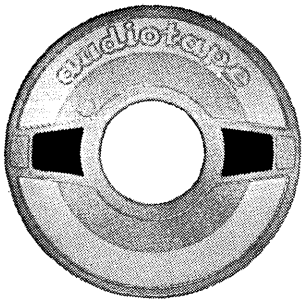


INTEGRATED CIRCUIT CHIP / Fairchild Semiconductor — This photomicrograph of an integrated circuit contains 456 active components. They are interconnected and functioning as a complete circuit of 64 flip-flop memory bits plus all input decoding circuitry. The single chip measures less than one-fiftieth of a square inch. This increased packing density for active components in a single chip is provided by what is known as the Planar II process. A similar circuit built of separate components would require several printed circuit boards with associated wiring for interconnections. (For more information, circle 111 on the Readers Service Card.)



"In the mad, mad, mad, mad world of movies, Computer Audiotape plays an important role,"

says Mr. John Fitzgerald, Data Processing Manager for United Artists Corporation **UA**



"In the colorful motion picture business even accounting is unique. For example, here at United Artists we use an IBM 1401 Computer for the sole purpose of processing producers' settlement statements. United Artists circulates as many as 1,000 films throughout the world at any given time. Our computer prepares detailed financial statements for each of these films. To do this job, we use Computer Audiotape. We first tried it two years ago, and it worked out so well we've often recommended it to other companies. As a matter of fact, we now use it exclusively."

United Artists Corporation is another prominent firm that consistently specifies Computer Audiotape. You can "test run" Computer Audiotape on your computer. "Test run" it on your own equipment, at no cost and at your convenience. For complete details write to Audio Devices, Dept. CA.

AUDIO DEVICES, INC., 235 East 42 Street, New York, N.Y. 10017

Circle No. 19 on Readers Service Card

"ACROSS THE EDITOR'S DESK"

Computing and Data Processing Newsletter

TABLE OF CONTENTS

APPLICATIONS

DRAFT INVESTIGATION AIDED BY COMPUTER

A University of Rochester professor will direct one of the key studies in the Defense Department's investigation of the future role of the draft. Professor Melvin R. Marks of the University's College of Business Administration will head the Qualitative Requirements Study through which the Department of Defense will seek to determine the relative effectiveness and cost of possible alternatives to the draft. The purpose of the study is not to support any specific procurement policy but to determine as realistically as possible the relative merits of various procurement methods.

The study — which will simulate the personnel operations of the Army, Navy, and Air Force inside an electronic computer — is believed to involve the largest simulation program ever undertaken in the personnel area.

As part of the computer project, each of some 230,000 fictitious servicemen (representing a one-tenth scale model of the present armed forces) will be followed through his hypothetical military hitch. Each will be rated on his aptitudes, education, military training, and experience. Then each will be tested, enlisted, assigned, trained, and given typical tours of duty — all by computer.

As a group, the simulated servicemen will resemble closely the composition of today's armed forces. Like their real-life counterparts, some of the mythical servicemen will go AWOL; some will become sick; some will be discharged; some will even re-enlist.

According to Professor Marks, the initial phase of the study, which recently has been completed, included an analysis of research already performed by military personnel research agencies. Such research indicated that the proficiency of an individual soldier can be predicted from a number of factors, including his aptitudes, years of education, formal military training, and on-the-job military experience.

"If the draft is eliminated, the composition of the armed forces with respect to these factors probably will change," Professor Marks explained. "This raises two questions: Will such changes affect the level of military effectiveness? Will it cost more to maintain military effectiveness under such circumstances?" Aided by a team of three research psychologists who will use facilities of the Air Force Data Processing Center in the Pentagon, Professor Marks will come up with some estimates on both questions by next April.

Because the computer can simulate the events of several years in a few minutes, it will be able to reproduce what might happen in the armed forces over a ten-year period — both under the present draft and under alternative methods of procurement. Analysts can then compare the relative merits of each system. Some possible alternatives to the draft which could be run through the computer are: the raising of military pay; the expansion of educational opportunities in the armed forces; and the replacement of some military personnel by civilians.

NORTHWESTERN ENGINEERS USE COMPUTER IN HEART DIAGNOSIS

An unusual partnership between engineering and medicine may enable doctors to check thousands of school children for heart diseases — by computer. This is the prediction of Northwestern University Professor John E. Jacobs.

According to Professor Jacobs, director of Northwestern's Bio-Medical Engineering Center, four research projects are currently underway to computerize the diagnosis of heart ailments. All projects make use of tape recordings of childrens' heartbeats, which are now diagnosed by a 'listening' physician.

One Northwestern project will use computers to identify and erase normal heart sounds from the tape. Doctors waste much time checking normal recorded heartbeats. Researchers are preparing to field test a small computer of this type that can be used by school nurses.

Going a step farther will be more difficult, Jacobs said. To 'train' computers to identify and diagnose faulty heart sounds will

require Northwestern scientists to do original research in the seemingly diverse fields of electronics and hydraulics — the study of the characteristics of fluids. He predicts, however, that the day may not be far away when computers will do all the listening, thus freeing doctors to worry about heart disease treatment.

MARINER MARS 1964 — CENTRAL COMPUTER AND SEQUENCER

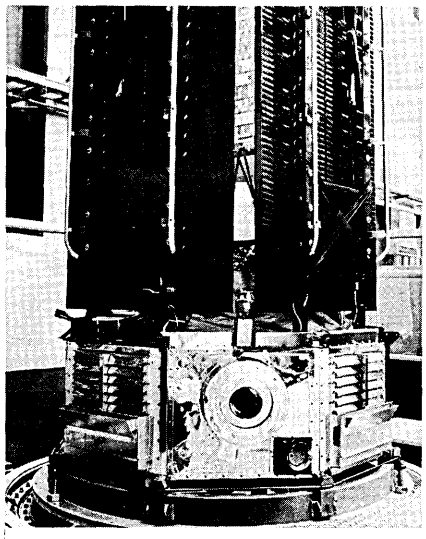
An opportunity for a mission to Mars comes only once every 25 months. Because opportunities are rare and the mission is difficult, it was determined to launch two identical Mariner spacecraft to Mars during the 1964 opportunity.

The mission is unprecedented: the flight distance to Mars is some 350 million miles compared with 180 million miles for the 1962 Mariner II flight past Venus; the Mars flight time is about eight-and-one-half months compared with the three-and-one-half months for Mariner II; a communications distance of 150 million miles for this mission compares with the record 53.9 million miles established 20 days after Mariner II flew past Venus; some 138,000 components in each Mars Mariner will have to function 6500 hours in space.

The Central Computer and Sequencer performs the timing, sequencing, and computations for other subsystems aboard the Mariner spacecraft. The CC&S initiates spacecraft events in three different mission sequences — launch, midcourse and cruise/encounter.

The launch sequence includes spacecraft events from launch until the cruise mode is established, a maximum of 16-2/3 hours after liftoff. These events include deployment of solar panels and activation of the attitude control subsystem, solar pressure vanes and Canopus sensor.

The midcourse maneuver sequence controls the events necessary to perform the midcourse maneuver in trajectory. Three of these are commands radioed from Earth and stored in the CC&S prior to initiation of the maneuver. They tell the spacecraft how far and in which direction to turn on its pitch and roll axes and how long the midcourse rocket engine must fire.



— Photograph of Mariner Mars spacecraft shows close-up of mid-course propulsion system. Umbilical plug matches electrical connector in bottom right, of rocket engine compartment. Polished metal louvers on adjacent electrical compartments provide internal temperature control. Four light weight solar panels, shown folded, will be deployed after launch and separation from launch vehicle.

The master timer sequence controls those events that occur during the cruising portion of flight and planet encounter. CC&S commands, during this sequence switch, the spacecraft telemetry transmission to a slower bit rate; switch the transmitter to the high-gain antenna; set the Canopus sensor at various cone angles relative to the predicted encounter time; turn on planetary science equipment prior to encounter for the 14-hour encounter sequence; and switch to the post-encounter telemetry mode for transmission of recorded video data.

The CC&S weighs about 11½ pounds.

Responsibility for the Mariner Mars project is assigned to the Jet Propulsion Laboratory by the National Aeronautics and Space Administration.

PAN AM TO OPEN WORLDWIDE RESERVATIONS SYSTEM

As early as 1955 Pan American Airways began to plan an electronic system which would expedite the airline's handling of more than 75,000 daily requests for information and reservations as well as fulfilling other tasks concerned with the internal operations of the Company. The system, designated by the airline as PANAMAC, will connect Pan Am offices in 114 cities on six continents with the hub of the system in the airline's Home Office, the Pan Am Building, New York City. There, in the Data Processing Center, dual IBM 7080 computers (specially adapted for PANAMAC) are installed. They have been undergoing tests for the past year.

For the first time, international travelers will be able to obtain bookings from Pan Am offices throughout the world in a matter of seconds. Additionally, bookings can be made with the same speed for Intercontinental Hotels Corp's. (IHC) 28 international hotels, located around the globe.

Initial cities to be linked to the Pan Am Building on the PANAMAC circuit will be Boston, Denver, Montreal, Toronto, and Seattle. They will be phased into PANAMAC gradually, with no interruption in the regular reservations service. High speed telephone communications lines, capable of carrying up to 2700 words a minute, are already installed between these cities and the Pan Am Building. IBM agent sets also are installed for use by Pan Am and IHC reservations personnel in making bookings.

Basic communications requirements for the system involve a combination of special overland lines and underwater cables tied to an existing global network used by Pan Am for several years in support of its flight operations. More than 100 PANAMAC landlines will radiate from New York to key United States cities. Underwater cables will transmit reservations data between New York and London, San Francisco and Honolulu, and Miami and San Juan. A high speed network (the first in use by a commercial company in Europe), connects London with Paris, Frankfurt and Rome.

Approximately 700 compact reservations sets, each about the size of a desk typewriter, are being installed in Pan Am offices in the United States and abroad. Sets will be located in city reservations offices and at airports.

By the end of this year, the entire Pan Am system will be tied into PANAMAC through the airline's worldwide communications network.

NEW CONTRACTS

GT&E AWARDED CONTRACT BY AIR FORCE OF $34.5 MILLION

A $34.5 million prime contract from the U. S. Air Force was awarded to Sylvania Electric Products Inc., a subsidiary of GT&E, by the Ballistic Systems Division, Norton Air Force Base, Calif. The contract is for the production of a command and control system for 150 Minuteman missiles and 15 underground launch centers in eastern North Dakota. The new contract brings to $154 million the total funds awarded to Sylvania on Minuteman programs. The work will be performed by Sylvania Electronic Systems, a division of the company, at Buffalo, N.Y., and Waltham and Needham, Mass.

Minuteman is a three-stage, solid propellant missile with a range of more than 6300 miles at speeds of more than 15,000 miles per hour. Over 600 already are poised, armed and operational in various parts of the country.

BUNKER-RAMO COMPUTER SYSTEM TO BE PART OF MECHANIZED MAIL HANDLING SYSTEM

The Bunker-Ramo Corporation, Los Angeles, Calif., has been awarded a contract for a 340 Control Computer System by the FMC Corporation, San Jose, Calif. The computer system will be an integral part of the FMC Letter Sorting System, a mechanized mail-handling and letter-sorting system developed by the FMC Machinery/Systems Group. (FMC is prime contractor to the U. S. Post Office Department for the development of a prototype system to be evaluated by the Post Office in late 1965.) The electronic directory of the FMC Letter Sorting System will be controlled by the Bunker-Ramo 340 control computer system.

GODDARD SPACE CENTER AWARDS CONTRACT TO C-E-I-R

Goddard Space Flight Center, Greenbelt, Md., has awarded a contract for computer programming and related Services to C-E-I-R, Inc., Arlington, Va. The contract will involve expenditures of up to $1 million over a three-year period. C-E-I-R will furnish a minimum of 15 man-years of work during the three-year period.

Services to be provided under the "call"-type contract will consist primarily of expert technical assistance for the Goddard SFC in its support function for various scientific, communications and meteorological projects. The services will encompass development, design, writing, testing and documentation of computer programs, operational analyses and computer operations.

CONTRACTS IN EXCESS OF $1 MILLION AWARDED TO GENERAL INSTRUMENT DIVISION

The Magne-Head Division (Hawthorne, Calif.) of General Instrument Corp., has received contracts in excess of one million dollars from Martin-Marietta Corp., to build magnetic memory drums for the Pershing ballistic missile program. The memory drums, for use in ground support equipment, will be supplied to Martin Company's Orlando (Fla.) Division, Pershing system prime contractor for the U. S. Army.

WESTERN RESERVE UNIVERSITY RECEIVES GRANT

The Center for Documentation and Communication Research, School of Library Science, Western Reserve University, Cleveland, Ohio, has received $111,908 to further its development of a documentation research facility for the Health Sciences, supported by the National Institutes of Health. The rapidly expanding volume of medical research and its increasing significance to the community demand new improved systems for communication amongst researchers and for the dissemination of research results.

A prime goal of the present phase of research is to continue and extend the activities of the Center's Comparative Systems Laboratory, designed to provide a methodology for the testing and evaluation of Information Retrieval Systems. Testing (including question analysis, search strategy, and evaluation of test results) will be the chief objective of the next year of CSL activity. Other concurrent activities will include an evaluation of abstractor efficiency and further study of indexing.

THREE CONTRACTS TOTAL $3 MILLION FOR AMPEX

Three contracts totaling approximately $3 million have been awarded Ampex Corporation, Redwood City, Calif., by Radio Corporation of America for magnetic tape handling systems. They are to be incorporated with RCA 110 computers for Saturn Space programs.

A total of 52 TM-4412 tape handling systems and 10 slave tape systems are included in the order to be used with the computers in check-out and launch of the Saturn vehicles under the National Aeronautics and Space Administration program. The systems will be installed at several NASA centers and manufacturing plants of several prime contractors. The tape systems will permit the 110 computer to function with up to nine slaves with one master interface for additional storage. Each system may be broadened by adding slaves.

AIR FORCE CONTRACT FOR TWO MOBILAB VEHICLES

The Data Systems Engineering Group of Fairchild Hiller Corp., Washington, D.C., has been awarded a $268,000 contract by the Air Force for delivery of two MOBILAB vehicles. Data Systems Engineering was organized recently and is primarily concerned with the design, development and management of intelligence and reconnaissance systems for space, airborne and ground applications.

MOBILAB is a self-propelled, rapid photo processing laboratory designed to process aerial reconnaissance film.

CONTRACT OVER $2 MILLION RECEIVED BY BECKMAN

Beckman Instruments, Inc., Fullerton, Calif., has received a contract in excess of $2 million from AETRON, A Division of Aerojet-General Corp., for data acquisition and processing systems to be used in testing the National Aeronautics and Space Administration's Saturn Space Vehicle. The contract calls for the delivery of four high-speed data acquisition systems and Model 420 Systems Computers to NASA's Mississippi Test Operations early next year.

Newsletter

MACHINE LANGUAGE TRANSLATION CONTRACTS AWARDED TO BUNKER-RAMO

Two contracts for development of machine translation of languages have been awarded to the Defense Systems Division of The Bunker-Ramo Corporation (Canoga Park, Calif.), by the Rome Air Development Center.

One contract calls for the development of a syntactic analyzer, a program for use in the machine translation of languages. In machine translation, the syntactic analyzer falls between the dictionary lookup and associated programs and the resolution of semantic ambiguities. One of the initial steps in writing the analyzer program will be to determine which of the many grammars now in existence is most applicable to machine translation. One of the grammars under study is the fulcrum grammar, which directs the primary syntactic searches upon those pivot words (fulcra) within the sentence around which other words are centered.

In a second contract with RADC, Bunker-Ramo will study the application of the fulcrum technique to Chinese-English machine translation. Major emphasis will be placed on the study of Chinese syntax with a goal of developing a grammar code and a syntactic recognition routine comparable to those which have been successfully developed here for the machine translation of Russian into English.

WEST GERMAN GOVERNMENT AWARDS CONTRACT TO WHITTAKER CORPORATION

The West German Government has awarded a contract, valued at more than one-half million dollars, to Whittaker Corporation's Electronics Division of North Hollywood, Calif., for air traffic control systems. The award was made by the Federal Office of Flight Safety (Bundesanstalt fur Flugsicherung) for Whittaker secondary surveillance radar to be installed at a major German airport during 1965.

The system supplements primary radar and provides positive control of military and civilian aircraft. The equipment will provide the West German Government with a prototype traffic control system consistent with the design requirements of the International Civil Aviation Organization.

CONTRACT AWARDED UNIVAC FOR NEW PENTAGON INSTALLATION

A $2,750,000 prime contract has been awarded to the UNIVAC Division of the Sperry Rand Corporation for the design and installation of a computer-based information system in the Army War Room, Washington, D.C.

The Pentagon installation will be built around two UNIVAC 1218 Military Computers and a UNIVAC 1004 Card Processor. Other UNIVAC equipment includes eight 1240 military tape transports and a FASTRAND mass storage subsystem. Additional peripheral equipment has been subcontracted to other firms and includes: CRT consoles, a large screen display subsystem, and an electromechanical plotter.

The new system will permit the vast amounts of diversified information, continually flowing into the War Room from sources throughout the world, to be readily evaluated, processed and stored for rapid retrieval when needed. The system is being designed by the Army and UNIVAC in such a way as to enable Army operations to use the system facilities without extensive specialized procedures.

USAF ORDERS EIGHT EDP SYSTEMS FROM HONEYWELL

The United States Air Force has awarded Honeywell Inc., Wellesley Hills, Mass., a contract calling for delivery of eight electronic data processing systems to major air command headquarters. Estimated annual rental for these systems is $1.5 million. Honeywell was selected from among six bidders for the project.

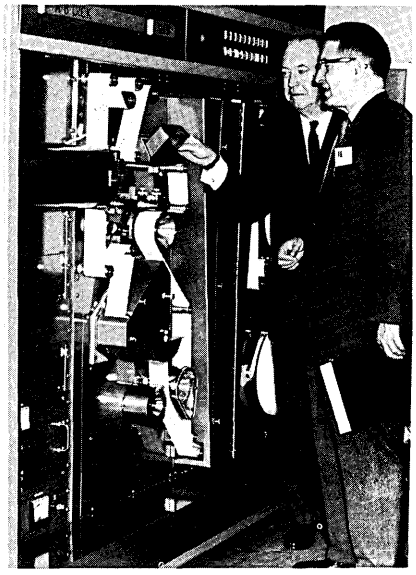
Under terms of the contract, eight systems — each consisting of a Honeywell 800 computer and a Honeywell 200 computer — will be installed by September 1965, in eight of the Air Force's major air commands. The contract includes an option for an additional three systems. All will be leased with an option to purchase.

Air command headquarters to which the initial eight systems will be delivered include: USAF Headquarters Command, Washington, D.C.; Strategic Air Command, Omaha, Neb.; Air Defense Command, Colorado Springs, Colo.; Tactical Air Command, Langley, Va.; Air Training and Security Services Commands, both in San Antonio, Texas; USAF European Command, Wiesbaden, West Germany; Pacific Air Command, Honolulu, Hawaii.

CONTRACT FOR AUTOMATED ADDRESSING SYSTEM

The A. B. Dick Company, Chicago, Ill., was recently awarded a contract for the development of a system which is intended to automate sack label and facing slip production for the entire U. S. postal system. The Post Office Department estimates an annual net savings of over $1 million in space, supplies and equipment should result from installation of the new system.

The automated addressing system under development consists of two magnetic tape handlers, the Videograph high-speed address printer, spirit transfer processor, and imprinter-stacker with the necessary cutting, stacking and binding capabilities. The imprinter-stacker device is being designed by Cheshire, Inc., Mundelein, Ill., under sub-contract from A. B. Dick Company.



— Deputy Asst. Postmaster General J. R. Thomason (right) and Karl Van Tassel, president of A. B. Dick Company, review developmental progress of the automated addressing system.

The proposed system will operate from computer prepared magnetic tape containing appropriate label and slip information in digital source data form. Under the terms of the contract, this prototype system will undergo tests for a minimum of 90 days in a postal facility.

NEW INSTALLATIONS

INTERSTATE SECURITIES INSTALLS H-200

Interstate Securities Company, Kansas City, Mo., an independent midwest finance firm, has installed the first Honeywell 200 business computer in the area at its executive offices. The new computer is being used by the consumer finance firm and its wholly-owned subsidiaries, the Old Security Insurance Companies, on its various bookkeeping, accounting, statistical reports, etc. Future applications include the field of forecasting and of "credit scoring", a method of evaluating the repayment potential of customers.

The new system includes a central processor, four magnetic tape units, a high-speed printer, and a card reader/punch unit.

INSURANCE COMPANY TO INSTALL IBM 1440

The Booker T. Washington Insurance Company, Birmingham, Ala., will install an IBM 1440 computer next spring at the company's headquarters. The Birmingham insurance firm, established in 1923, has almost $70 million worth of insurance in force. It also controls several subsidiaries in the funeral, drug, real estate, and lodging business.

The IBM computer is designed to handle all bookkeeping and accounting for the company, as well as accounting and statistical information reports for subsidiary companies. Other computer uses anticipated by the company includes automatic rating and writing of policies.

HAYDEN, STONE TO INSTALL REAL-TIME COMMUNICATIONS AND DATA PROCESSING SYSTEM

Hayden, Stone Inc., New York, N.Y., will install a real-time communications and data processing system, early in 1965, which will enable the firm to provide, quickly and efficiently, a full range of brokerage services to its growing roster of customers and accounts.

A UNIVAC 418 and a world wide network of telephone and teletype communications lines will expedite the services for Hayden, Stone customers on New York Stock Exchange and American Stock Exchange transactions, over the counter trading, municipal bonds, corporate underwritings, commodities, business conducted for and by correspondents, research information and general traffic.

Hayden, Stone has 55 branch offices in the United States and 12 offices in Europe, South America, and the Middle and Far East. The company also services 39 branch offices of correspondents. All of these offices will be connected in the new system by a private wire network containing 43,000 miles of circuitry.

MATS INSTALLS SECOND RCA COMPUTER SYSTEM

The Military Air Transport Service (MATS) has installed a second Radio Corporation of America 301 system to provide flexibility in processing and scheduling flight reports for its world-wide aircraft network. MATS provides global airlift capability for all agencies of the Department of Defense on a routine or an emergency basis, according to Colonel Raymond E. Brett, MATS Director of Automation. In addition, the MATS computer center, at Scott Air Force Base, Ill., will provide a centralized processing service to the 10 MATS installations located within and outside the continental limits of the United States.

ELECTRONIC RETINA SYSTEMS TO BE INSTALLED BY COLORADO REVENUE DEPARTMENT

The Department of Revenue of the State of Colorado is planning the addition of an optical character recognition system to its electronic data processing installation at Denver, Colo.

The new equipment, called an Electronic Retina Character Reader, is manufactured by Recognition Equipment Inc., Dallas, Texas.

Initial use of the device will be the processing of motor vehicle registrations. Further applications now under development will be driver history records, drivers licenses, automobile titles, and many tax applications.

UNIVERSITE de MONTREAL TO INSTALL CDC 3400

The Universite de Montreal has ordered a Control Data 3400 computer system which will be installed at the University's Computing Center. The University expects that the center, to be in operation early next year, will be one of the largest and most powerful in Canada. The center will be used by all faculties and affiliated schools of the University.

The Control Data 3400 computer system has a high-speed magnetic core memory of 32,000 words. The new system also will use a Control Data 3100 computer as a satellite processor and associated data processing equipment, including card readers, line printers, magnetic tape units, and a graphic plotter.

NEW JERSEY BANK ORDERS GE-415

The National State Bank of Elizabeth, N.J., has ordered a General Electric 415 computer to add to its growing computer center Already serving demand deposit accounting (DDA) for 50,000 accounts a day, the center handles electronic accounting for 11 of its own branches, five branches of the First Bank and Trust Company of Perth Amboy and for the Rahway Savings Institution.

By second quarter next year, the center plans electronic processing of installment loan accounting, mortgage loans and payroll accounting. By late 1966 it anticipates expansion into electronic accounting for industry, along with utility billing and tax accounting services.

NETHERLANDS GOVERNMENTAL SAVINGS BANK TO INSTALL NCR SYSTEM

The Rijkspostspaarbank (Governmental Savings Bank), Amsterdam, The Netherlands, has announced plans to install an NCR data processing system next spring. The financial institution performs savings bank services and handles 16 million transactions annually.

The system will be built around an NCR 315 computer and will include three CRAM (Card Random Access Memory) units, two magnetic tape devices, a punched-card reader, and a high-speed printer.

Newsletter

IRS ORDERS TEN H-200's FOR TAX PROCESSING

The U. S. Internal Revenue Service has ordered ten Honeywell 200 general-purpose business computers from the electronic data processing division of Honeywell Inc. The H-200's will be used primarily to process individual and business tax returns at the seven Internal Revenue regional service centers.

Three systems already have been installed in Lawrence, Mass., Philadelphia, Pa., and Atlanta, Ga. A fourth system also has been installed in the Internal Revenue systems division headquarters, Washington, D. C. Systems for Austin, Tex., Cincinnati, Ohio, Kansas City, Mo., and Ogden, Utah, will be installed by the end of this month.

Major components of the first eight systems are being purchased by Internal Revenue for approximately $1.3 million. Each system includes a central processor, four magnetic tape units, a high-speed printer and a card reader/card punch unit.

COMMON MEMORY DDP-24's DELIVERED BY 3C

The Western Division of Computer Control Company, Inc. (Los Angeles, Calif.) has shipped to the Rucker Company an integrated computer control system which incorporates a memory-to-memory communication. The memory sharing system differs from the normal DMA/FBC approach. It uses standard 8K memory module switching, modified to operate between two DDP-24's, and priority determination logic to resolve memory access conflicts.

The system permits two DDP-24 computers operating randomly to access each other's memory for the transfer and/or use of single words.

The 3C system will program specific tests and control the operation of NASA's new centrifuge at Clear Lake, Texas. This will simulate space flight conditions in connection with the Apollo program.

ORGANIZATION NEWS

NCR NEGOTIATING FOR ACQUISITION OF BUSINESS FORMS COMPANY

The National Cash Register Company, Dayton, Ohio has been negotiating with Business Systems Inc., a Los Angeles business forms producer, for the acquisition of that company. BSI is a leading West Coast producer of forms used with accounting and bookkeeping machines. Many of its customers are users of NCR accounting equipment.

Robert S. Oelman, NCR chairman, said that an "agreement in principle" has been reached as a result of the negotiations, but certain matters remain to be settled. He added that the assets of BSI, under the agreement, would be acquired in exchange for shares of NCR stock. Also if BSI is acquired by NCR, the organization would operate as a subsidiary of NCR under the supervision of the present management, with no substantial changes in operations contemplated.

ENGLISH ELECTRIC-LEO COMPUTERS LTD. BECOMES SUBSIDIARY WITHIN THE ENGLISH ELECTRIC GROUP

The English Electric Company Ltd., London, England, has purchased J. Lyons & Company's shareholding in English Electric-Leo Computers Ltd. for approximately $5.2 million. It now becomes a wholly-owned subsidiary within the English Electric Group and will be known as English Electric Leo Marconi Computers Limited. The shareholding being acquired from J. Lyons & Co. Ltd. will be transferred to The Marconi Company Ltd., English Electric's principal electronic subsidiary company.

C-E-I-R, INC. AND BRITISH AFFILIATE FORM NEW COMPANY

C-E-I-R, Inc. and its British affiliate, C-E-I-R, Ltd. are cooperating in the formation of a new company in the Netherlands, C-E-I-R, N.V. This is the first joint venture of the two companies in expanding their international operations.

The new company's headquarters will be at The Hague. It will help to serve present clients and develop new business in Holland and Germany. C-E-I-R, N.V. also may cooperate with C-E-I-R, Ltd. in serving the latter company's many other clients on the European continent.

DOC INC. WILL CONTRIBUTE TO "PREPARE"

Documentation Incorporated, Bethesda, Md., will contribute specialized materials for the Labor Department's program, PREPARE (see Computers and Automation, July 1964, p. 43). The program is being conducted by Datatrol Corp., Silver Spring, Md.

DOC INC will donate as a public service an electronic accounting machine (EAM) billing procedure currently used to administer an insurance program. This procedure will be used to train the students in the group who will specialize in the operation of EAM equipment.

COMPUTING CENTERS

CARNEGIE INSTITUTE HAS CENTER FOR STUDY OF INFORMATION PROCESSING

A Center for the Study of Information Processing has been established at Carnegie Institute of Technology through a more than $3 million contract from the Advanced Research Projects Agency (ARPA) of the Department of Defense.

According to Dr. Alan Perlis, director of the computation center, and Dr. Allen Newell, institute professor of systems and communications sciences, all intellectual activity presumes information processing and all systems require communication and control. The importance of understanding information processing stems from the fact that it pervades and interpenetrates all other fields.

The new center will use Carnegie Tech's computer facilities which includes a paired computer with the second largest memory storage of any machine in industry or education in the United States. It is expected that another computer (making a total of five) shortly will be added to the com-

putation center. There also are twelve teletype units at various places on the campus from which research projects can be conducted on the computer. It is expected that by the end of this year, thirty such units will exist in various departments and residence halls on campus.

Organizationally, the center will consist of a small number of full-time faculty and a large number of joint appointments and non-paid faculty users of the computation center's facilities.

The fundamental aim of the center is the understanding of the nature of information processing — that is the systems which process and transform information, and the way it is used to control, integrate, and coordinate other systems.

Dr. Perlis visualizes the center as using the computer as sort of a "public utility" similar to power companies in that it would provide its facilities to fit individual needs of many simultaneous users. Future plans, in fact, call for a system installed by the Bell Telephone Company whereby the Tech computer will be available for problem solving by any qualified person anywhere in the United States.

COMPUTER SERVICE FOR MOTOR FREIGHT INDUSTRY

Maxson Electronics Corp., Great River, L.I., N.Y., has established a new subsidiary, Datamax Corp. with headquarters in Dallas, Texas. Datamax Corp. offers a computerized rating and billing service exclusively designed for the Motor Freight Industry. A Univac 490 Real-Time Computer system is programmed to answer rate inquiries and to give motor carriers instantaneous rates, extensions and totals on a standardized freight bill. System details were developed cooperatively with communications and equipment specialists.

The DATAMAX program also includes a systemwide computer message switching network, comprehensive revenue accounting and statistical reports for the motor freight carriers. Charges are planned on a "per freight bill" or "per inquiry" basis, with the basic reports and message switching furnished without additional charge as part of the Datamax service.

Initial Datamax operation is being developed in the southwestern area of the United States as a result of two years of preliminary studies and surveys conducted by Univac, the Southwestern Motor Freight Bureau, southwestern motor freight carriers, and communications equipment companies. A national network of Datamax centers to service all motor freight carriers is planned. At that time, Datamax service will contain freight rates and tariffs for use by general commodity carriers throughout the United States. (For more information, circle 35 on the Readers Service Card.)

HONEYWELL EDP OPENS THREE NEW EDUCATION AND COMPUTING CENTERS

Three new education and computing centers were opened in mid-October by the electronic data processing division of Honeywell Inc., Wellesley Hills, Mass. The centers, initially equipped with H-200 small-scale business computer systems, are part of the Chicago, Detroit, and Washington, D. C. branch offices of Honeywell EDP's marketing organization. Similar centers were established earlier this year in New York City and Los Angeles.

The new centers have been opened to increase Honeywell's customer support efforts, to provide additional field systems for hardware and software demonstrations for prospective customers, and to augment branch office training facilities for field service, operating and sales personnel.

NEW COMPUTER CENTER FORMED AT COLORADO SCHOOL OF MINES

Formation of a new Computer Center at the Colorado School of Mines has been announced. The center, built around a $150,000 high-speed digital computer facility, will make it possible for faculty members and graduate students to do, on campus, work which formerly had to be taken elsewhere. The equipment, a CDC 8090 computer system, will be leased from Control Data Corporation. Dr. A. Raymond Jordan, Dean of the Graduate School, said, "The computer is becoming a basic engineering tool with which every student must be familiar."

Graduate students will use the facilities in graduate courses as well as research. Undergraduates in mineral engineering and science programs will make extensive use of the computer in several courses, including Plane Surveying and Numerical Methods for Digital Computers; Applied Operations Research and others.

The Control Data Corporation 8090 computer system includes the central processor, a card reader, printer, tape controller and two magnetic tape handlers.

EDUCATION NEWS

COMPUTER SYSTEMS INSTITUTE CHOSEN FOR TRAINING OF BLIND COMPUTER PROGRAMMERS

Qualified blind persons can now be trained as computer programmers, a field that formerly was considered open only to sighted persons. Dr. Norman Yoder, Commissioner, Pennsylvania State Office for the Blind and Mr. Ralph Beistline, Industrial Consultant for the Office for the Blind, announced that after two years of planning, the Computer Systems Institute of Pittsburgh has been chosen as a training facility for the blind. In addition, the Association for Computing Machinery has visited and investigated the school, and has sanctioned it for the training of programmers who are blind. It is the only school of its kind in the nation that has been so sanctioned.

At present, it is estimated that there are only about 25 to 30 blind programmers in the nation out of an estimated 45,000. These are mostly scientists who have acquired a knowledge of computers in universities or industrial concerns. In contrast to the national total of 25 to 30, two already have been graduated from the Computer Systems Institute, and a special class of eleven blind students started training as programmers at the Institute last September.

The blind are uniquely qualified for computer programming. They possess intense powers of concentration, which is essential to a computer programmer. In addition, simply to exist, blind people must possess well-organized and "logical" minds. Daniel W. Christian, Director of Education for the Computer Systems Institute, points out that "Blind people actually program their lives the same way

we program computers. Everything they do must be rigidly systematized, otherwise there would be chaos. Things that are very simple for sighted people require careful programming by a blind person, things like dressing, preparing a meal, brewing a cup of coffee, or getting around town. A qualified blind person takes to programming naturally, because that's the way he has learned to think and live."

Entrance requirements are: a high school diploma, ability to read and write Braille and script, and/or type, a satisfactory grade on the Programmer's Aptitude Test that is administered to all prospective students, and sufficient maturity to accept the spirit of competition that he will be put to.
(For more information, circle 36 on the Readers Service Card.)

SUI DEPOSITORY FOR IOWA PUBLIC OPINION POLLS

Some 25,000 IBM cards, reflecting opinions and attitudes of Iowans on topical issues during the past six years, are being transferred to the State University of Iowa to serve as a resource for faculty and student research. The cards were donated by the Iowa Poll of the Des Moines Register and Tribune and will be kept in the Laboratory for Political Research in SUI's Department of Political Science.

Professor Donald Johnson, chairman of the Department of Political Science says that the data will be invaluable for research and teaching, and particularly helpful as a source of historical information for analysis of Iowa's political history. Most of the information is on political issues and personalities.

The Laboratory for Political Research was established in 1962 to house modern equipment and data to assist faculty and students in research and training. Data stored in the laboratory include election and interview material, and national political surveys.

COMPUTERS AT YALE UNIVERSITY

The Yale University Computer Center has put into operation a new system linking together two high-speed computers — the IBM 7040 and IBM 7094. The system, one of the most advanced at any university, will solve half the problems fed into it in 12 seconds or less, with additional waiting time being consumed by clerical routine.

Before the installation of the IBM Direct Coupled System, an IBM 709 had been running 24 hours a day, 7 days a week trying to keep up with demand. The changeover points up the importance of the computer in a modern university where researchers not only in the sciences but in the arts, in music, and linguistics, have been waiting in line to use the device. Users often had to wait anywhere from six hours to two days to obtain results of their programs.

The new system will be able to handle a normal day's work in a few hours, even though use of the Computer Center is expected to increase about 430 per cent this year. The Center will remain open from 8:30 a.m. until 1 a.m. the next day, however, for the convenience of students and faculty who must work at night.

The reason for the immediate surge in computer use is twofold — use of computers is increasing rapidly at Yale because programs are being expanded; and many programs now being carried out at other computer installations will be transferred to Yale.

Besides the Direct Coupled System, the Center will retain three smaller computers for use on less complex problems, and for teaching programming and computer science. These are an IBM 1401, and IBM 1620, and an IBM 610. The 709 computer has been put in storage.

The growth of computer use at Yale has not been confined to the Computer Center. The departments of Industrial Administration and Engineering and Applied Science have their own 1620's, while the Physics Department has a Digital Equipment Corp. PDP-1 and is planning to get another. Several departments that are heavy users of computer facilities have their own card punches and sorters. The office of the University treasurer has an IBM 1401 to process records, while another 1401 will be installed in the new Laboratory of Epidemiology and Public Health at the School of Medicine this month.

For the future, there is the possibility of remote input stations in various departments linked to the Center, so that users could communicate with the DCS without leaving their offices. A proposal is being studied to tie in the 1401 computer at the Medical School to the Center so that it can be used as a remote station. Another linking arrangement that would tie the DCS to the control computer at the University's Nuclear Structure Laboratory also is being considered.

Although scientists and engineers are naturally the Center's biggest customers, the computers are being applied to some less obvious areas of scholarship, including art, the humanities, music, even philosophy. Some of these projects include studies of theory proving in philosophy, statistical investigations in art and music, a computer analysis of musical sounds, and a comparison of Polynesian languages. The Graduate School is studying possible uses for the computers in the humanities, while the Medical School Library is cooperating with Harvard and Columbia in developing a high-speed computer system to replace cumbersome card catalogues.

SOFTWARE NEWS

14 IBM COMPUTERS NOW COMPATIBLE WITH SYSTEM/360

IBM Corporation, White Plains, N.Y., has announced compatibility features which enable virtually all computer programs written for the IBM 1410, 7010, 7040, 7044, 7070, 7074, 7080, 7090, 7094, 7094II and 709 data processing systems to be executed on System/360. Features which make the 1401, 1440 and 1460 computers compatible with System/360 were previously announced.

Users will be able to plan for an economical and orderly transition to System/360. The user will be able to execute existing programs by using the new features at the same time he is developing new programs which take full advantage of System/360's capabilities. In addition, he will not have to rewrite infrequently used programs.

Read-only storage is coupled with programming systems techniques. This makes it possible to add a complete instruction set — representing a currently installed system — to the organization of a particular System/360 configuration.

The procedure is known as emulation. It yields performance beyond the range of the simulator technique which relies on programming alone to provide compatibility. Read-only storage enables operation codes of a 1410, for example, to be translated into electronic signals understood by System/360. These signals trigger the same operations that would occur in the 1410. The new emulators will produce identical results as current systems programs except when the original program contains such things as unusual time dependencies or error conditions.

Performance of each emulator will depend on the mixture of instructions and the system being emulated. Performance will range from a minimum of one-half the overall system speed of the 7080, when its programs are emulated on the System/360 Model 62, to as much as twice the speed of the 1410, when its programs are emulated on System/360 Model 50.

The first emulator is scheduled to be delivered in the fourth quarter of 1965. The others are scheduled for delivery either in the first or second quarter of 1966.
(For more information, circle 39 on the Readers Service Card.)

"OFF-THE-SHELF" COMPUTER PROGRAM SYSTEM

A new off-the-shelf system, known as CPSS (Common Programming Support System), will be able to cut present program production costs by 70 per cent or more, according to Dushan Boreta, a member of the Technical Staff of System Development Corporation's (SDC) Washington Operations Center, Falls Church, Va. With CPSS, program production systems costs are expected to run less than $3 per instruction (current individually tailored systems average approximately $9 per instruction for program production costs).

The SDC-developed system is both machine-independent and procedure-independent. It is applicable to a large class of computers and is adaptable to most medium-scale and all large-scale computer systems. Using CPSS, it is possible for programmers with little or no knowledge of the computer they're using to program and code-check computer programs.

CPSS has been programmed in a subset of the JOVIAL language, comprising approximately 36,000 lines of code of which less than 5 per cent is machine assembly language code.

The system has been separated logically into eight subsystems corresponding, in general, to the common program production functions. These subsystems are comprised of computer programs which further are partitioned functionally into subroutines.

Mr. Boreta noted that as a program production system, CPSS (1) provides many functions desirable for use in construction the computer programs and computer program systems, (2) provides a higher order language for all tasks and functions related to computer program production, (3) contains design features that provide for the effective production of computer programs and the efficient utilization of the computer, and (4) contains design features that afford the rapid and inexpensive installation of CPSS.
(For more information, circle 43 on the Readers Service Card.)

MI/DAC PROCESSING

MI/DAC (Management Information/Decision and Control) is a new management system for contractor and truck and car fleet executives. It was developed and named by Mobil Oil Company. Through this program Mobil offers its many fleet customers a specific plan for gathering, correlating and interpreting maintenance and operating facts for improved management decision and control.

A cooperative arrangement between Mobil Oil Company and the Service Bureau Corporation will provide data processing for MI/DAC in SBC data processing centers throughout the United States.

Under the system, Mobil customers desiring to use MI/DAC will provide SBC offices with basic information on equipment description, fuel and oil consumption and maintenance activities. From this, SBC can provide, on IBM data processing equipment, a variety of periodic reports such as a monthly maintenance-cost-by-vehicle report, repairs by type and terminal, etc.
(For more information, circle 38 on the Readers Service Card.)

AUTOMATION

AUTOMATIC BOOK COMPOSITION BY COMPUTERS

ROCAPPI, Inc., at its plant near Swarthmore, Pa., has developed a computer program which electronically prepares books and magazines for printing in a fraction of the time required by conventional methods. ROCAPPI (an acronym for Research on Computer Applications in the Printing and Publishing Industries) operates a computer service center for graphic arts applications.

Employing RCA Systems experts, ROCAPPI has spent more than a year developing the complex program for the RCA 301 computer that permits it to handle any line length or type face, select the proper head, eliminate widows, and even provide for white space to balance out the columns and pages. The computer has been programmed to process a 300-page book (50 lines per page) in about three hours — a job that would take a printer nearly a month to do by hand working 12 hours a day, six days a week.

The ROCAPPI system is a 4-phase operation. Before any type is set, the customer's taped manuscript is justified and hyphenated by the computer and stored on magnetic tape. A high-speed printer simultaneously prints out the manuscript for proofing and alterations. (Storage of the book manuscript on magnetic tape, one of the key features of the method, enables the publisher to make necessary copy revisions and update the tape for future use before any type is cast.) The third step involves pagination or page makeup with the computer processing the corrected tape at 500 lines per minute. The completely coded tape containing the final manuscript is then generated by a paper tape punch and returned to the customer for typesetting.

The ROCAPPI operation, now in commercial production, is capable of inputting from any type of tape perforating device and outputting to any automated composing machine. The system is geared mainly for film typesetting, such as Linofilm, ATF and Photon. John W. Seybold, President of ROCAPPI, Inc., said he prefers film to hot metal simply because certain photo-typesetting devices have the capacity to handle complete pages of composition from

tape in a variety of type sizes and faces.

While the RCA 301 has been used for computerized typesetting by some leading newspapers across the country, Mr. Seybold explained that the problems of book composition are much more demanding and the economies to be gained are in ROCAPPI's pagination and correction techniques, not so much in hyphenation and justification.
(For more information, circle 40 on the Readers Service Card.)

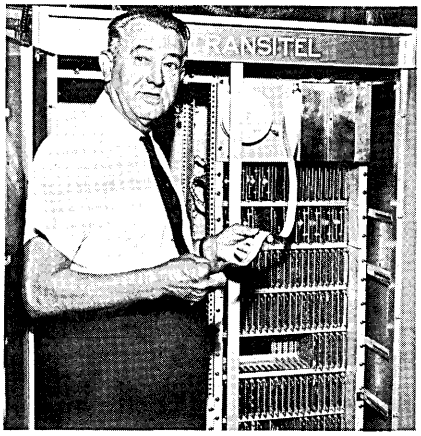
AUTOMATIC METER READING

A field trial of the Transitel automatic remote meter reading system in Owosso, Mich., was termed "successful" by its three sponsors, the Consumers Power Company of Michigan, the General Telephone Company of Michigan (a subsidiary of General Telephone & Electronics Corp.) and Transitel Corporation, Paramus, N.J. A 16-month trial program was carried out in which thirty-eight residential gas and electric meters were read automatically by telephone. Results of the program indicated the system was accurate within two per cent of the actual energy consumed by the customer's billing meter and that its operation was 98 per cent reliable.

The Transitel system used in the Owosso test was activated by a special code pulse which was transmitted over the telephone customer's line. A scanning device within the meter quickly reads the meter dials electromechanically and reports the data to an electronic tape perforating machine. During the field test, direct read-out of the data stored on the perforated tape was transmitted over telephone lines to the Consumers Power headquarters in Jackson, Mich., some 70-miles from the test site, providing information for customer billing.

The over-all meter reading process required less than five seconds per meter during the test and did not disturb conventional telephone conversations. Test meters were read during the early-morning hours to minimize "busy" phone lines. If a "busy" line was encountered, the equipment skipped over that particular line and later was returned to it manually to read the meter dials.

Built-in safeguards prevented interruption of telephone conversations, and other controls prevented the equipment from actually ringing the customer's telephone. More than 11,000 test calls were made for meter-reading purposes during the field trial with no instances of customer interruption or accidental ringing reported.



— Transitel meter data receiver. Mr. Leo Duffy of the Consumers Power Company holds 8-level punched paper tape on which the readings are recorded.

GT&E said the field trial was carried out as part of a continuing program to expand and improve communications services. However, the company emphasized that extensive development work as well as market studies would be required before any commercial meter-reading system would be considered feasible.

AUTOMATED CREDIT CONTROL

An automated credit-checking service has been established by Hooper-Holmes Bureau, Inc., Morristown, N.J., a nationwide commercial reporting firm. The service, called Credit Index, was specifically designed to level the $30 million bad debt loss currently absorbed by the mail order industry each year. It provides for the transmission of customer listings and similar credit files by telephone from distant collection points directly to the firm's data processing center in Morristown. There the information is screened automatically by a computer and results returned to the inquiring company within 24 hours The system is the product of a pilot study conducted by Hooper-Holmes in cooperation with computer consultants and a number of mail order firms.

Key facilities in the system are Bell Telephone System Data-Phone data sets, which enable the transmission of information on punched cards between distant transmission offices and the firm's computer center over regular phone lines. At headquarters, a Honeywell-400 computer system, containing credit delinquency data gathered from the records of major mail order houses throughout the country, evaluates the inquiries.

The master file has at present approximately 2,000,000 entries, representing in dollar value over $34 million in credit delinquency. The system is now handling about 30,000 inquiries a day, and has the capability of handling 300,000 inquiries daily.

Under present procedures, all subscribing companies deliver their new account orders in punch card form to the transmission offices (presently located in New York and Chicago). After a connection is made by a regular phone call to the Morristown center, the cards are fed into a transmission device connected to the Data-Phone unit.

— After calling the firm's computer center, using the Bell System Data-Phone data set at left (top), a clerk inserts punched cards into a Honeywell transmission unit for relay over phone lines directly to the computer which runs a credit check on them. Within hours the originating office receives back information (bottom) on persons identified as having a record of credit delinquency.

This information is transmitted automatically over phone lines directly into the computer which compares the incoming data with the master file and prints out names

of delinquents identified. This information is then transmitted back to the originating point within 24 hours.

In its study of credit operations, Hooper-Holmes found that delinquents follow a well-defined pattern to escape detection. By minor changes in the vowel structure of the last name, or by substitution of various names, they can successfully defeat most alphabetical filing systems. To overcome this problem, the Index's computer system has been programmed to search orders by street address or box number first, next by city and state, and finally by name. The computer then focuses on money owed to one or more companies, printing the name, address, date and dollar amount due.

While initially designed for direct mail merchandisers, such as book and record clubs, the Index has been found to be of considerable value to other types of businesses as well because of the "delinquency crossover" factors encountered in almost all credit operations. A significant number of the same delinquents are found in the files of credit card holders as in direct mail and catalog credit programs. For this reason, a group of major oil companies now is testing the service as a means of reducing losses on credit card holders. In addition, the U. S. Post Office is using the service and may contribute its records on mail fraud to the file. (For more information, circle 41 on the Readers Service Card.)

PEOPLE OF NOTE

H. H. AIKEN RECEIVES HARRY GOODE MEMORIAL AWARD

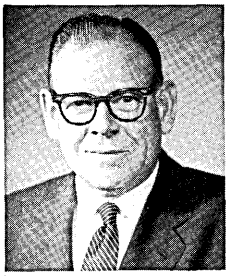
First presentation of the Harry Goode Memorial Award, established by the American Federation of Information Processing Societies to honor a distinguished leader in data processing was made during the conference luncheon at the 1964 Fall Joint Computer Conference.

Recipient of the initial award is Dr. Howard H. Aiken of Fort Lauderdale, Fla., a professor emeritus of Harvard University, long identified with computer developments.

The citation announced by Sam Levine of The Teleregister Corp., Stamford, Conn., chairman of the AFIPS Award Committee, reads:

"The award is being given to Howard Aiken for original contributions to the development of the automatic computer. In particular, for development of the Harvard MARK I, the first large-scale general purpose automatic digital computer ever put into operation, and for his continuing work and inspiration to the field of digital computers over a period of two decades, as an engineer and as a teacher."

WALTER W. FINKE ELECTED CHAIRMAN

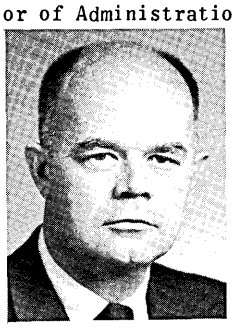


Walter W. Finke, president of Honeywell's Electronic Data Processing Division, has been elected chairman of the Business Equipment Manufacturers Association (BEMA). Mr. Finke was one of seven executives elected to the BEMA board at the conclusion of its 48th annual meeting.

EXECUTIVE DIRECTOR OF AFIPS IS APPOINTED

Homer G. Asmus has been appointed Executive Director of the American Federation of Information Processing Societies (AFIPS).

Mr. Asmus was formerly Director of Administration and Marketing



Manager for Auerbach Corp. Before joining Auerbach, he wa was General Manager of the New York Division of Computer Sciences Corporation. Earlier, he was with the General Electric Company for fifteen yea years, where he fulfilled various functions with GE's Computer Department.

NEW LITERATURE

INTRODUCTION TO PERT COST

The Air Force has prepared an easy-to-read introductory text to PERT Cost — the management tool developed primarily for Government defense and space programs. This tool uses programming and computers to enable planners to determine both project cost and schedule on a common basis.

Topics covered in the text include symbols and terms, work breakdown and packages, account code structure, networking, and timing and scheduling. Costing, data input and output, analysis of data, and computer operations are also described.

The publication, now available to industry, is entitled An Introduction to PERT Cost, price $2.75. Order AD 600 184 from OTS, U.S. Department of Commerce, Washington, D.C. 20230.

ITT ASSOCIATE OFFERS PERT COST MANUAL

A new text on PERT (Program Evaluation and Review Technique) has been announced by the Federal Electric Corp. (Paramus, N.J.), service associate of International Telephone and Telegraph Corp. "PERT Cost — A programmed Instruction Manual," has been prepared by Stuart M. Rothfeld and other members of Federal Electric's Special Services Department.

The 171-page volume begins with a review of basic PERT Time concepts, and continues with chapters on planning; scheduling; budgeting; control; updating plans, schedules and budgets; a review and conclusions; and a glossary. The manual is based on the programmed learning approach, specifically designed for self-study. The student actively participates in the learning process by answering questions, filling in blanks, giving opinions, etc. Responses are either verified or corrected before proceeding to the next step.

The procedures and reports presented in the text are compatible with those described in the U. S. Air Forc PERT series. The manual is available at $6.50 per copy. (For more information, circle 42 on the Readers Service Card.)

MONTHLY COMPUTER CENSUS

The number of electronic computers installed or in production at any one time has been increasing at a bewildering pace in the past several years. New vendors have come into the computer market, and familiar machines have gone out of production. Some new machines have been received with open arms by users — others have been given the cold shoulder.

To aid our readers in keeping up with this mushrooming activity, the editors of COMPUTERS AND AUTOMATION present this monthly report on the number of general purpose electronic computers of American-based companies which are installed or on order as of the preceding month. These figures included installations and orders outside the United States. We update this computer census monthly, so that it will serve as a "box-score" of progress for readers interested in following the growth of the American computer industry, and of the computing power it builds.

Most of the installation figures, and some of the unfilled order figures, are verified by the respective manufacturers. In cases where this is not so, estimates are based on information in the market research reference files of COMPUTERS AND AUTOMATION. The figures are then reviewed by a group of computer industry cognoscenti.

Any additions, or corrections, from informed readers will be welcomed.

AS OF NOVEMBER 10, 1964

NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS**
Addressograph-Multigraph Corporation	EDP 900 system	Y	$7500	2/61	11	1
Advanced Scientific Instruments	ASI 210	Y	$2850	4/62	21	1
	ASI 2100	Y	$3000	12/63	5	2
	ASI 6020	Y	$2200	4/65	0	1
	ASI 6040	Y	$2800	7/65	0	1
Autonetics	RECOMP II	Y	$2495	11/58	64	X
	RECOMP III	Y	$1495	6/61	20	X
Bunker-Ramo Corp.	TRW-230	Y	$2680	8/63	11	3
	RW-300	Y	$5000	3/59	40	X
	TRW-330	Y	$5000	12/60	30	X
	TRW-340	Y	$7000	12/63	11	18
	TRW-530	Y	$6000	8/61	23	3
Burroughs	205	N	$4600	1/54	62	X
	220	N	$14,000	10/58	42	X
	E101-103	N	$875	1/56	122	X
	E2100	Y	$535	8/64	55	985
	B100	Y	$2800	8/64	10	28
	B250	Y	$4200	11/61	95	16
	B260	Y	$3750	11/62	70	170
	B270	Y	$7000	7/62	87	27
	B280	Y	$6500	7/62	96	40
	B370	Y	$8400	7/65	0	16
	B5000	Y	$16,200	3/63	37	20
	B5500	Y	$35,000	3/65	0	3
Clary	DE-60/DE-60M	Y	$525	2/60	255	0
Computer Control Co.	DDP-19	Y	$2800	6/61	3	X
	DDP-24	Y	$2500	5/63	38	22
	DDP-116	Y	$900	2/65	0	2
	DDP-224	Y	$3300	12/64	0	5
Control Data Corporation	G-15	N	$1000	7/55	320	X
	G-20	Y	$15,500	4/61	26	X
	160*/160A/160G	Y	$1750/$3500/$12,000	5/60;7/61;3/64	383	21
	924/924A	Y	$11,000	8/61	28	3
	1604/1604A	Y	$38,000	1/60	60	X
	3100	Y	$7350	12/64	0	12
	3200	Y	$12,000	5/64	13	60
	3300	Y	$15,000	7/65	0	6
	3400	Y	$25,000	11/64	0	18
	3600	Y	$58,000	6/63	25	20
	3800	Y	$60,000	5/65	0	12
	6600	Y	$110,000	8/64	1	4
Digital Equipment Corp.	PDP-1	Y	Sold only about $120,000	11/60	54	2
	PDP-4	Y	Sold only about $60,000	8/62	48	7
	PDP-5	Y	Sold only about $25,000	9/63	75	5
	PDP-6	Y	Sold only about $300,000	10/64	1	8
	PDP-7	Y	Sold only about $45,000	11/64	1	10
	PDP-8	Y	Sold only about $18,000	4/64	0	14
El-tronics, Inc.	ALWAC IIIE	N	$1820	2/54	24	X
Friden	6010	Y	$600	6/63	180	110
General Electric	205	Y	$2900	10/64	2	15
	210	Y	$16,000	7/59	60	X
	215	Y	$5500	11/63	30	15
	225	Y	$7000	1/61	120	2
	235	Y	$10,900	12/63	25	18
	415	Y	$5500	5/64	18	105
	425	Y	$7500	7/64	7	43
	435	Y	$12,000	10/64	1	22
	455	Y	$18,000	6/65	0	8
	465	Y	$24,000	6/65	0	4
	625	Y	$50,000	2/65	0	10
	635	Y	$65,000	12/64	0	12
General Precision	LGP-21	Y	$725	12/62	135	50
	LGP-30	semi	$1300	9/56	430	3
	RPC-4000	Y	$1875	1/61	98	1

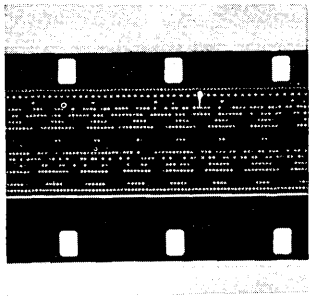
NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS**
Honeywell Electronic Data Processing	H-200	Y	$4200	3/64	135	580
	H-300	Y	$3900	7/65	0	7
	H-400	Y	$5000	12/61	103	7
	H-800	Y	$22,000	12/60	62	17
	H-1400	Y	$14,000	1/64	9	5
	H-1800	Y	$30,000	1/64	4	7
	H-2200	Y	$11,000	10/65	0	20
	DATAmatic 1000	N	---	12/57	4	X
H-W Electronics, Inc.	HW-15K	Y	$490	6/63	3	4
IBM	305	N	$3600	12/57	500	X
	360/30	Y	$4800	7/65	0	2000
	360/40	Y	$9600	7/65	0	650
	360/50	Y	$18,000	9/65	0	350
	360/60	Y	$35,000	10/65	0	100
	360/62	Y	$50,000	11/65	0	40
	360/70	Y	$80,000	10/65	0	180
	650-card	N	$4000	11/54	380	X
	650-RAMAC	N	$9000	11/54	70	X
	1401	Y	$4500	9/60	7500	700
	1401-G	Y	$1900	5/64	320	750
	1410	Y	$12,000	11/61	440	145
	1440	Y	$1800	4/63	1125	400
	1460	Y	$9800	10/63	800	700
	1620 I, II	Y	$2500	9/60	1520	20
	701	N	$5000	4/53	1	X
	7010	Y	$19,175	10/63	53	38
	702	N	$6900	2/55	3	X
	7030	Y	$160,000	5/61	6	X
	704	N	$32,000	12/55	40	X
	7040	Y	$14,000	6/63	52	32
	7044	Y	$26,000	6/63	45	12
	705	N	$30,000	11/55	82	X
	7070, 2, 4	Y	$24,000	3/60	525	35
	7080	Y	$55,000	8/61	70	2
	709	N	$40,000	8/58	11	X
	7090	Y	$64,000	11/59	45	2
	7094	Y	$70,000	9/62	250	15
	7094 II	Y	$76,000	4/64	55	48
ITT	7300 ADX	Y	$18,000	7/62	9	6
Monroe Calculating Machine Co.	Monrobot IX	N	Sold only - $5800	3/58	155	X
	Monrobot XI	Y	$700	12/60	435	165
National Cash Register Co.	NCR - 304	Y	$14,000	1/60	26	X
	NCR - 310	Y	$2000	5/61	46	1
	NCR - 315	Y	$8500	5/62	240	120
	NCR - 390	Y	$1850	5/61	700	170
Philco	1000	Y	$7010	6/63	15	0
	2000-210, 211	Y	$40,000	10/58	19	2
	2000-212	Y	$52,000	1/63	5	2
	2000-213	Y	$68,000	6/65	0	0
Radio Corp. of America	Bizmac	N		-/56	3	X
	RCA 301	Y	$6000	2/61	525	100
	RCA 3301	Y	$11,500	7/64	8	28
	RCA 501	Y	$14,000	6/59	27	3
	RCA 601	Y	$35,000	11/62	4	1
Raytheon	250	Y	$1200	12/60	160	14
	440	Y	$3500	3/64	6	8
Scientific Data Systems Inc.	SDS-92	Y	$900	12/64	0	20
	SDS-910	Y	$2000	8/62	85	55
	SDS-920	Y	$2700	9/62	65	5
	SDS-925	Y	$2500	12/64	0	8
	SDS-930	Y	$4000	6/64	8	24
	SDS-9300	Y	$7000	10/64	1	6
UNIVAC	I & II	N	$25,000	3/51 & 11/57	32	X
	III	Y	$20,000	8/62	78	25
	File Computers	N	$15,000	8/56	23	X
	Solid-State 80, 90, & Step	Y	$8000	8/58	328	X
	Solid-State II	Y	$8500	9/62	42	2
	418	Y	$11,000	6/63	7	8
	490	Y	$26,000	12/61	37	18
	1004	Y	$1900	2/63	2080	600
	1050	Y	$8000	9/63	95	235
	1100 Series (except 1107)	N	$35,000	12/50	14	X
	1107	Y	$45,000	10/62	21	5
	1108	Y	$50,000	7/65	0	12
	LARC	Y	$135,000	5/60	2	X
				TOTALS	22,887	10,493

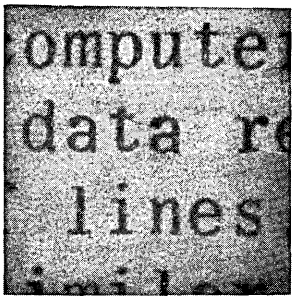
X = no longer in production.

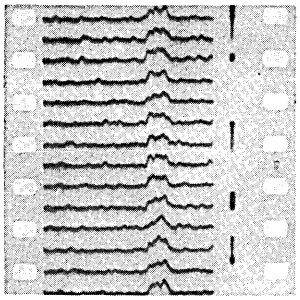
* To avoid double counting, note that the Control Data 160 serves as the central processor of the NCR 310. Also, many of the orders for the 7044, 7074, and 7094 I and II's are not for new machines but for conversions from existing 7040, 7070 and 7090 computers respectively.

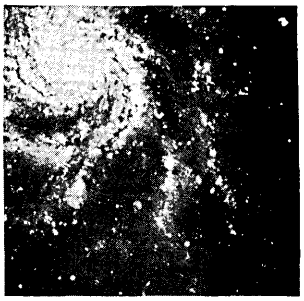
** Some of the unfilled order figures are verified by the respective manufacturers; others are estimated and then reviewed by a group of computer industry authorities.

5000 POINTS PER SECOND









Information International, Inc., Cambridge, Mass., has developed a fully automatic Programmable Film Reader to read scientific or engineering data recorded on photographic film, paper, or similar media. Readout can be had on IBM-compatible magnetic tape, or in the form of numerical print-outs, graphs or plots, or visual CRT displays. This article describes the system and its applications.

THE FILM READING SYSTEM Using 16 or 35 mm. film as a medium for recording scientific data has many advantages. Because of the small input power and limited storage space that are required, it is particularly suitable for recording data produced by recording devices in space vehicles or aircraft; by wind and current measuring devices; and by other devices of similar nature.

However, reading or transcribing the data from film once it has been recorded has presented many problems in the past. It has generally been necessary for an analyst or researcher to read the data visually from the film and transcribe it by hand. This has been found to be a time-consuming, laborious and relatively expensive operation. In some cases, semi-automatic film reading devices are available. However, these can read only about 5000 points per day and require a human operator.

Information International, Inc., of Cambridge, Mass., has now developed a completely automatic computer film reading system which can read film at the rate of approximately 5000 points per second. Scientific data recorded on 16 or 35 mm film can be read completely automatically and printed out in the form of numerical listings or recorded on magnetic tape for further processing and analysis. The film reading system is based on three major elements: A general purpose digital computer, together with a visual display scope; a film reading device; and computer programs for using the computer and film reader.

THE FILM READING PROCESS The film reading process involves the scanning of film by a rapidly moving light point on the visual display scope. The output of this scanning operation is detected by a photo-sensitive device in the film reader and relayed to the digital computer for further processing and analysis. In addition to translating the data itself into a more desirable format, the film reading system can also furnish additional summaries and analyses of the data as may be required.

EXTREMELY FLEXIBLE SYSTEM The flexibility of the film reading system in two respects should be emphasized. First, almost any format of data on film can be read, with appropriate modifications to the basic computer program. This includes data represented in the form of lines, graphs (e.g., radar pulses), points, and other similar forms of data. Second, almost any type of desired output may be obtained once the basic data is obtained from the film. Forms of output which are available include the following:

(i) A print-out or listing of data on paper.

(ii) A record of the data on magnetic tape.

(iii) Visual representations of data. These may take the form of a continuous graph (using a digital x-y plotting device). Or they may take the form of photographs — still or motion — of scope displays.

In addition to data recorded on film, data recorded on paper can also be read by means of the film reading system.

SYSTEM APPLICATIONS

(i) Analysis of data produced by oscillographs or other types of graphic recorders

(ii) Tracking and analysis of objects for which motion pictures are available (e.g., missile tracking studies)

(iii) Reading of astronomical or astrophysical data recorded on film (e.g., analysis of stellar configurations)

(iv) Reading photographs of cloud chambers, bubble chambers, and spark chambers

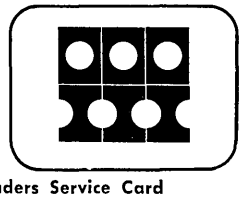
(v) Counting of particles (such as blood cells or bacteria) in photographs

(vi) Character recognition

To the best of our knowledge, Information International is the only commercial firm supplying fully automatic computer film reading systems. We do essentially two things. We develop and manufacture film reading systems for clients to use at their own facilities (as, for example, in the case of radar film reading systems we have developed for Lincoln Laboratory and the U. S. Air Force). And we furnish services for reading films which are sent to us for processing (as in the case of oceanographic current meter film).

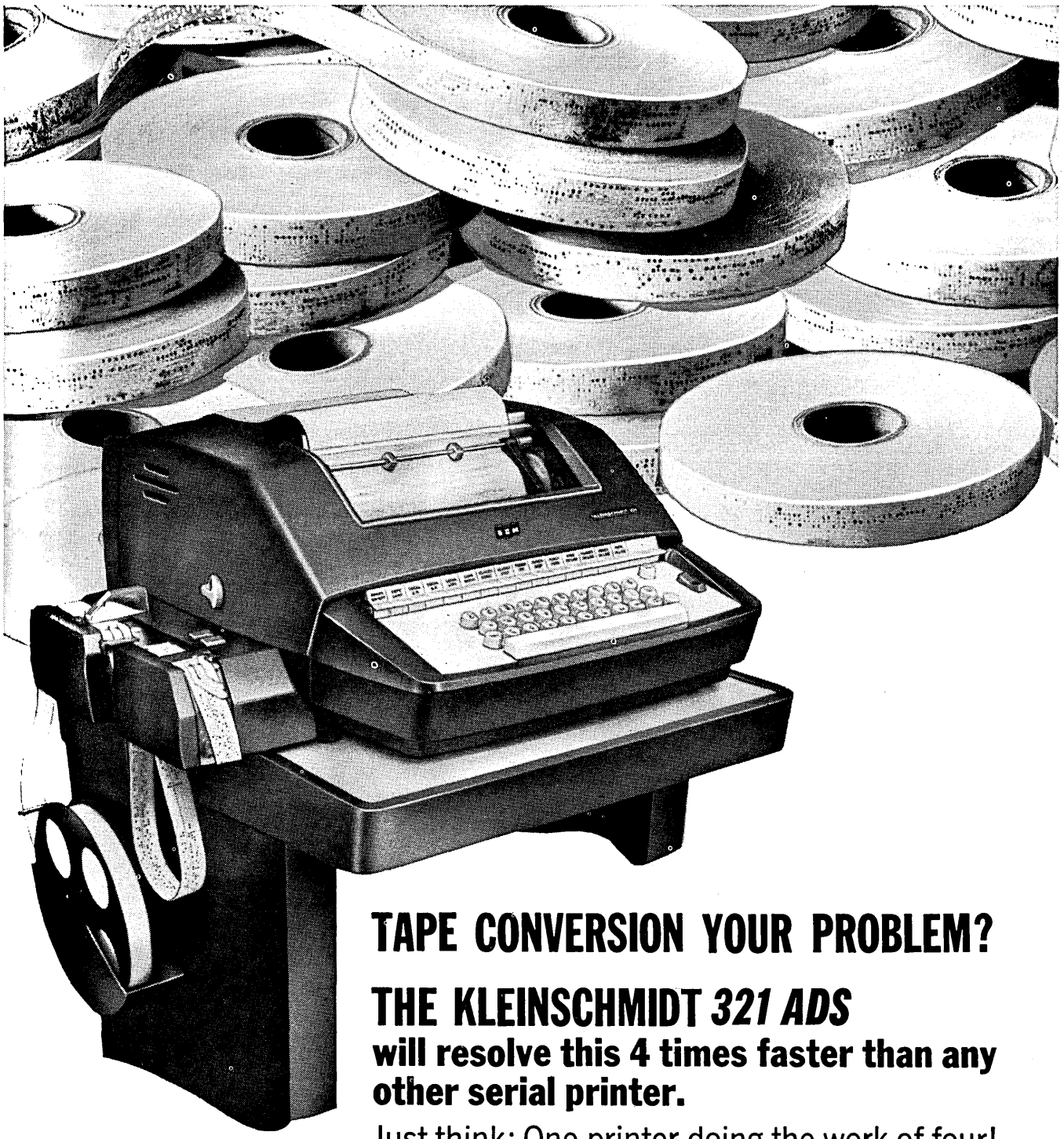
III is able to supply equipment to satisfy a variety of customer needs. Customer options include transmittive or reflective input media, binary density decision, multiple level density measurement, local contrast measurement, and various degrees of system resolution.

We can supply a completely set-up, ready-to-run "turnkey" film reading system (including a medium price, general purpose computer). Or we can provide the basic film reading device, appropriate computer programs, or technical consulting to those planning to develop their own film reading systems. The film reading device itself may be used with specialized film reading computer programs, such as those we have developed, which make use of highly sophisticated filtering techniques to minimize the effect of "noise" (dirt, scratches, general illegibility) on the film. As a result, the film reading system is capable of reading film in relatively poor condition. Or, where the quantity of data on film is not great enough to justify investment in a film reading system, I.I.I. can furnish services for reading film and transcribing data on a production basis. A brochure describing the film reader and film reading systems we have developed is available on request.



INFORMATION INTERNATIONAL INCORPORATED
200 SIXTH ST., CAMBRIDGE, MASS.

Circle No. 20 on Readers Service Card



TAPE CONVERSION YOUR PROBLEM?

THE KLEINSCHMIDT *321 ADS*
will resolve this 4 times faster than any other serial printer.

Just think: One printer doing the work of four!

At 400 words per minute, the KLEINSCHMIDT Model 321 provides hard copy from your data tapes four times faster than existing equipment. ■ "On-line" or "off-line," the Model 321 provides complete facilities for local tape preparation — tape duplication — hard-copy print-out. ■ The use of electronic control in the Model 321 Automatic Data Set insures reliable operation in any data-processing or communications system. ■ For information on the Model 321 ADS or other KLEINSCHMIDT Electronic Data Communications equipment, write: KLEINSCHMIDT Division of SCM Corp., Lake-Cook Road, Deerfield, Ill.

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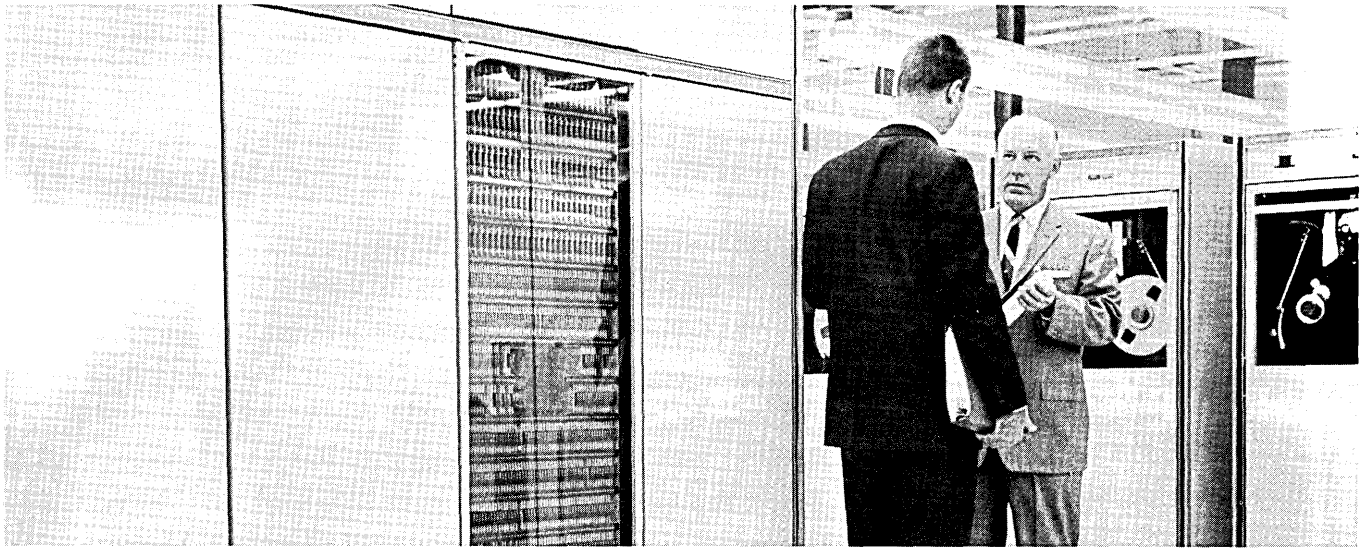
SCM® KLEINSCHMIDT
DIVISION OF SCM CORPORATION

EXTEND YOUR CAREER EXTEND YO



Help us extend our capabilities

A large-scale expansion in computer and data systems development at Collins has opened many ground-floor opportunities for hardware and hardware-oriented people. Positions are in Cedar Rapids, Iowa, and Newport Beach, California.

SENIOR TECHNICAL ADVISOR

A BSEE degree is required, as well as 10 years' experience in design and development of digital hardware, including circuits, memory, logic and systems, and packaging. He must be hardware-oriented but also have programming experience and knowledge. He will serve on the senior technical staff to the assistant vice president and director of the Data Systems Engineering Division to advise in all aspects of computer hardware and system design and development.

DIAGNOSTIC PROGRAMMERS

These men will have a BSEE degree and possibly a master's degree, as well as 2 years' minimum experience in writing factory and/or field diagnostic programs for digital computer hardware. Vast knowledge of digital equipment organization is necessary. These men will write diagnostic programs for factory test and for field maintenance of digital equipment. They will formulate factory and field test philosophy and procedures.

DIGITAL CIRCUIT DESIGNERS

At least 2 years' experience in development of high-speed digital logic circuits is required, as is a BSEE degree. Work includes development of state-of-the-art, high-speed, digital logic circuits. Applications of these and microelectronic circuits to digital functions and equipment, coping with interface problems including interconnects, transmission lines, terminations, etc. are involved.

MICROPROGRAMMERS

A degree in electrical engineering or mathematics is preferred. These men should have one or more years' experience in (1) logic design, particularly arithmetic and control units and/or (2) machine language computer programming. These positions involve development of stored logic routines for advanced microprogrammed computers which execute complete, comprehensive instruction including fixed and floating point operations.

MEMORY DESIGN ENGINEERS

A BSEE degree is necessary with a master's degree desirable, along with 2-8 years' experience in core memory design and/or solid state circuit design. This includes participation in the design, specification, development and test of memory arrays and electronics for high-speed core memories.

LOGIC DESIGNERS

At least 3 years' continuous experience in computer logic design is required, as well as a BSEE degree. The area of endeavor includes the design and development of digital computer equipment.

Send complete resume in confidence to L. R. Nuss, Manager of Professional Employment, COLLINS RADIO COMPANY, Cedar Rapids, Iowa

Circle No. 22 on Readers Service Card

CLASSIFIED

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.

room for achievement at IBM®

After working as an accountant and later as a design engineer, Roderick Ward started looking for more variety. In June, 1961, he began a career as an IBM Data Processing Systems Engineer. Today he works with a wholesale distributor, a meat packer, a toy manufacturer, and an automotive parts distributor. Rod's projects have varied from sales analysis to market forecasting and inventory control.

Career Opportunity—Data Processing Systems Engineer: With a degree in Mechanical Engineering (CCNY '60), Rod Ward was well qualified to enter IBM's school for Systems Engineers in New York City. There he learned how to find data processing solutions to a variety of business and industrial problems, make systems studies, define solutions on computers, test the solutions, and assist customers in putting the solutions into effect.

Men and women who have developed an analytical approach to problems and are capable of disciplined thinking in a variety of areas will find a lifetime career in Data Processing. Degrees in Engineering, the Physical Sciences, Mathematics, Business Administration, and even Philosophy provide an excellent background for success in this dynamic new profession.

Other Career Areas: Marketing and Sales, Customer Engineering, Finance and Administration, Development, Manufacturing and Research.

IBM offers recent college graduates exciting assignments with room to move ahead. Broad education programs keep employees up to date in their fields. Personal benefits, all company-paid, are among the most liberal in industry. IBM's 20 engineering laboratories, 17 plants, and over 200 branch offices coast to coast offer a wide range of working locations.

If you seek a challenging and rewarding career, consider Data Processing Systems Engineering—or one of the other areas listed. Go to your nearest IBM branch office or write, outlining your education and interests, to: **Manager of Employment, Dept. 539Z, IBM Corporate Headquarters, Armonk, New York 10504. IBM is an Equal Opportunity Employer.**

Feel that muscle...and see why our system is the hottest contender for the title

in the bout between the two leading low cost source data automation systems!

This is how the two systems shape up!

SCM TYPETRONIC		SYSTEM "X"
30 CPS	Reading Speed	10 CPS
30 CPS	Punching Speed	10 CPS
10 CPS	Printing Speed	10 CPS
X + 40%	Throughput Speed	X
Yes	Buffered*	No
Yes	Solid State Circuitry	No
Low	Noise Level	High
Complete	Modular Construction	Limited
Yes	Variable Carbon Control	No
Today's	Styling	Yesterday's
Electronic	Computations	Electro-mechanical
Photo-Electric	Type of Reader	Mechanical

*operates during the carriage motion

SCM TYPETRONIC® 2816 AUTOMATED DATA SYSTEM

SCM TYPETRONIC® 7816 AUTOMATED DATA COMPUTING SYSTEM

For a ring-side seat to see the **better** system, send the coupon back today!

SCM CORPORATION
DATA PROCESSING SYSTEMS
410 Park Avenue, New York, N. Y. 10022

Gentlemen:

I would like to learn more about the features of SCM TYPETRONIC SYSTEMS and their applications—no cost or obligation on my part, of course.

Name .....

Title .....

Company .....

Address .....

City ..... State ..... Zip Code .....

4

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