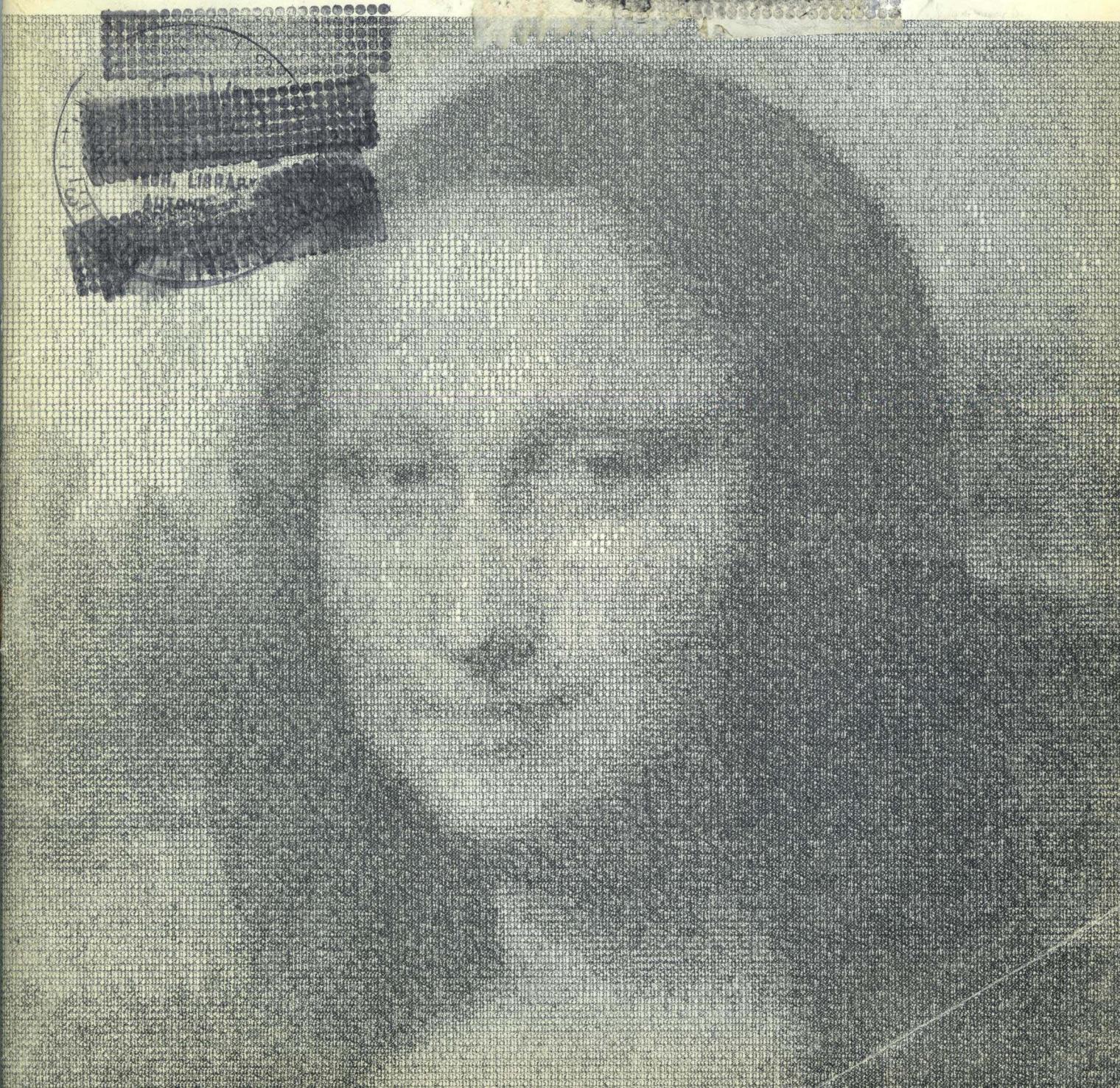
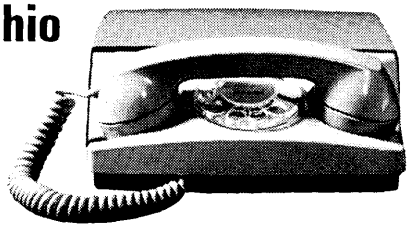
December, 1965

computers and automation

The Digital Mona Lisa



Bell System Data-Phone service clears blizzards of bits for Standard Oil of Ohio



Bell System Dataspeed* data communications service at SOHIO'S Cleveland headquarters use regular telephone lines to transmit some 14,000 heating oil orders a day to 16 truck terminals in Ohio.

During the peak cold weather season, nearly one billion bits of data a month are interchanged between Cleveland and the terminals.

At the terminals, teletypewriter machines print out delivery tickets from the tape. The tickets give the drivers complete information, even telling them how to locate fill pipes.

After delivery, the exact amount of oil received by the customer is stamped on the tickets. A punched tape of the day's deliveries is made and this tape is fed into the terminal's Dataspeed unit. The data is automatically sent back to Cleveland, where computers process the information for billing and inventory control.

SOHIO installed its data system primarily to improve profit margins on heating oil sales. The system achieved this goal as it centralized operations, reduced paperwork, speeded cash flow and improved customer service.

Consider the advantages of Bell System Data-Phone* service for your data system. One of our Communications Consultants will be happy to go over them with you in detail. Just call your Bell Telephone Business Office and ask for his services.

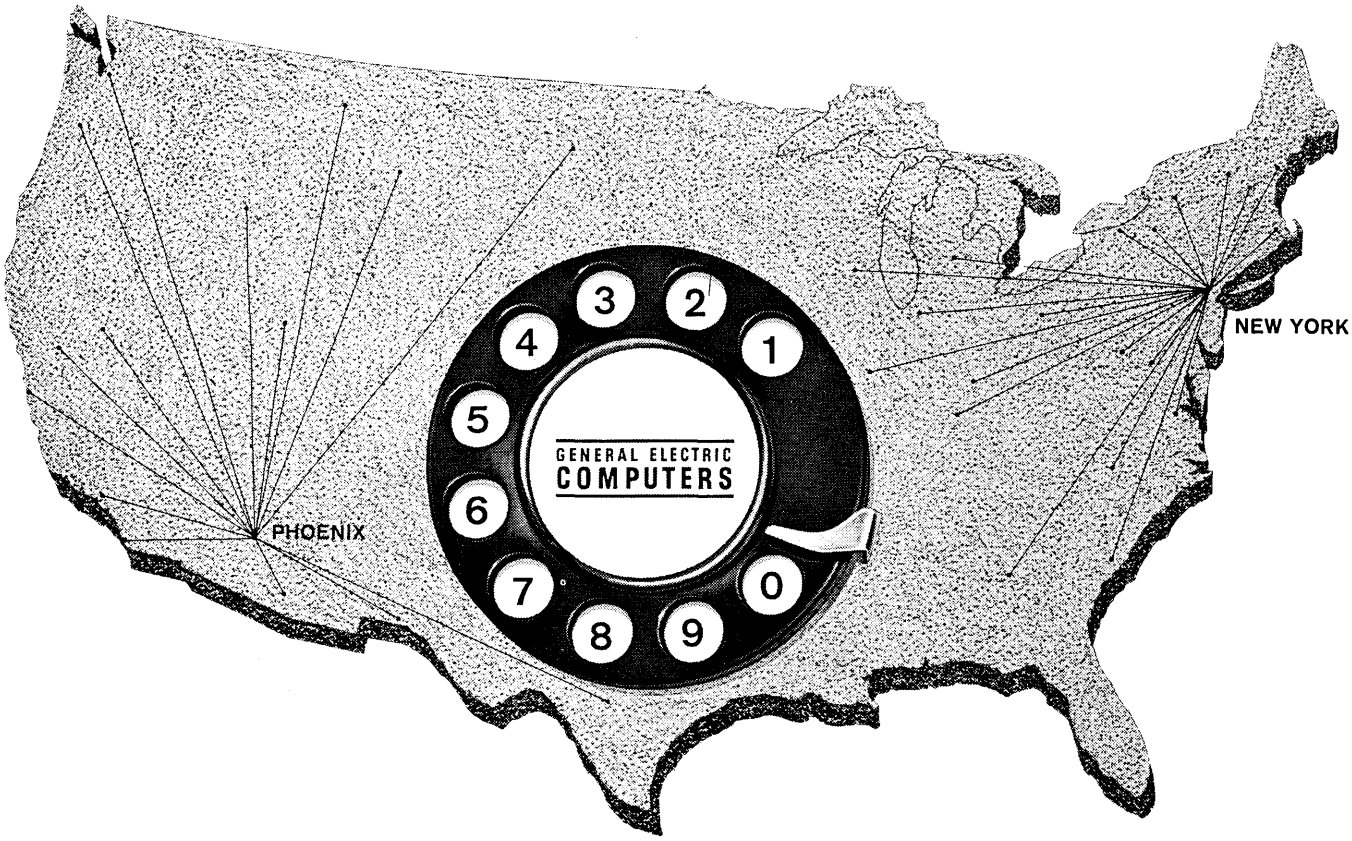
*Service mark of the Bell System

Bell System
American Telephone and Telegraph and Associated Companies

Designate No. 1 on Readers Service Card

Designate No. 2 on Readers Service Card →

Now dial G.E. for "instant computing"



New service by General Electric's Information Processing Centers gives you direct access to a modern "time-sharing" computer system for as little as $350 per month

Wherever you're located, you can now have a direct line to a central computer system. All that's required is an inexpensive terminal device in your office or plant. Then you simply "talk" to the computer over an ordinary phone line. It's at your immediate command, whenever you need it.

What is "time-sharing"?

It's the next big step in electronic data processing—and General Electric is leading the way. Today's typical computer does its work one batch at a time. But G.E.'s new time-sharing systems are designed to utilize the total power of computers that perform thousands of additions or subtractions in a single second, so that they can be working on **many** jobs at the same time. As a result, each user receives such swift service he feels he's the **only** user—though a hundred or more other subscribers may also be using the computer.

Who can benefit?

Any business firm, scientific laboratory, engineering group, or school that occasionally needs the tremendous computing power of a system it could never afford to lease or own. Also: far-sighted companies that want to acquire practical experience before installing their own General Electric time-sharing systems.

What does it cost?

Only $350 per month, which entitles you to 25 hours of access to the computer (plus, of course, telephone toll charges and a modest installation and rental charge for the terminal device). Beyond that, you pay only for what you actually use, at a reduced rate.

When will it be available?

Right now from our New York and Phoenix Information Processing Centers. And we plan to make this new service available at other locations in the near future.

Why don't you dial today for "instant computing"?

Just phone your G-E Computer Representative for a hands-on demonstration of a General Electric time-sharing system. For complete details and a brochure explaining how easy it is, please write General Electric Computer Department, Section CPA-120-A, Phoenix, Ariz. 85023.

GENERAL ELECTRIC

Designate No. 15 on Readers Service Card

AN OFF-BIT HISTORY OF MAGNETIC TAPE... #9 of a series by Computape*

There were mutterings at the Round Table that Merlin the Magician was growing absent minded, not to say daft. The Knight of the Silver Spoon was sure of it. And the Knight of the Iguana agreed.

"Absent minded am I? Ready for Medicare am I?" cackled Merlin. "I'll show them!"

And so he collared the noble Galahad. "Watch this, Gal old boy!" he crowed.

And without so much as an abracadabra — lo! The two were suddenly in a strange room, where a damsel pecked absently at a typewriter and musicians played Greensleeves from the balcony.

"And what do you think those are?" Merlin whispered to Galahad, pointing a warty finger at a bank of computers that had suddenly materialized along the far wall.

"Computers," Galahad replied promptly. "As for the tape, it's heavy duty Computape. Magnetic. 556, or 800, or 1000 bits per inch with no dropout, if I recall."

Merlin sighed. "Then I've shown you this before?"

"At least 25 times," said Galahad. "But fear not, Merlin. None shall ever be the wiser."

And none ever was. After all, would you have the heart to tell on a poor old man?

Galahadn't either.

One of a series of documentaries made possible by COMPUTRON INC., a company even more interested in making history than fracturing it. Our Computape is so carefully made that it delivers 556, 800 or 1,000 bits per inch — with no dropout. Available with 7, 8, 9, 10, 16 channel or full-width certification to meet your systems requirements.

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

*Reg. T.M. Computron Inc.

COMPUTRON INC.
MEMBER OF THE BASF GROUP
122 CALVARY STREET, WALTHAM, MASSACHUSETTS

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

Designate No. 4 on Readers Service Card

The front cover shows a copy of the painting "Mona Lisa" by Leonardo da Vinci, produced as a digital plot by a scanner and two Control Data Corp. computers. Each small cell contains two decimal digits reporting the density at a point on a color projection slide copy of the painting. For more information see page 13.

computers and automation

DECEMBER, 1965 Vol. 14, No. 12

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

Special Feature
1965 Pictorial Report on the Computer Field

In This Issue

In Every Issue

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The International Computation Center in Rome

From time to time I have wondered a little about the International Computation Centre in Rome. This October I found out about it.

My introduction to the ICC was the conference held under its auspices on the Economics of Automatic Data Processing from October 19 to October 22. The conference was organized very well, and many interesting papers were given. Attendees came from 26 countries. With impressive punctuality, the proceedings of the conference, printed in excellent format in the Netherlands, were distributed to the attendees as they registered:

"Economics of Automatic Data Processing", Proceedings of the International Symposium on Economics of Automatic Data Processing, Rome, October 19-22, 1965, edited by A. B. Frielink, published by the North Holland Publishing Co., Amsterdam, 1965, 384 pp

Among the 37 papers were:

"General Considerations on the Economics of A.D.P." by Joannes Benay, Ingenieur en Chef a la Cie. Generale d'Organisation, Paris

"Computer Pricing Policies from an Economist's Point of View" by William F. Sharpe, Assoc. Prof. of Economics and Operations Research, Univ. of Washington, Seattle, Wash.

"Experience with Control of Efficient Computer Use with a Large Computer Centre", P. de Jager, Deputy Director, Philips Gloeilampenfabriken N. V., Eindhoven, Netherlands

and many more well worth reading.

The large hall where the meetings were held was several long blocks away from the International Computation Centre, and I hunted for the Centre to visit it. I found it in several rooms of an immense Italian-style office building, complete with courtyard and beautiful vistas. I started to ask some questions in English, then French, — was smilingly talked to in Italian, which I could not understand — and was directed to a young lady (from Australia), executive editor of the Bulletin of the ICC.

How big was the Centre in terms of people? About ten people.

What equipment did it have? An Olivetti ELEA 6001 with 20,000 characters of core memory, which the Centre could use for 40 hours a week, the other hours belonging to Olivetti. Software? A FORTRAN and an ALGOL compiler.

What was the mission of the International Computation Centre?

1. Scientific research — to establish and operate one or more laboratories equipped with various types of computers; to conduct scientific research related to computing devices; to promote collaboration among computation institutes throughout the world; . . . .
2. Education — to prepare and carry out a program for vocational and advanced training of specialists in computation (actually, 46% of the budget of ICC is devoted to teaching and training activities, especially for the developing countries);
3. Consulting — to provide a consulting and computing service, primarily for Member states and especially those which have limited resources.

What was the chief present task of the International Computation Centre? Operating a six months advanced seminar in data processing for 20 people from 12 countries, Argentina, Czechoslovakia, Ghana, Hungary, India, Iraq, Israel, Mexico, The Netherlands, Nigeria, the Philippines, and Thailand.

How many countries supported the Centre? Thirteen. It was essentially an offshoot of UNESCO, and it was supported by the 13 countries in proportion to their contributions to UNESCO.

Which were the countries supporting the Centre? I was told them in a random order, but I have rearranged them approximately in the rank of their contributions to the budget of the ICC: France, Japan, Italy, Belgium, Argentina, Mexico, Greece, United Arab Republic, Cuba, Israel, Ghana, Ecuador, and Libya.

Why didn't the United States, Great Britain, the Soviet Union, Germany, Sweden, and some of the other outstanding, developed countries of the world participate in the support of the International Computation Centre? No answer was offered me.

I was appalled and distressed with the lack of interest and support of the ICC by the great, developed countries. Here is a group of computer people trying to do a large and worthwhile task in the computer field, with very small and insufficient resources. The benefits of computers and data processing need to spread quickly to the developing countries; the ICC is focused on this task.

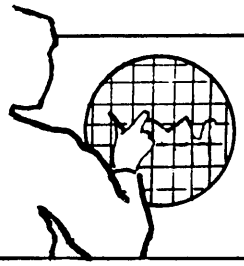
The editors of "Computers and Automation" would like to call on all readers of "Computers and Automation" to send any contributions that may be possible — financial, books, computer programs, etc. — to the International Computation Centre, to help with its work in the computer field. The address is:

International Computation Centre
23, Viale Civilta del Lavoro
Rome, E.U.R., Italy

Also, it would be logical and highly desirable for the International Federation of Information Processing Societies, and the American Federation for Information Processing, to put on their agendas for discussion and action, at this time, the matter of increased support and increased membership by developed nations in the International Computation Centre.

Edmund C. Berkeley

EDITOR



c & a MARKET REPORT

IBM'S RECENT PRICE POLICY CHANGES AND THEIR SIGNIFICANCE FOR THE COMPUTER FIELD

"The greatest difficulty in achieving forecasted goals of profitability in the computer industry is controlling the mix of sales vs. rentals of equipment", Control Data's President William Norris was quoted as saying at CDC's Annual Meeting last month. No firm in the computer field is more conscious of this problem, nor more able to pioneer pricing policies to astutely control it, than IBM.

An example of IBM's exercise of this control is its announcement to its customers on October 1, 1965, outlining new arrangements under which a customer can purchase rented IBM equipment, and also adjustments on the maintenance charges that customers with purchased IBM computers or punched card equipment are required to pay for IBM service on their equipment. To explain these changes, let's contrast them with policies previously in effect.

"Purchase-of-Rented" Plan

Prior to October 1st, the purchase price of rented IBM computers and punched card equipment to a customer was based on the length of time the equipment was installed at the customer's location. For computers, the purchase price declined 5% a year for the first four years of use, and 10% thereafter until a minimum price of 65% of list was reached at the end of 5 1/2 years. For punched card equipment, the purchase price declined to a minimum of 45% of list for equipment still in production, 35% of list for equipment out-of-production but still available in the market, and 25% of list for equipment both out-of-production and no longer available on a used basis from IBM.

On October 1st, IBM declared that age is no longer a factor in determining the economic value of its equipment to a customer. Instead, IBM pointed to economic and technological change as the primary factors in determining the economic value of IBM equipment for its users. On that premise, IBM has frozen the purchase price to a renting customer of all its currently installed computers and punched card equipment at the value each achieved as of October 1, 1965.

A consequence of this action is that IBM has raised the sale price of its used data processing equipment in inventory to 100% of the list price for similar new equipment. Also, a punched card customer may well find, for example, that two 407 accounting machines at his installation, both with the same date of manufacture and both yielding the same performance, might have sale prices of $24,000 and $55,000 respectively . . . based on the fact that the former one has been in use at his particular installation for eight years while the latter was installed only a few months ago.

"Option-to-Purchase" Plan

Prior to October 1st, customers renting IBM equipment could obtain an "Option-to-Purchase" contract which allowed them to apply between 45% and 55% of the first year rental payments for their equipment toward the purchase price of the equipment. The fee for entering into this contract was the payment of 1%, of the purchase price of the equipment ninety days prior to its installation.

Starting October 1st, IBM no longer offers this contractual arrangement. In its place, IBM now allows all customers renting its data processing equipment the opportunity to apply 40% to 60% (depending on the equipment) of the first year rental payments toward the purchase price of the equipment. The actual percentage of rental applied on each type of equipment has been extensively changed under the new plan. For example, under the previous plan, 45% of the first year rental on central processors and 55% on peripheral equipment was credited against the purchase price; under the new plan, the percentages are reversed.

Therefore, under the new IBM policy, the minimum purchase price of IBM DP equipment installed after October 1, 1965, will be 88% - 89% of the full list price (since IBM's purchase/lease ratio on most data processing equipment is roughly 50/1, one half of the first year's rental equals approximately 6/50th or 12% of the purchase price).

Maintenance Prices

IBM has announced sharp increases in maintenance charges for customers using certain purchased IBM equipment. For example, on January 1, 1966, maintenance charges on a purchased IBM 1402 card reader/punch less than three years old will be increased from $50.25 per month to $120.00 per month, an increase of 140%! This effectively changes the breakeven point on a decision to purchase versus rent this unit from just over 59 months to over 68 months . . . a 15% longer pay-back period for users with an IBM maintenance contract on this equipment. This increase has a stiff impact on IBM competitors offering the 1402 as part of their product lines. IBM now requires its competitors to purchase rather than rent IBM DP equipment.

To reconcile its declaration that age has no effect on the performance value of its equipment, IBM has established a single monthly maintenance fee for each of its units. Formerly maintenance charges increased with the age of the machine in three year cycles.

IBM has also increased maintenance charges for customers receiving maintenance on a time and materials basis. The hourly labor charge has been increased 20%,

from $15 to $18 per hour. Overtime charges have been increased similarly.

IBM press announcement on the subject declared that "because of continuing improvements in IBM's maintenance and reconditioning programs, it is possible to provide equivalent performance levels in machines with different dates of manufacture." These improvements have apparently not come easily, for since 1963 IBM's monthly maintenance charges to customers with purchased equipment have increased 80% for punched card equipment and 100% for computers. Since these increases in maintenance charges have not been made with a concomitant increase in rental rates for computers and punched card equipment, IBM has been in effect increasing the equivalent purchase price of their equipment between 10% - 20% during the last three years.

The new IBM announcement appears to be but one of a series of planned moves IBM has been making during the last four years to control the percentage of its computer and punched card equipment being purchased. The previous increases in maintenance charges to customers with purchased IBM equipment, and the shortening of the period during which a percentage of rental payments could be applied to the purchase price from two years to one year, are examples of these moves. Their overall objective, of course, is to maintain IBM's profit goals in the years ahead. Three prominent reasons motivating these changes at this time appear to be (1) the expected long market life of System/360, (2) the activities of purchase-lease-back companies, and (3) the used computer market.

Long Market Life of System/360

Since the System/360 is envisioned by IBM as being a series of computer systems actively marketed and in use for ten or more years, IBM is anxious to keep a high percentage of installed systems on rental so that they will provide continuing revenues to IBM during the latter half of their decade of use. IBM apparently reasons that customers likely to purchase their system in any case will do so by the end of the first year of use — reacting to the incentive of the 11% to 12% discount — rather than delaying for two or more years the decision to purchase. Customers not being able to make a decision to purchase by the end of the first twelve to eighteen months of use will probably continue to rent their 360 system indefinitely, since the purchase price on their aging equipment will remain fixed.

Two other factors that will discourage users of 360 equipment from purchasing are: (a) the rapid advances being promised in peripheral equipment, especially in the areas of printers, optical character recognition units, displays, and mass memories, and (b) the program compatibility between models of 360 make upgrading of the central processor to achieve greater processing capacity a relatively simple technical step . . . making customers wary of getting locked in at too low a level by purchasing a processor which might be found to be underpowered for the application load required.

It is likely that under IBM's new plan between 80% - 85% of System/360 users will rent their equipment for the long haul. Those that do purchase will put forth their purchase price within their first six to sixteen months of use of their system, suggesting that IBM will be receiving a generous share of income from purchased systems during '66 and '67, the two years of heaviest installation activity with its associated heavy marketing, training, and installation expenses.

Purchase-Lease-Back Companies

Probably the single most compelling reason for the timing of IBM's price changes has been the "purchase-lease-back" activities of companies such as Management Assistance, Inc., Boothe Leasing Corp., D. P. A., Inc., Cyber-Tronics, Inc., etc. During the past year these firms have been generating an impressive volume of business by arranging for computers and punched card equipment users (particularly the latter) renting equipment from IBM to purchase their equipment at the reduced prices allowed by IBM's former price policy. The "purchase-lease-back" firm would then, as their name implies, purchase the equipment from the user for the same price and lease it back to the user usually at substantial savings in rental costs. It is believed that the volume of IBM equipment purchased during the last twelve months by these companies is in excess of $40 million.

The effect on"purchase-lease-back" companies of IBM's new policy is likely to be a strong acceleration in their activities during the next year or so, since the purchase-lease-back arrangement for IBM equipment will never be more attractive than it is at the current time. In the next three to five years, however, if the IBM policy stands, a restriction in the growth of these firms is clearly indicated.

Logically, IBM should be anxious to curtail the activities of "purchase-lease-back" firms for two reasons. First, IBM loses profitable rental income on its data processing equipment, particularly punched card equipment, that is usually fully depreciated on its books. Second, since many of the "purchase-lease-back" firms provide their own maintenance service, or arrange for maintenance service through outside sources, IBM loses its close service relationship with its customers, thereby greatly lessening IBM's opportunity to upgrade the customer's equipment to a more elaborate punched card installation or to a computer. In fact, one "purchase-lease-back" firm reports that in over half of the punched card installations purchased by it which have subsequently upgraded to a computer, the computer was of non-IBM manufacture.

Used Computer Market

The freezing of the purchase price of IBM computer systems raises the ceiling at which used IBM computers of the first or second generation will be able to enter the used computer market during the next two to three years. However, since even under the "Purchase-of-Rented" plan, IBM's purchase prices were well above that of the free market, little effect on the quantity or price of used computers is foreseen. The new IBM plan does, however, firmly squelch suggestions made by some EDP consultants that IBM might be planning a drastic reduction in the purchase price of its second generation equipment in order to make a final

"cash-in" on the 1400/7000 series prior to quantity deliveries of the System/360.

IBM has several further moves it can make if the percentage of its data processing equipment rented by its customers is not brought on target by the new policy. One step is to shift the purchase/rent price ratio of its equipment upward, thereby increasing the purchase price of its data processing equipment without changing its monthly rental. IBM has made several purchase price changes on data processing equipment in the past, but is quite proud of the fact that only once in the recent past (in 1956, after signing the Consent Decree) did it ever change the rental price of some of its equipment. The second measure is to withdraw its "Option-to-Purchase" plan entirely, thereby allowing no application of paid-in-rental toward the purchase price of its rented equipment. Since the new "Option-to-Purchase" plan does not involve a contractual arrangement as did the previous one, IBM is free to make this change in the future with a minimum of thirty days notice to its customers.

Both these moves, of course, would offer some additional competitive price advantage to IBM competitors in the computer industry. However, this effect might well be outweighed by the additional profits to be realized by the rental income coming from a generous share of the 65% to 70% of the computer market IBM is expected to maintain command of in the 1970's.

Patrick McGovern

Associate Publisher

INVENTORY CONTROL

"So you didn't get what you wanted — Santa does not need an operating inventory control system!"

THE PRICING POLICY OF IBM FOR USED EQUIPMENT

Nicholas H. Dosker, Jr.
Data Processing Equipment Exchange Co.
Louisville, Ky. 40202

International Business Machines Corp. is singular in many ways. The October 1, 1965, IBM announcement of pricing policy changes again probably makes IBM singular among U.S. industry equipment manufacturers in that, for computers and punched card equipment purchased from IBM by users after that date, age has practically been eliminated as a pricing factor, and that full IBM customer Engineer maintenance at some selective higher prices is planned to support the move to persuade a higher percentage of users to continue on a rental basis from IBM and to discourage the free market activities of private leasing companies and of users including the Government at all levels who have enjoyed the advantages of the previous "Option to Buy" plans and ownership of computers and punched card equipment of IBM manufacture.

The secondary or used market for IBM equipment has shown a healthy growth in recent years since the Consent Decree of January 25, 1956, made such a market possible under the provisions that users could have options to buy and own this equipment at prices which declined with the equipment age, as well as to rent it from IBM. These User Options to Buy have made possible significant savings to many users both large and small as compared to IBM rental only or option to buy only at small discounts without reference to equipment age, which seem to be the objectives of this recent new IBM pricing policy.

Relative technological obsolesence of computers and punched card equipment has been an important pricing factor in the secondary market. This will probably still continue as a practical matter in the free market for this equipment; but price curves for good used IBM machines will probably show an upward trend so long as this IBM policy stands, since the practical effect in the long run will be to diminish the supply of used IBM machines available in future at much less than about 88% of new list price to near the vanishing point.

The user who has leased IBM equipment from IBM for about 50 months has paid its purchase price once and is starting over again; the user who owns his IBM equipment has been accumulating the benefits of depreciation against his own cash flow without surcharges for additional shift operations. In the case of most punch card machines and second generation computers he will have a reasonably good residual equity when he decides to "move up" to larger capacity or later model machines of any make if he uses the services of an alert broker who keeps in close touch with market developments.

A case in point on the question of option to buy is the Federal Government. As the largest user of this kind of equipment, they recently bought large quantities of formerly leased equipment on the recommendation of the General Accounting Office from IBM and others for economy reasons.

It seems that the IBM Consent Decree of January 25, 1956, ran for 10 years and is due to expire in January 1966. It would seem that many users of IBM equipment who have enjoyed the relative benefits of owning IBM equipment and of the Free Secondary Market in this equipment might want to inquire of the U.S. Justice Department whether this Free Market is to be cut off at its present level and probably dried up in the future or whether some action can be taken again by the U.S. Justice Department to assure a continuance of the free market in this equipment under reasonable terms including a user "Option to Buy" at declining prices based on age and with manufacturers maintenance assured to owners of IBM equipment at non-discriminatory rates, as has been increasingly the case under the reasonable rules in effect for the past 10 years.

It is suggested to such users as are interested in making such inquiries that the Honorable Arnold Olsen, Chairman of the Subcommittee on Census and Government Statistics of the Committee on Post Office and Civil Service at Washington, might also be interested in hearing users' views. His committee has cognizance of many matters concerning the use of this equipment in Government, and he is interested in economy in Government expenditures which have been at a rate well above $100,000,000 annually in recent years for data processing activities. After all, all users of this equipment are also taxpayers who have an interest in Government economy as well as in their own costs of doing business, which in the competitive modern economy includes the use of computers, punch card machines and related equipment for practically any business of any size.

THE PURPOSES AND THE DUES OF PROFESSIONAL ORGANIZATIONS

Enoch J. Haga
Editor, Educators Edition Business Automation
Livermore, Calif. 94550

In regard to your September editorial "The Computer Field and Bandwagons" you have struck one of my nerves in your remarks concerning the Association for Computing Machinery. While I realize that you were using the ACM merely as an example, without having my remarks construed as an

attack on ACM, I wish to offer some remarks on the same topic.

First, I agree that an organization does not have to be big and important to be useful. The *Journal of the ACM* is certainly not a general interest publication, and I too think it unfortunate that ACM chose to "tax" all members for its support. No doubt it serves an extremely useful purpose, and probably a necessary one. I do not object to the publication, not even to taxation of all members for its support, but mainly to a seeming *lack of explanation* on the part of ACM officials as to *why* this taxation is necessary — in other words, it does not seem to me that sufficient alternatives were explored.

At the time that ACM dues were raised, I recall writing a letter of protest to the President. Evidently, as an ordinary member I was not important enough to receive a reply. The gist of my protest was that, while ACM might have a right to raise dues without consulting the members, that they shouldn't do so on moral grounds. Apparently alternatives were not explored, which is what I object to (or if they were explored, this fact was not communicated to the membership.)

Also, I understood that ACM members had once voted not to have membership requirements, but I note in a press release that this policy has been reversed. In my opinion, this is the first step on the road to a mutual admiration society.

I can no longer afford to be a member. I must add that most educators, especially those who do the actual teaching, can't afford to either. I'd like to be an ACM member, receive a general interest magazine, etc., but can't see paying a big price for a collection of technical journals I can't use.

In regard to education, I would like to see ACM, DPMA, SABE, AEDS, SPA, ORSA, and perhaps other groups, organize a Joint Council on Education. This can occur when they remember that they might benefit more by helping each other than by working at cross purposes. Together much more could be accomplished, and at less cost, in furthering the cause of computers and automation education.

COMMENTS ON "THE SOCIAL RESPONSIBILITIES OF COMPUTER PEOPLE"

I. From Rudy C. Stiefel

President
Infotran, Inc.
New York, N.Y. 10021

I noted with interest your editorial on the "Social Responsibilities of Computer People" in the October issue, and I whole-heartedly agree with you.

While we like to enjoy the niceties that electronic computers have brought us, we must also face the responsibilities of adverse, and sometimes dangerous, consequences to others — even though we do not necessarily have the authority to control future developments except by advice and invention.

II. From Donn B. Parker

Los Altos, Calif.

I read your October editorial on the social responsibilities of computer people with great interest. Your position paper is well done as far as it goes, but I feel it is incomplete. It covers world peace, world law and underdeveloped countries. What about the professional's social responsibility to his own country, in science and in arts?

I suggest the following additional areas under Part 2:

1. National, state and local law — the application of computers to decrease crime and prosecute wrongdoers effectively and fairly for the protection of society.
2. Military effectiveness — increase the effectiveness of the national military establishment to protect the national society and defend other nations; minimize the potential loss of life and human suffering in the event of necessary military action.
3. Government — employ computers to provide more efficient and fair government services to society.
4. Science — accelerate the quest for truth upon which technology is based to increase the living standards of society.
5. Arts — the use of computers to assist in creation and propagation of the artistic products of society for society.
6. Industry — the application of computers to assist in more efficient and thorough management of industry to produce goods and services where they are needed, when they are needed, at fair prices and for reasonable profit.

III. From Morgan W. Huff

Manager, Electronics Dept.
Life and Casualty Ins. Co. of Tenn.
Nashville, Tenn.

I note your editorial in the October issue and am so disturbed that I had to write.

I have been a programmer since June 1950, having started my business career at Eckert-Manchly on the Univac I. I have been involved ever since with computers and, therefore, felt justified to speak as a "computer person". I know that you too have been in this field for quite a number of years.

I say to you that we should leave the sociological problems of our times to the sociologists. You have listed some responsibilities of "computer people", but take a look again at the Ten Commandments. If any one in this business lives up to them, I don't think you have to worry about their not accepting any of the responsibilities you have listed.

I look to your magazine to give me information on automation purveyed by experts in this field. With all due respect I don't think you can combine automation and sociology without hurting the quality of one or the other. Let's be master of one, not a jack of all trades. I will look for articles pertaining to sociology in publications that specialize in that field. So if you can't stick to automation, then this reader will go elsewhere.

IV. From A. Pianaitis

Squier, Schilling, and Schiff
Newark, N.J.

We read with great interest your editorial on social responsibilities of computer people in the October issue. May we have a copy for reprinting in our publication "News and Notes" (sample enclosed) published by the Northern New Jersey Chapter of the Systems and Procedures Association?

V. Note from the Editor.

The answer was yes.

COMMENTS ON "THE SMALL COMPUTER AND TIME-SHARED SYSTEMS"

Harrison R. Morse, III

Marblehead, Mass.

I recently read the article *The "Small" Computer Versus Time-Shared Systems* in the September issue of "Computers and Automation" and must agree with the author's conclusion that small computers are not only here to stay, but serve a useful purpose. However, the reasons for this conclusion, and the author's comparison of time-shared systems versus small computers, require clarification and comments on some points.

In his discussions of time-shared systems (he includes, by intent, multi-programmed and multi-processing systems also) the author has overlooked the prime motivation and advantage of such systems. Time-shared systems permit *dynamic* allocation of a computer's capabilities among those having access to it.

When comparing time-shared versus small computers, the author is actually discussing dynamic versus static allocation of facilities. The small computer user who slightly exceeds his capacity has no recourse but to go to a larger facility, which may take months, while the user of a time-sharing system who exceeds his initial estimate of need may correct that in a matter of milliseconds.

Regarding the current speed of small computers, the author should be aware that there are generally available, and have been for some time, small capable computers for less than $20K with a memory cycle time of less than 2μs. So the day of the nominal speed advantage is long gone. However, the actual speed difference is due only in a small part to the memory speed. For most problems involving arithmetic computation, floating point representation of data is required, or at least extremely convenient. The hardware to implement floating point operations is very complex compared to the central processor of a typical small computer. Combine this with the fact that the word size of a small binary computer (typically 12 to 18 bits) requires multiple words to store floating point numbers which require single words on larger machines, and the resulting increase in processing time combined with the decrease in effective storage capacity grossly undermines the supposed equality gained by equivalent memory cycle times. Anyone who has tried to put a 40 x 40 matrix on a 12-bit, 4000 word machine requiring three words for each floating point value realizes the problems.

The direct access to small computers is indeed a two-sided blade. Although a user-engineer may have access to a computer as and when he wants, he must also be familiar with the programming aids. That is, he must not only know how to write a FORTRAN program, he must also prepare the input representation of that program, be able to load and run the compiler, and know how to perform whatever other manipulations are necessary to actually initiate execution of his program. In effect, the computer user has freed himself from the burden of using programmers at the expense of training himself to be a computer programmer, coder and operator, combined.

As for the efficient use of computers, one could infer from the article, that the primary aim of using computers was to use them efficiently. I personally hold the opinion that computers should help me with my work, not vice-versa.

A computer operating at any efficiency, no matter how low, is well used if the increased productivity of those having access to it justifies its cost. The author falls into the same trap again when he comments that "artificial languages . . . are not highly efficient." The point obviously missed in both cases is that one may justify local inefficiency by an overall increase in efficiency.

However, a second point relating to efficiency bears an even stronger relation to the article. Some of the original motivation for time-sharing at M.I.T. was to recover the unused computing power available on small computers being used directly by programmers without removing the advantages of direct access. That is, time-sharing was partially motivated by the desire to recover idle time resulting from the use of small computers by an on-line programmer. So we have come full circle, using time-sharing systems as an argument to justify the need for small computers.

I must say I feel the author has done a disservice to small computers by pitting them against an adversary in that adversary's home ground. When facing a David against a Goliath one should have the decency to allow the David the use of his slingshot, and not require he use Goliath's club, which he can barely lift, never mind wield.

Small computers serve in their own areas extremely well. In the area of special purpose equipment — a small general-purpose machine programmed to perform a specific function — they have no peer. Process control, data collection, and device monitoring applications are examples. As devices to handle real-world interface problems, small computers are performing a tough job very well indeed. Examples are teletype concentrators, display processors and I/O controllers.

However, as general-purpose computers intended to perform the computational needs of our technological community, small computers have neither the word size, speed, memory size nor data manipulation capability to compete with their bigger brothers.

"LIFELINE TO THE OUTSIDE WORLD"

I. From Rev. Jim Hite

Catholic Chaplain
Georgia State Prison
Reidsville, Ga. 30453

I am writing to you in the hope that you might be in a position of assisting us in the following matter: We have approximately 3000 men confined at this institution. It is always a problem to provide the men with the variety of good, wholesome, informative, reading matter they request and need. We are unable to purchase these items, as our office is without a budget. All our endeavors are carried on through charity.

We have recently begun writing to many top religious and secular magazines, requesting one "gratis" subscription to their magazine. I am delighted with the response shown thus far. However, there is still a great need. As the men come from varied backgrounds and interests, I am interested in obtaining subscriptions to the various Trade Journals and House Organs, etc. I therefore appeal to you in the hope that it might be possible to obtain a subscription to your magazine. I would be both a valuable and welcome addition to our "Decency In Reading & Activities Program" here at the prison. If you are able to assist, please list this subscription under my name and address.

An consideration you may be able to offer in this matter, would be gratefully appreciated by both the men and myself.

II. Note from the Editor

A complimentary subscription was entered.

III. From Roscoe E. Walls, 42665

Supervisor, Data Processing
Indiana Reformatory
Department of Correction
Pendleton, Ind.

Your complimentary subscription to the publication COMPUTERS AND AUTOMATION, continues to reach the Data Processing Center, Indiana Reformatory, monthly.

We are sincerely grateful to both you and your fine organization for making this possible.

As you know, we are without funds which would otherwise make these materials available through normal channels and as a consequence we receive only that which is contributed by companies and individuals such as yourself. That interest and support, Mr. Berkeley, is a life line to the outside world known within the walls as "free society."

On behalf of the entire installation, please accept our gratitude and thanks for continuing your much valued assistance.

THE DIGITAL MONA LISA

H. Philip Peterson
Control Data Corp.
Digigraphic Laboratories
Burlington, Mass.

In your "Computer as an Artist" covers of the past, analog forms seem to dominate. In an effort to counter this insidious tendency, I have sent you, for your consideration, a "pure" digital work of art (admittedly not original). It is digital in the following ways:

a) It is composed of square cells, 0.115″ on a side. It is 256 cells wide and 390 cells high. (The top and bottom two rows contain identification information.) Cells are marked off by ticks in the horizontal lines between rows.

b) Each cell contains two decimal digits. The magnitude of these numbers is proportional to the density at points on a color projection slide (.9″ by 1.35″) as measured by a CDC 160 computer driving a special high-resolution "jumping spot" scanner. (Actually, 9 bits of density are measured at each point.) There are about 100,000 cells in this picture. My research scanner, however, is capable of examining 64 x 10^6 points inside a 2″ x 2″ target area, extracting 9 bits from each, but this much detail would require 12,000 hours to plot using this technique.

c) The number in each cell is the result of scanning 8 points in each tiny area and averaging their densities. About 10^6 points were examined which took the CDC 160 about four minutes.

d) The digits are plotted by an incremental plotter driven on-line by a CDC 3200 computer. I designed the font in such a way that the larger the pair of digits are, the darker they appear to the human eye at that cell. Up close to the picture, you see what the computer "sees" — namely, a number field; at about 30 feet away, you see the picture shaded as well as a newspaper photograph. (Perhaps a little better, since there are 100 gray levels.)

e) It takes about 64 plotter steps to make each digit. The whole picture took about 16 hours to plot and consists of about 16,000,000 plotter steps (300 per second). It was done on a weekend in one continuous computer run.

Figure 1 — This shows a close-up of one of the eyes of the digital Mona Lisa. Here the decimal digits in the cells can be seen; the digits are not visible in the reduced, screened picture on the front cover.

How digital can one get? (However, much to my chagrin, the reproduction process is analog — a sepia copy from a diazo machine.) In any case, I hope you enjoy this version of Mona Lisa. A close-up of her enigmatic smile would probably be the most interesting way of demonstrating the technique used.

"COPYRIGHTED COMPUTER PROGRAMS" — SOME COMMENTS

I.

Bernard I. Savage
Consultant
Boston, Mass. 02134

I am the author of a copyrighted Monitor System for the PDP 4/7. The program is operational and I have had some initial success in leasing the Monitor. The manufacturer did not release a Monitor with his software. Therefore, in regard to the article "Copyrighted Computer Programs: Some Questions and Answers" in your July issue, perhaps my experience in marketing a copyrighted program may be of interest, especially to other copyright holders.

Mr. Banzhaf III, in his article, thought that users would turn to leasing an existing program that fulfilled a particular need rather than develop it themselves, if the lease represented a small enough fraction of the normal development cost, to save time and money. I thought so, too; however, here are some representative user reactions:

(1) Some users wouldn't discuss leasing. Their attitude was — "whenever we think we need something we do it ourselves." Apparently, some people are not fully concerned with cost and time-lag.

(2) Some users prefer to pressure the manufacturer for the same software (instantaneously?). They simply feel that they shouldn't have to pay for software even on a low-cost computer. Such pressure does not endear the copyright holder to the manufacturer.

(3) Many users are incredibly naive about the costs and time requirements of programming and software development. They would probably consider any lease-price, except the most nebulous, as to high.

(4) Some view a program that is shared by many as they would view a fallen woman who is shared by many. They would gladly use it free but won't pay for it.

(5) Some have disdain for the notion of copyrighted programs because they think it is unprofessional to copyright. If anything, I feel that the ability to copyright programs represents the best hope of creating a profession from programming and its offshoots.

Many users, of course, hold several of the above views.

I had thought that a manufacturer would welcome any software that helped his users which was produced at no expense to the manufacturer. Again, I was in for a surprise. For sundry reasons, many of them obvious rationalizations, the manufacturer seems to prefer to neither make known your programs to his customers nor help you reach his customers. It may, therefore, be very difficult to reach your market.

One might expect from the persistent cries about the shortage of competent programmers that copyrighted programs would be zealously welcomed by shorthanded users and harassed manufacturers. My limited experience indicates that such is not the case except for the more mature users. A good deal of user education about the real costs of programming and software development, even in-house, must take place before a significant atmosphere of acceptance exists for

(Please turn to page 56)

COMPUTERS AND ECONOMIC CONCENTRATION

Walter W. Finke, President
Honeywell Electronic Data Processing Division
Wellesley Hills, Mass. 02181

In regard to the impact of computers on economic concentration, I would first like to try to appraise frankly past and present trends in computer development and usage, and relate my experience in dealing with nearly every segment of the computer market.

The brief but dynamic history of the computer industry seems to follow a five-year pattern of evolution. The period from 1950 to 1955 marked the pioneering years. In 1951, the U.S. Census Bureau installed the first computer to be used for commercial information processing. Four years later the first commercial computer in a non-governmental environment was installed at General Electric's appliance plant in Louisville, Kentucky.

The years from 1955 to 1960 proved the applicability of computers to the problems and operations of the business community. During this period the EDP industry began its explosive growth.

From 1960 through 1965 there have been dramatic improvements in the size, speed, cost, modularity and languages of computers. We have now moved into what I believe can be aptly called, The Age of the System. By this I mean that much of our future progress will be in the area of relating computer power to the specific system needs of the user; gearing equipment configurations to the exact dimensions of individual customer requirements; and providing an economical and orderly means for handling the growth of these requirements.

The Trend in Price

The earliest computers, those introduced 10 or 12 years ago, were generally enormous machines that cost upwards of $2 million each. Only the largest industrial, commercial, service and Federal organizations, those with volumes of about $100 million or more each year, could afford them.

Within several years, computer technology had advanced to the point where the price of computers had dropped considerably. Machines were available on the market for less than one million dollars. They had started to reach middle-size businesses.

In the first two years of this decade, the transistor and growing market interest in the computer again brought about an improvement in costs. During that period the first so-called "small computers" made their appearance in quantity. Our definition of small computers excludes devices such as electronic accounting machines, though they may possess some computational capability. We define a computer as a device with internal storage, be it core or other types of storage, that can be programmed internally rather than externally.

In the past three years, the evolution of computer products for the smaller user has accelerated at its fastest rate. Today there are more than 50 different models in this class. Monthly rentals for these computers, which vary between 1/40th and 1/50th of the purchase price, range from $3,000 to $7,000. Since most computers in business organizations — about 75 per cent according to industry averages — are leased rather than purchased, it means that a wide range of low-cost computer power is now affordable to smaller businesses.

Thus there has been a continuing accelerating trend to bring computer prices down in order to reach larger segments of potential users.

The Trend in Performance

As prices have come down, performance has steadily gone up, and in dramatic fashion. The large vacuum-tube computers of a decade ago could store 2,000 words in their memories, do perhaps one task at a time, and had a processing speed of up to 50 microseconds (millionths of a second). Their immediate successors improved that performance by a factor of about three. Improvements in performance rate have continued until today memory storage can go as high as several hundred thousand words, machines can do eight or nine tasks at once, and processing speeds are now being measured in nanoseconds (billionths of a second).

For example, in the evolution of Honeywell's product line we find a total price-performance improvement factor of 80

(Based on testimony before the United States Senate Committee on the Judiciary, Subcommittee on Antitrust and Monopoly, relative to the effect of computers on the concentration of business.)

when comparing our first system with the present leader of our line. More specifically, when comparing the leading computers in each of the "three generations" of the industry we find the IBM 650, first installed in late 1954, had an average monthly rental of $5,000 and an average instruction time of 5,500 microseconds. The IBM 1401, first installed in 1960, had an average monthly rental of $6,000 with an average instruction time of 230 microseconds, some 24 times faster.

The Honeywell 200, first installed in 1964, has an average monthly rental of $5,000 and an average instruction time of just 44 microseconds, over five times faster than the 1401 and 125 times faster than the first generation leader of just ten years ago.

The Trend in Users

Because of the improvements in price and performance among small-scale computers, these have been by far the most popular machines. The number of installed small computers, according to many industry census reports that keep track of these figures, is roughly 16,000, while the combined totals of medium and large computers is roughly 4,000. That's a 4-to-1 ratio, although the larger models had a several-year installation lead.

The smaller companies are taking advantage of these small computers. In my own company, this year, 55 per cent of our customers have been smaller companies, those with annual sales less than $50,000,000. Of the remaining customers, 27 per cent are large companies, 8 per cent are Federal agencies, and 10 per cent are local government, educational, and non-profit institutions. Almost one-third of our customers are businesses with annual sales less than $10,000,000.

If you consider 500 employees the dividing line between small and large companies, 40.4 per cent of our 1965 customers have been small businesses and 42.9 per cent have been large businesses, with the balance going to government, educational, and non-profit institutions.

Honeywell entered the small computer market only two years ago, and did so for just one reason: it apppeared to us then, as it does now, to be the area of greatest growth now and in the future. We believe that the small user, the man who has a small punched card installation now or who uses manual methods now but whose volume will shortly justify a computer, constitutes the largest share of the market.

Economic Maturity

Another factor in considering the problems of economic concentration as related to computers is the growing maturity of the entire industry — manufacturer and user alike.

Because of the newness of the discipline, market needs and market demands evolved slowly at first. Assessment of the future potential of the industry was not clear. Only 15 years ago, for example, there were industry experts who estimated that as few as 20 large computers would adequately serve the entire scientific community of the nation.

But in recent years, from the manufacturer's viewpoint, there has been growing recognition of the needs of the industry and concerted efforts to meet demands in virtually every broad and narrow market. The result has been a flood of new products, innovations, and companies to serve divergent information needs.

If we look below the level of the small computer, for example, we find dozens of "desk-type" calculators and processing devices. Recent developments in this area have brought the level of computation of these devices very close to that of a full-fledged computer. The major differences lie only in price, external versus internal programming capability, and the expandability of the units. These machines are now so versatile and capable that for businesses of even the "corner-drug store" variety, a new computing capability has been made available. They range in rental from several hundred to several thousand dollars a month, and can be purchased in some cases for less than $10,000.

The scientific computing requirements of the smaller users have also been provided for in recent years. Scientific processors that rival in speed models costing many times more have been developed by a number of small computer manufacturers specializing in such equipment.

As a result, there is no shortage of reasonably-priced computing equipment for any small computer user. And in the future, there will be that much more as development continues at a steady rate.

Systems

From the user's viewpoint, maturity has taken other directions also. Because of experience with large computers over a period of five or more years, most large corporations appear to have a distinct advantage in systems know-how; that is, knowledge of the complex flow of information, of the types of information, of the forms that information must take to be most useful when it reaches the computer for processing, and after it has been processed.

Definition of a task, the design of the system to achieve it, the flow-charting of how data will move through an office, and the programming of the instructions that tell a computer what to do with the information constitutes more than half of the effort of using a computer. The effectiveness of a company's data processing operation is largely dependent upon the skill used in developing its systems approach.

This area of systems capability is one that has been a primary source of concern among those who fear that large corporations will eventually monopolize talent, capability, and achievement in the field of computing.

Offsetting Factors

Several factors tend very strongly to offset any implied advantage of the large companies:

First, while large companies may have been the first users and learned a great deal, we all know that those who follow pioneers travel much more rapidly over roads already hewn by their predecessors. That has been the case in the computer industry. The trial-and-error from very basic beginnings is over for large, and generally for small, companies. All users are profiting from the early efforts of the large businesses.

Second, the computer industry has been a very mobile one. While the largest data processing staffs reside in large corporations, there are also great numbers of knowledgeable and talented people at the helm of computer departments in smaller firms. Large companies and manufacturers were the training grounds for most data-processing specialists.

Third, because of their size, larger companies inherently have larger problems, more complex problems, and more levels of information and management to provide computing power for. In just a simple task like a payroll computation,

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the firm with 50,000 employees in 50 States and 18 foreign countries — with thousands of types of pay scales, deductions, taxes and incentives to reflect in its pay envelopes — has a vastly more difficult systems task than the local businessman with 500 employees all working out of the same location. Escalate this one minor task into the hundreds it takes to run a company, and the crying need of big business becomes large-scale computing capability — in terms of equipment, systems and people — merely to maintain its current level of operation.

Fourth, manufacturers, outside consultants and independent specialists have often lived intimately with the problems of developing systems in large companies. These same people work just as closely, and impart considerable guidance and assistance, to small users.

Fifth, service bureaus, which are independent organizations that process a firm's data for fixed rates based on time and service provided, have also been an asset to small businesses who learned EDP and systems techniques by working with skilled service bureau people. This will also help smaller users in the future, when time-shared-computer service bureaus — in which many small users share a single computer by having a direct access to it over communications lines — begin to develop.

Improvement of Applications

By improving applications, I mean improving the quality and quantity of the tasks to which the computer is applied. For the better part of the past decade, most computers were used, both in large companies and small ones, as extensions of accounting departments. The mundane tasks of billing, general accounting, payroll, and so forth, were the ones most frequently processed by the computer. The computer was used to help cut costs, rather than to help generate profit.

Now users are moving from mundane applications to advanced ones. They are experimenting with new and different approaches to systems work, and to getting their jobs done. They have gained a base of experience on which to build, and are ready to do so. More important, they have seen the industry pass through its most recent wave of product introductions, and are ready to incorporate the features of the new equipment into their plans.

Product Change

Product development in the past ten years has been very volatile. From now on it will be much more orderly. The days of total product overhauls are nearly played out. Startling increases in computing speeds every few years are no longer likely. In a recent study we performed with several other companies for the U.S. Army, in which we were asked to forecast computer capabilities in the mid-1970's, we discovered that speed increases would be moderate, as would computer processor improvements. This forecast would tend to indicate a period of product stability is at hand.

Fuller Use of Computing Power

Most computer users sense that this is the case. The hesitancy of past years to commit oneself to elaborate long-range programs seems to have ended. Users are settling down to the job that is the most important they have — to study, design, develop and implement effective information processing systems.

This concentration on making fuller use of new computing power will tend to improve the level of performance of all computer users, both large and small.

For the large and experienced company, its work will largely be done in-house by its own staff. Its primary task will be the better definition of earlier systems, many of which have required extensive "patching" during the past few years as concepts changed and understanding grew.

The complexity of operating in a large-company environment will have to be faced and answered by the systems staffs of these large companies. The basic weakness of clogged and inefficient communications within a highly-structured business will have to be overcome. The refinement of literally mountains of data poses an enormous challenge. The task for the larger companies will be an enormous one.

Problems of Smaller Businesses

The problems of smaller businesses differ largely in degree. Their structures are less dense, their communications lines clearer, their information base much smaller. Smaller computers will be adequate to process their workloads.

The primary applications work of small users will also be in the areas of integrating various information systems and subsystems into more complete systems. While a large proportion of their work will be in-house, they, far more than larger users, can rely on the systems support of EDP suppliers, who are trying to make the transition to more advanced applications as easy as possible for small business.

Applications Packages

Suppliers have been quick to provide specialists and what we at Honeywell call "applications packages" with which small users can quickly move to a total systems design concept, and then develop that concept into reality in modular stages. These packages consist of a generalized systems concept, into which related subsystems, complete with programming, flowcharting and documentation, can be integrated.

Our packages are geared for small users. In fact, we have dubbed them "Software Systems for the Small Guy." We have developed these packages for manufacturing, distribution, insurance, printing and publishing, grocery, education, and transportation. We also have several industry-oriented groups, men who specialize not only in data processing but in the data processing applications in a given industry. Other manufacturers have similar organizations and capabilities upon which small users can call.

We have many examples — case histories, as we call them — of the successful application of computers in smaller businesses. Let me briefly just illustrate two such case histories. One involves a Northeast trucking company with $16 million annual billings that has installed a Honeywell computer and an on-line data communication network. The system links the firms 24 freight terminals in New England, New York, and New Jersey to its headquarters and monitors the movement of all freight from the time it is picked up until it reaches its destination. The system automatically calculates the charges and routing for each shipment and produces all financial control reports required by the corporation.

As freight arrives at any of the 24 terminals, a paper tape describing the shipment is punched on the terminal's remote data communications console. Information includes such items as point of origin and destination, type of goods and weight. The information is transmitted to the headquarters computer, which automatically rates the shipment, computes the charges, and assigns a delivery route. The computer then computes a final freight bill to a communications console at the destination terminal. I now quote the Executive Vice President and Treasurer of the firm:

> "Transmitting the final bill to the destination terminal, is one of the keys to our use of data communications.

Normal procedures of the trucking industry is to have a driver hand-carry the paper work with him. This means that the destination terminal never knows what its work load for any particular day will be until the trucks begin rolling in from out of town. The terminal never really knows how many men or trucks it will need to efficiently handle a day's business. With the new data communications network our terminals know a shipment is being sent to them before it leaves the originating terminal!"

Another example involves an independent department store in the Southwest area of the country. Here a computer has resulted in a 70 per cent reduction of the time required to handle the store's paper work, which means much faster service to customers of this retailer. The computer has been assigned the task of processing all billing and accounts receivable records, and it maintains an inventory control system that insures immediate availability to customers of any of the thousands of products sold by the firm, which range from clothing and household goods to food and farm implements.

Here I quote the controller of the firm:

"The computer is making it possible for us to handle our data processing activities in less than 30 per cent of the time previously required. Its flexibility is helping us give more advanced service to our customers by quick, efficient processing of the information we need to run our business."

Summary

These then, are the actual trends that have developed in the data processing industry. I believe they will continue for many years.

To summarize, we can come to some plain conclusions about the relation of the computer to the smaller user:

1. The price of computers has trended low enough to make them available to an ever increasing number of smaller businesses.
2. The number of small companies using computers is increasing rapidly.
3. There are alternate methods for small businesses to obtain computer power and support, aside from having their own installations. These are notably through service bureau and time-shared systems.
4. Advanced systems knowledge is not necessarily held only by large companies, but is shared by smaller ones too.
5. The complexity of systems problems in small companies is less than that of large companies, implying that small company knowledge need not be as sophisticated as large.
6. The entire industry is moving into a period of developing more advanced applications — small companies as well as large.
7. There is a trend among manufacturers to provide more specialized systems support, such as special software packages and industry-oriented consulting services for smaller users.

If we can accept these conclusions as generally valid, the question then becomes: What effect will they have on smaller businesses?

The great strengths of a small business cannot be undermined by someone else's use of a computer. Those strengths are the ability to develop sound products, to provide good or better service than the competition, to respond quickly to changing trends, to keep overhead expenses to a minimum, and to be able to communicate quickly as situations demand.

The weaknesses of a small business are limited financial muscle, perhaps limited product line developments, and most important, limited staff.

In every case mentioned, the presence of computational power can enhance the strengths of a small business in whatever proportion the company elects to seek increased strength. And in every case mentioned, a computer can reduce or eliminate the weaknesses inherent in small business.

Detailed Anaylses for Small Businesses

An example of how a typical small business limitation can be overcome by computers will serve to illustrate that point:

Big companies have always been able to afford detailed analyses of their problems and opportunities. Even before computers, they had the staff and the size to make this possible. For them, the addition of a computer made it easier and perhaps cheaper to make these analyses.

Small businesses rarely could afford detailed analyses, in the sense that they could not afford a large staff, because they did not have sufficient volume to spread the expense over. But powerful, new, low-cost computers now make competent detailed analysis possible for small business.

Therefore, while both large and small companies will benefit from computer analysis, for large companies it is only a matter of degree. For small companies it is a matter of kind.

From this illustration it is clear that the ability to perform detailed analyses will permit the small company to operate with the flexibility, speed, and product/marketing differentiation which it theoretically always had, but which in fact it probably did not have.

Economic Concentration

I believe the concern with economic concentration as a result of computer usage is a concern with the theory that the large computer user will get much more value out of his computing equipment than will the small computer user, so that eventually the small user will no longer be able to compete effectively.

There is no evidence to support such a theory. On the other hand, there is ample evidence that growing numbers of small businesses are making use of growing numbers of computer products designed specifically to improve their efficiency and effectiveness.

Staying in Business

A second fact, it seems to me, is that a computer can no more put a company out of business than it can keep one in business. A computer is a tool, and a very powerful one. Its value lies however in the skill of the user; in that regard, the user of a large computer is not necessarily better or more skilled than the user of a small computer.

Finally, in our economic system, no one holds a monopoly on skill. There are many good managers of small businesses, just as there are good managers of big businesses. There are many good managers of small computers, just as there are good managers of big computers.

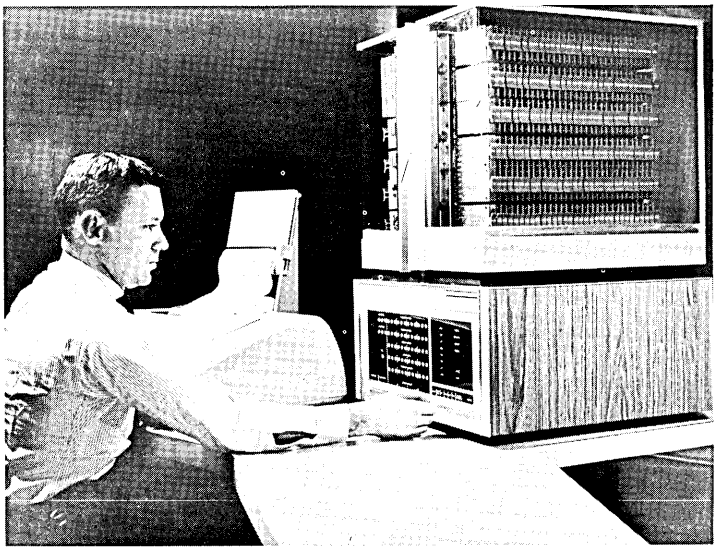
It is management skill in total, not relative to the computer alone, that will be the determinant of the degree of competition and economic concentration among U.S. industry. The computer will help them all become more skillful.

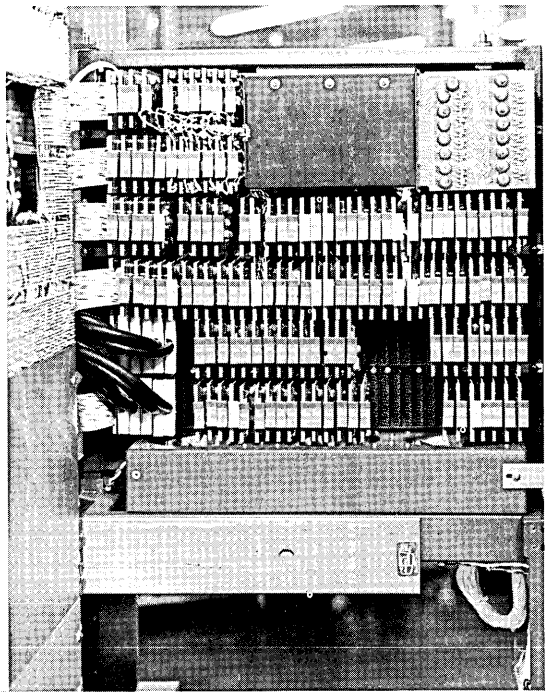
Computing Power Available

In conclusion, I believe the relative computing power available to small business is equal to or greater than that available to large business. The capability to make full use of that equipment is available in equal measure. Our experience in recent years has indicated a very strong trend towards increased small-business usage of the computer.

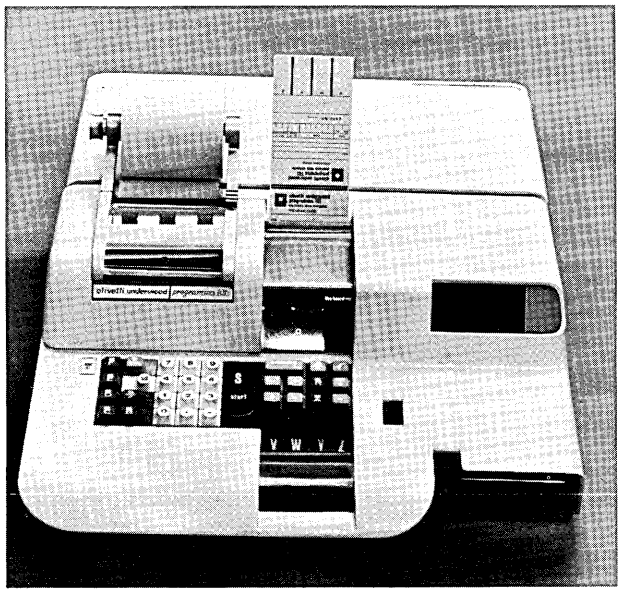
Annual Pictorial Report

DIGITAL COMPUTERS





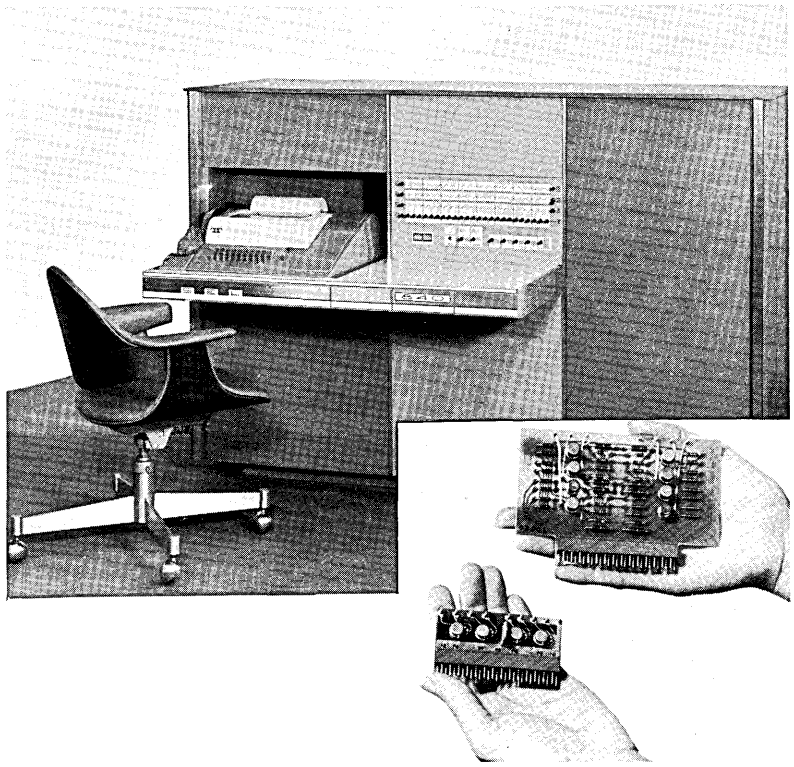
PDP-8 DIGITAL COMPUTER / Digital Equipment Corporation — Improving on the PDP-5, the PDP-8 is one-third less expensive, half as big, and four times as fast because of new circuitry and other technical achievements. It performs an addition in three-millionths of a second, and transfers data at rates up to 8 million bits per second. It includes, as does the PDP-5, a complete programming system. This 200-pound, general-purpose computer does many analysis-control instrumentation jobs. It may be standard table top as shown at the left, or rack mounted. A view of FLIP CHIP modules used in a rack mounted PDP-8 computer is shown in the photo. (For more information, designate #43 on the Readers Service Card.)

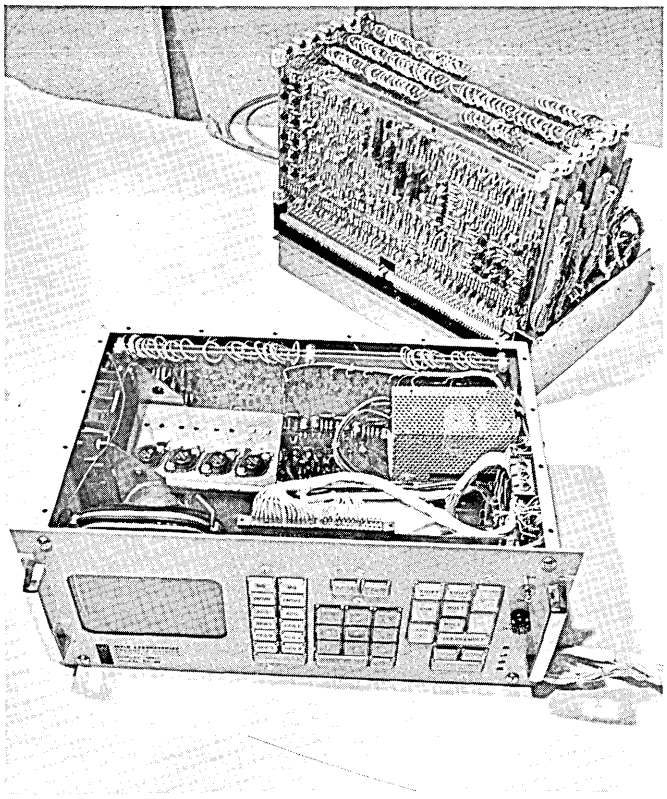


PROGRAMMA 101 / Olivetti Underwood Corporation — The world's first desktop computer which can "write", store, and run programs while making logical decisions is about as large as a standard typewriter. Programs calling for as many as 120 instructions are stored on convenient magnetic cards (shown inserted). Results are printed out on a plain, paper tape (left). (For more information, designate #44 on the Readers Service Card.)

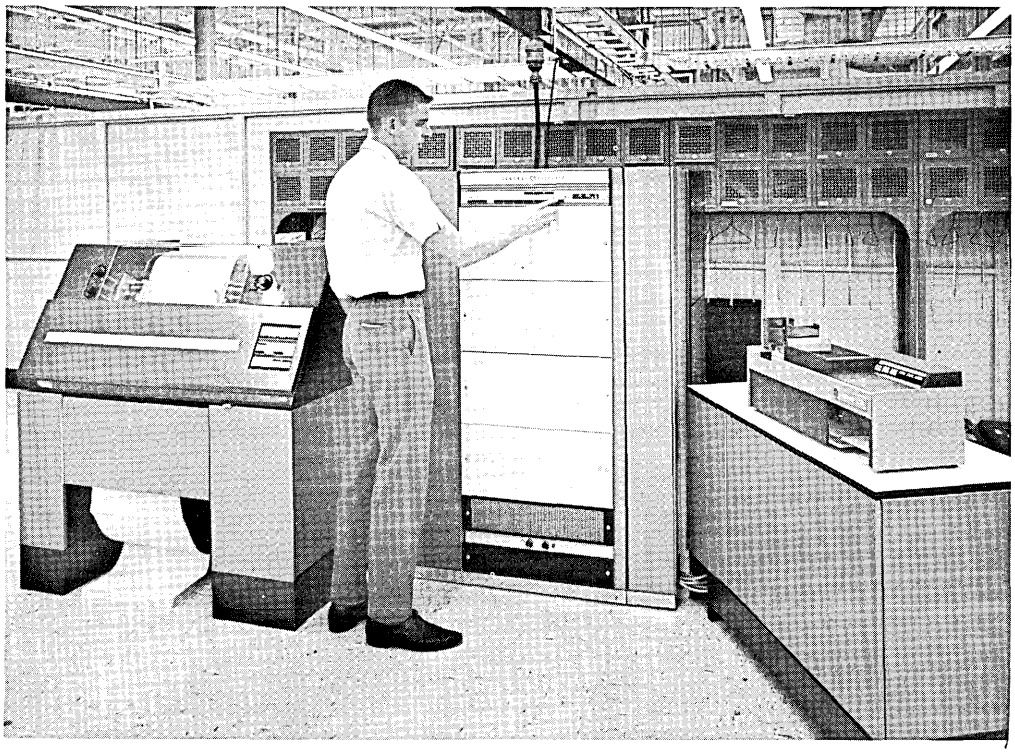
SYSTEM/360 MODEL 75 / IBM Corporation — The photograph shows an IBM technician connecting a maze of wires in a final assembly stage of a System/360 Model 75. This close-up of the computer's console was taken with a specially-constructed wide-angle camera. The Model 75's main memory operates at 750 nanoseconds and is available in three sizes ranging up to 1,048,576 characters of information. Its memory is interleaved up to four ways to obtain increased performance. (For more information, designate #41 on the Readers Service Card.)

SEL 800 SERIES / Systems Engineering Laboratories, Inc. — The smallest machine in the series, the SEL 810, is a 16-bit binary unit capable of executing up to 60 instructions. In the medium scale is the SEL 840 (shown at the right), which has a 24-bit capacity and the capability of executing 91 instructions. Both have 4096 word basic storage capacity and hardware multiply and divide capability. All silicon monolithic integrated digital circuits are used in place of discrete component (either full size or micro-miniature) circuits. This type of circuitry significantly increases the reliability of the machines, which have a full cycle time of 1.75 microseconds and fully parallel operation. New SEL integrated circuit card, shown at left of lower right photo, is one-fourth the size and does the same work as the old discrete component circuit board that it replaces. (For more information, designate #42 on the Readers Service Card.)



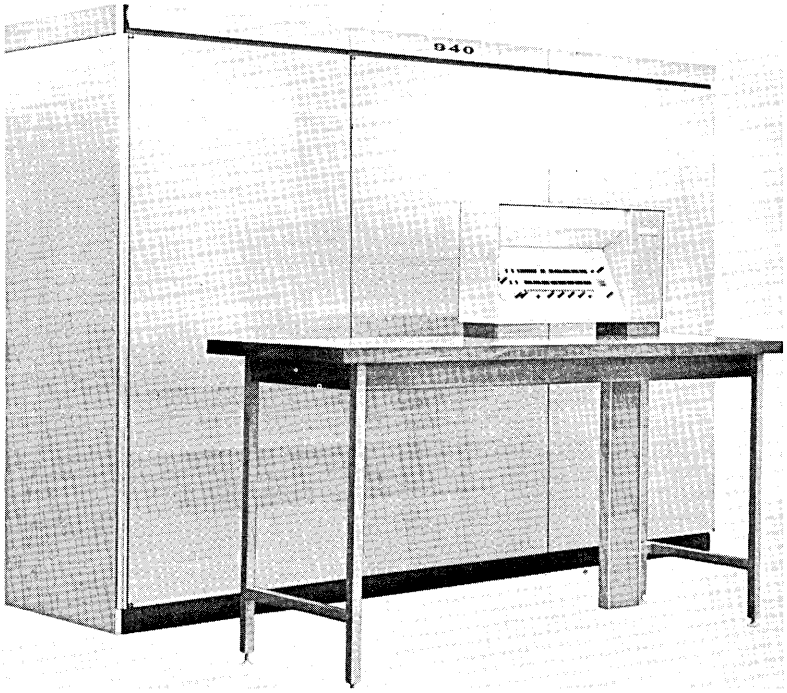


WYLE SCIENTIFIC / Wyle Laboratories — This desk-top system, with unlimited stored-program automatic input, is designed for complex problem solving in fields ranging from science to education. Problems are programmed through the Programmed Automatic Card input system and fed into the computation center at a speed of eight operations per second. The Scientific has three storage registers. Contents of the registers are displayed at all times on an eight-inch cathode-ray tube screen and may be edited or corrected by pushing a correction key. Numbers are entered on a standard ten-key board, with an eleventh key for the decimal point. The Scientific does not require special computer "language" and the operator can master operation in less than two hours. (For more information, designate #46 on the Readers Service Card.)

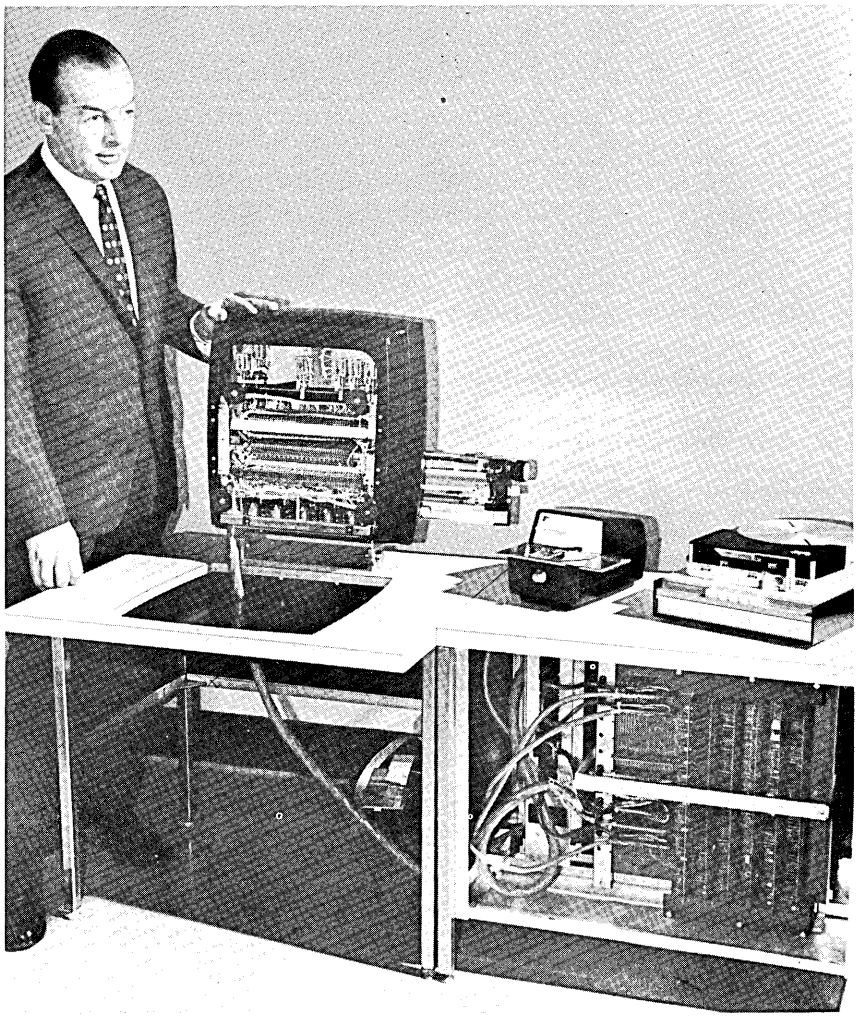


GE-115 COMPUTER SYSTEM / General Electric Company — Smallest of General Electric Computer systems, this GE-115 is being checked out by test engineer Dan Hoesch at G. E. Computer Department's headquarters. The configuration includes (l to r) a 300-line-per-minute printer, central processor with 8,000-word memory and 8-microsecond memory speed, and 300-per-minute card reader. Designed for small punched-card data processing applications, the 115 may be switched over to remote-terminal operation and linked by communications lines to larger central computers when computing needs exceed system capacity. (For more information, designate #45 on the Readers Service Card.)

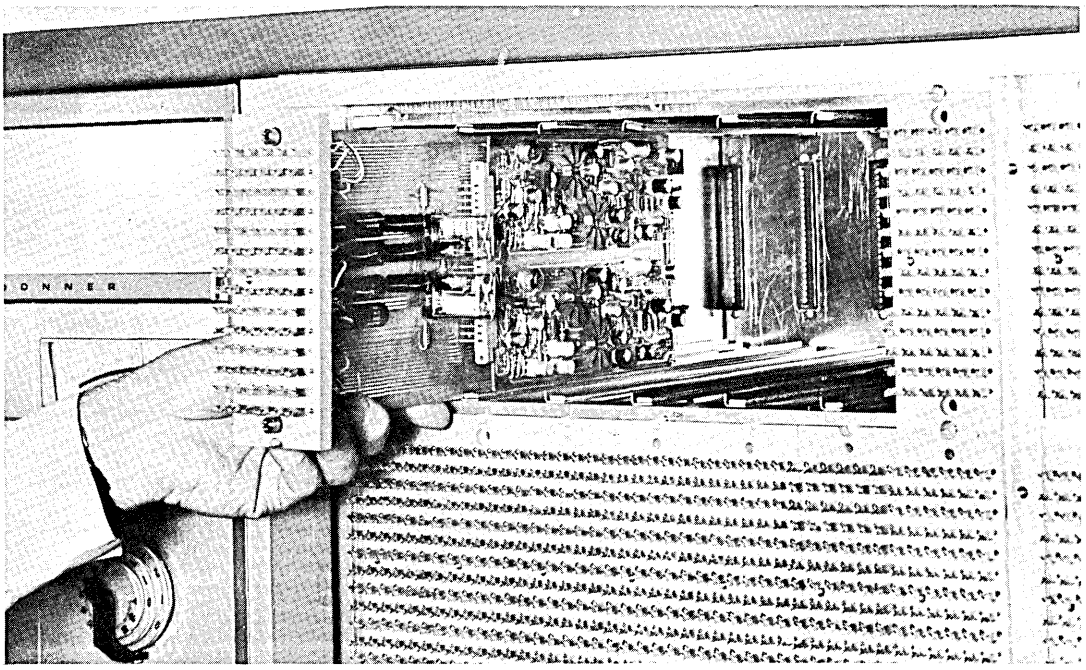
SDS 940 TIME SHARING COMPUTER / Scientific Data Systems — All aspects of time sharing are featured in the SDS 940 including multi-programming; real time processing; on line, remote data processing; and simultaneous access by several users of the central computer. Memory cycle time is 1.75 microseconds with memory expandable to 65,536. The computer has a 24-bit word size and 48-bit capability for floating point arithmetic. The flexibility of the SDS 940 programming system allows it to be used either by untrained operators in a conversational mode or by highly skilled programmers. (For more information, designate #48 on the Readers Service Card.)

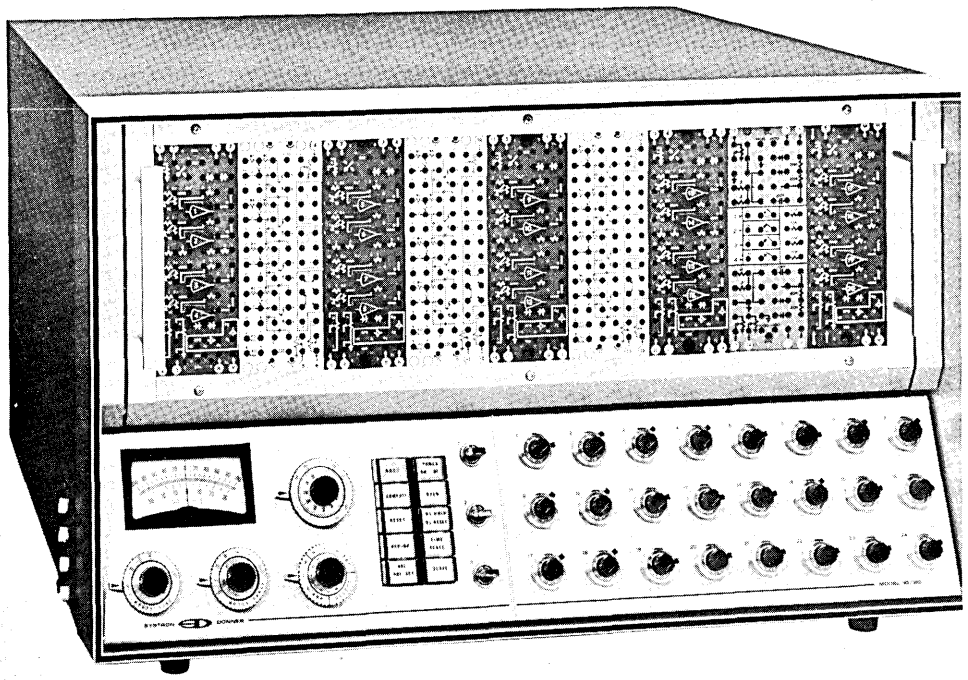


TYPETRONIC 2816 / SCM Corporation — A high-speed automatic system utilizing punched paper tape and edge punched cards to imprint repetitive data on business documents. It permits the manual typing of variables by an operator, and also can be programmed to record all or part of the data on punched tape or cards for subsequent re-use. Service accessibility features of the data processing equipment is demonstrated in the photograph by President Emerson E. Mead. The input-output printer of the system tilts up and a removable panel provides easy access to the solid state master control module. The typical system shown here consists of a solid state electronic master control module, input-output printer, a tape and edge punched card reader and a tape punch. (For more information, designate #47 on the Readers Service Card.)



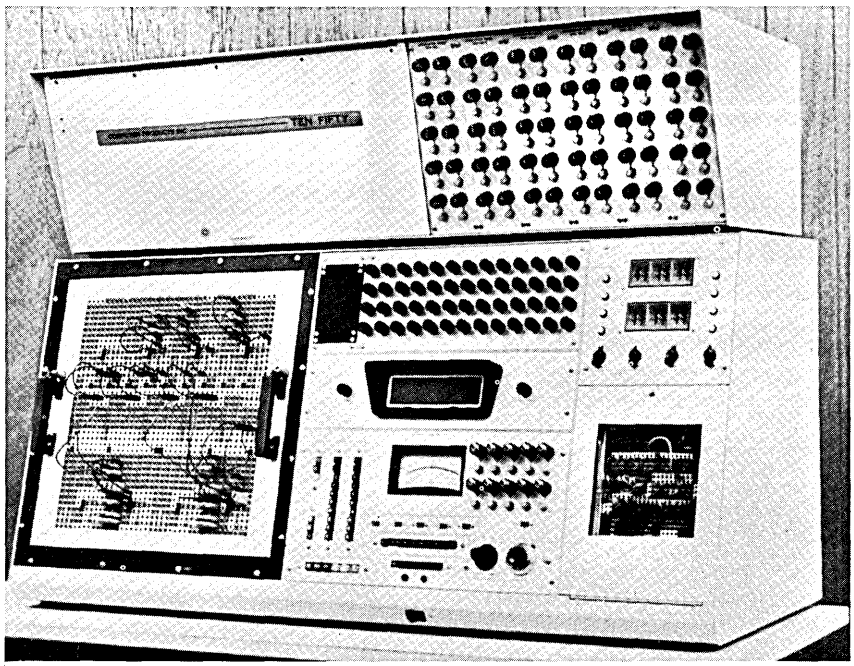
ANALOG COMPUTERS

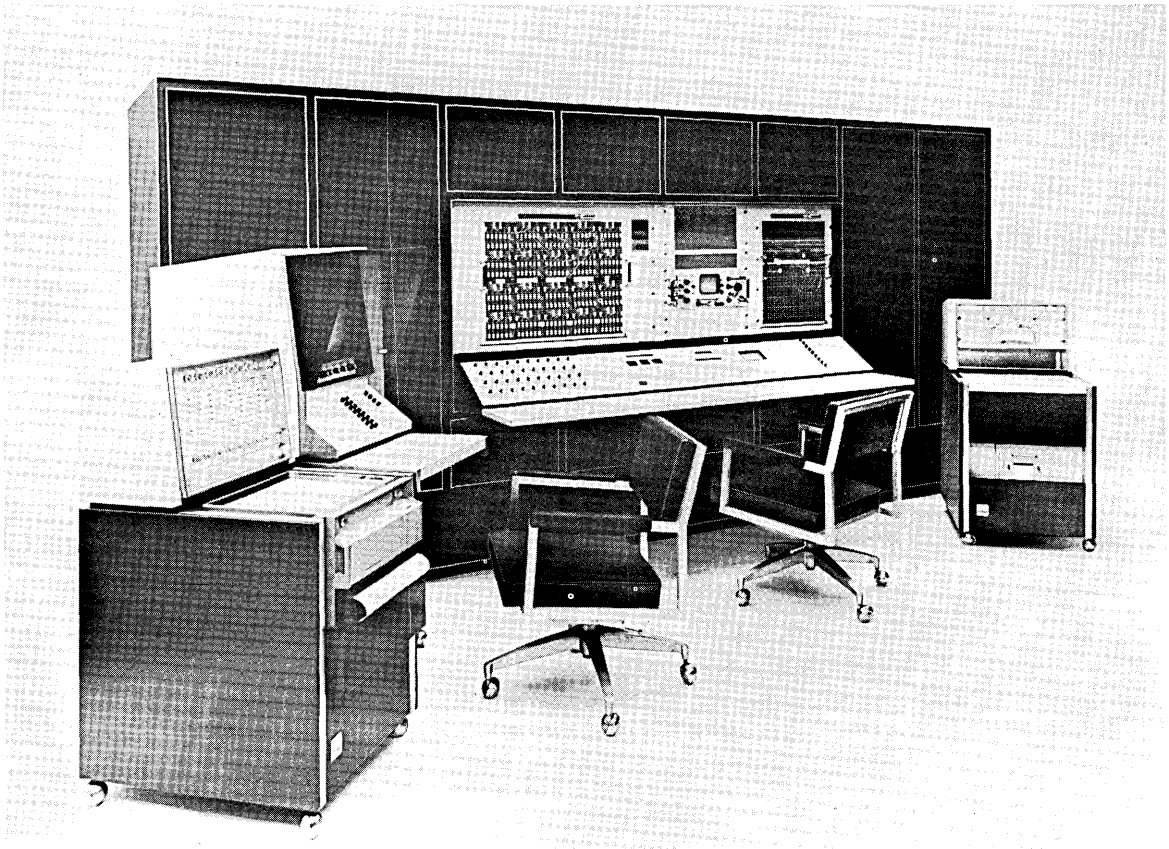




SYSTRON DONNER ANALOG COMPUTERS / Systron Donner Corporation — The picture (at the top of the page) shows a plug-in Dual Summer module being inserted into the modular, pre-wired patch bay of a Systron-Donner SD 80 Analog Computer. Four other plug-in computing modules perform all the required linear and non-linear computing functions over a full ±100 volt operating range. The SD 80 computer can be fully expanded to 84 operational amplifiers and can include plug-in digital logic modules for hybrid expansion, which are inserted in the same manner in the universal patch bay without any increase in size of the basic computer. The SD 80 is the largest in a series of ±100 volt, solid state desk-top analog computers. Smaller versions are an SD 40 computer and an SD 10/20 series computer. The SD 10/20 (shown above) features a removable problem board, ±.01% component accuracy, complete short circuit protection, and full iterative flexibility. Designed for expansion, to 20 amplifiers, the design permits full trade-in to an SDS 40/80 series for expansion to 84 amplifiers. (For more information, designate #49 on the Readers Service Card.)

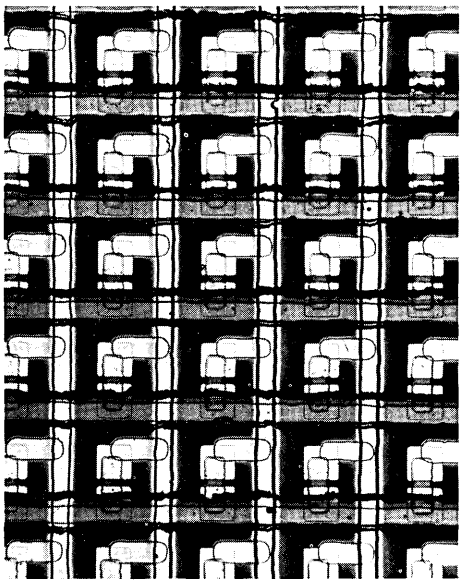
CP 10/50 ANALOG COMPUTER / Computer Products, Inc. - This 10-volt analog computer has been developed to bring maximum reliability and high computing power within budget range of laboratories and schools in process control, aerospace, biomedical and other research and engineering fields. The desk-top device offers high-speed three-mode electronic mode control (EMC) for repetitive and iterative solutions and internal logic control. It can be linked to external digital computers to give full-scale hybrid computation. The CP 10/50 is fully pre-wired and can be expanded to 50 amplifier channels by adding plug-in modules. (For more information, designate #50 on the Readers Service Card.)



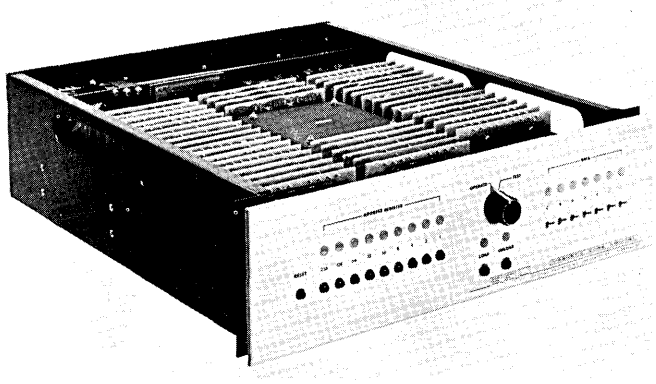


MODEL 4100 ANALOG COMPUTER SYSTEM / Milgo Electronic Corporation — This high accuracy 100-volt computer has a sub-system called ACCESS (Analog Computer Command Entry Sub-System) which facilitates hybrid techniques and enables command entry and control of all operation elements within the computer. It accepts commands from paper tape, magnetic tape, digital computer or keyboard. The same Milgo computer is used by IBM Federal Systems Division, Huntsville, Ala., in connection with their contract with NASA Marshall Space Flight Center on the Saturn program. (For more information, designate #51 on the Readers Service Card.)

MEMORIES

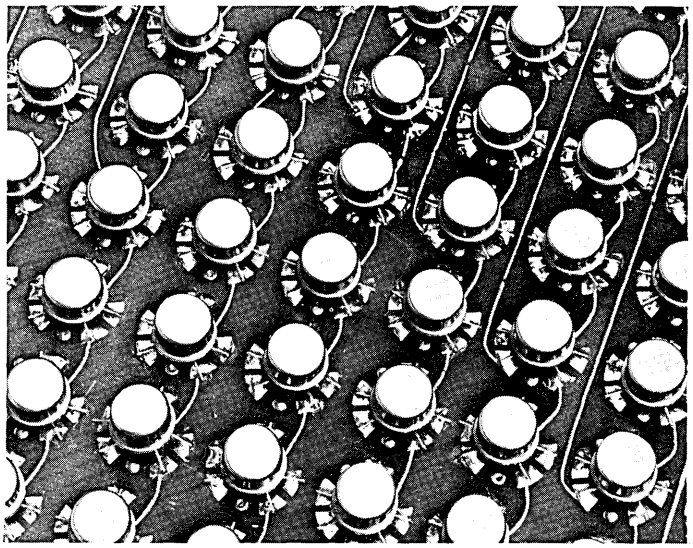


THIN FILM MEMORY / Autonetics, a division of North American Aviation, Inc. — By depositing thin films of silicon on sapphire, Autonetics has developed a low-cost, micro-miniaturized fixed memory. The process allows for more than 100,000 diodes per square inch. A total of 676 bits or diodes are contained in the 1/16-square inch sapphire wafer shown in the photo at upper left. Conductors fan out to wide interconnection pads at the periphery of the wafer. The connector lines form a grid pattern around diodes and pads in fixed memory matrix, shown below left. The diodes are the inner rectangles which have dark bands (PN junctions) through their middle. (For more information, designate #62 on the Readers Service Card.)

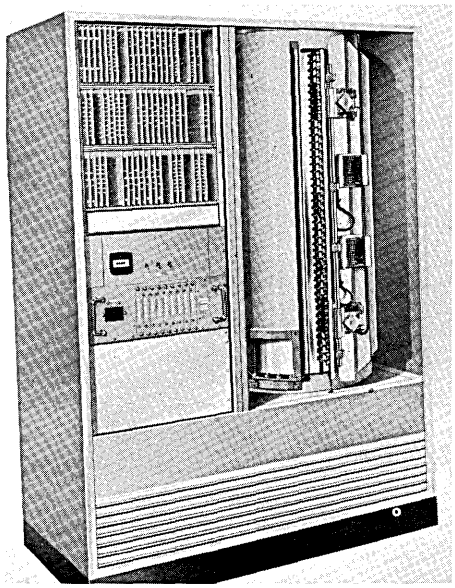


SEL MEMORY SYSTEMS / Systems Engineering Laboratories, Inc. — Silicon monolithic integrated circuits are used in SEL's new series of magnetic core memory systems. SEL memories have a full cycle time of 1.50 to 1.75 microseconds, with storage capacities from 128 to 8192 words for the basic unit. Access time is 600 nanoseconds for read or read/restore operation. Addressing methods available are random access, sequential, sequential/interlace and combinations of these methods. Standard logic levels are nominally 0 and +2 volts. (For more information, designate #58 on the Readers Service Card.)

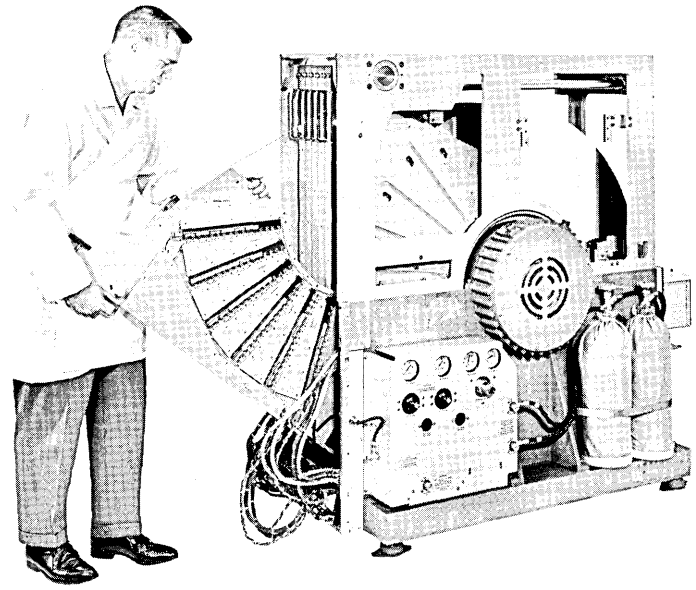
MONOLITHIC INTEGRATED CIRCUIT MEMORY / The Bunker-Ramo Corporation — This 200-nanosecond monolithic integrated circuit memory was fabricated as a scratchpad under a company-sponsored research program. This effort is now being extended to the development of a low-power guidance computer memory for aerospace applications under a government contract. Emphasis is being placed on the use of metal oxide semiconductors (MOS) and batch fabrication techniques for economical production. A 1000-word, 30-bit, 2-usec MOS memory will be developed and a conceptual 2000-word memory will be designed on paper. The MOS memory cell constructed at the Canoga Park facility exhibits write and read times of 50 nsec and 20 nsec respectively and dissipates less than 100 microwatts. (For more information, designate #53 on the Readers Service Card.)



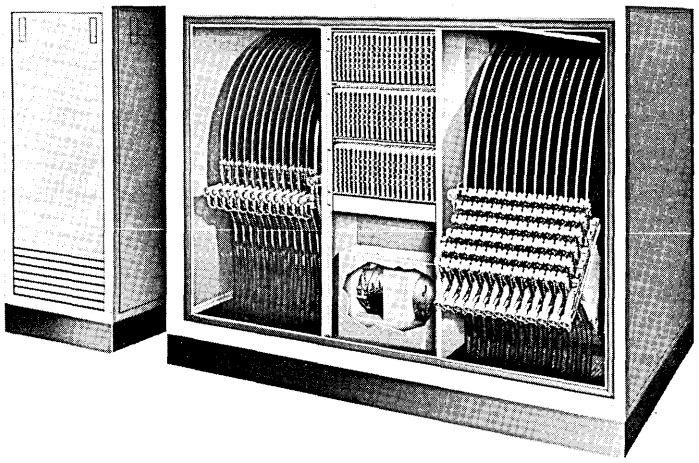
PhD-170 - POSITIONING HEAD DRUM / Bryant Computer Products, Division of Ex-Cell-O Corporation — This rotating magnetic drum uses positionable write/read heads to provide independent, simultaneous random write/read access to 172,800,000 bits stored on its 2752 tracks. The PhD-170 provides up to four computer channels each with 43 heads operating simultaneously. Each channel operates independently of the others and has access to all 2752 tracks on the drum. Using multiple positioners, two, three, or four heads can gain access to the information in the same track at the same time. This means that track-to-track access time to the data stored is limited only to electronic switching and latency time. (For more information, designate #61 on the Readers Service Card.)



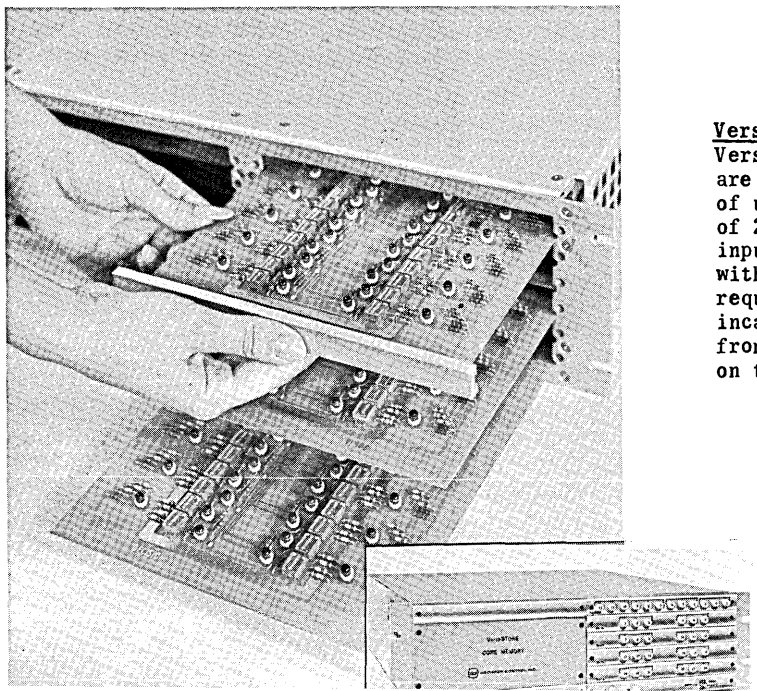
RAM®, RANDOM ACCESS MEMORY SYSTEM / Potter Instrument Company, Inc. — The new dual-cartridge RAM®, identified as Model TLM-4550, offers the same on-line capacity and performance capabilities intrinsic in the basic single-cartridge RAM, but provides important additional operational flexibility. Since the new machine is equipped with two Tape Pack cartridges, it now is possible to copy partial or entire data content from one cartridge to the other, eliminating the necessity for two machines where the on-line capacity of one is adequate. Each cartridge comprises two rows of four magnetic tape loops. The machine provides 50.2 million bits of on-line capacity equally divided between the two cartridges. Average access time is less than 90 milliseconds, including both head positioning and average latency time. Data transfer rate is 600 KC/S. (For more information, designate #52 on the Readers Service Card.)



LIBRAFILE 4800 MASS MEMORIES / General Precision/Librascope – These new mass memories are available in a basic 6-disc configuration with a storage capacity of 400 million bits, a data transfer rate up to 150 million bits per second, and an average access time of 35 milliseconds. By combining 16 files on a single trunk line, an on-line storage capacity of 6.4 billion bits can be achieved. With special electronics, a data transfer rate of a billion bits per second is available. In the picture, a technician retracts mounting plates of LIBRAFILE 4800 mass memory. The retractable plates permit easy maintenance. (For more information, designate #59 on the Readers Service Card.)



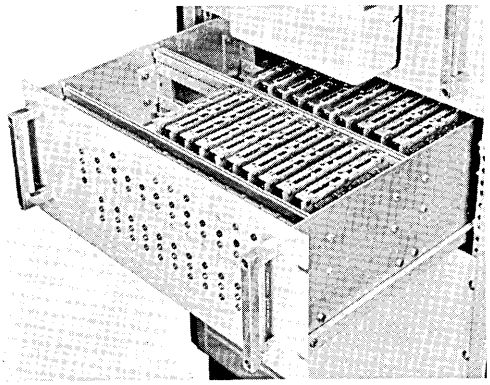
MODEL-2 SERIES 4000 DISC FILES / Bryant Computer Products, Division of Ex-Cell-O Corporation — Model-2's have a capacity in one unit up to 1.6 billion bits and are all equipped with self-contained environmental control. They can be furnished with a Dual/Rapid random access head positioning system that permits independent operation of the two sides or disc file modules and greatly increases programming flexibility and access time. One head position system can be used to select tracks in a random mode while the other is selecting tracks sequentially. One module of the file can be used with one computer while the other works simultaneously with another computer. (For more information, designate #60 on the Readers Service Card.)

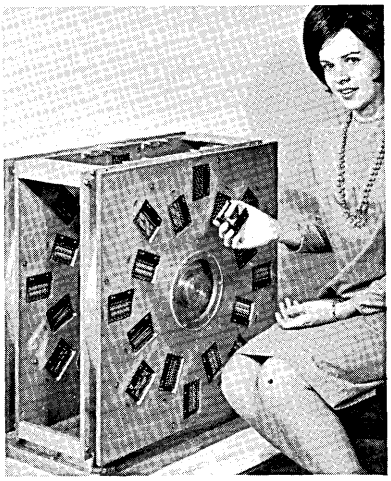


VersaSTORE MEMORY SYSTEMS / Decision Control Inc.— VersaSTORE Integrated Circuit core memory systems are available in capacities of 128 to 4096 words of up to 24 bits. The devices operate at speeds of 2 usec. full or half cycle with flexible signal input and output levels ranging from 3v. to 12v. with both PNP and NPN interfaces available. Power required is ±12v. A unique feature is a continuous incandescent lamp display of all registers on the front panel. (For more information, designate #56 on the Readers Service Card.)

RCA MF2100 MONOLITHIC FERRITE MEMORY MODULE / Radio Corporation of America, Electronic Components and Devices — This module consists of a plane 4.5" x 3.75" x .22" thick, containing two monolithic storage arrays, an integrated silicon-diode selection matrix, and all internal interconnections, as well as terminals for external circuit connectors having standard 50-mil center-to-center contacts. The storage arrays are solid monolithic ferrite wafers approximately 1 inch square and 5/1000 inch thick. Each wafer contains 4096 "virtual cores" with an effective diameter of only 5 mils each. The extremely small size of these "virtual cores" permits the MF2100 to provide a full READ/DELAY/WRITE cycle time as short as 200 nanoseconds and output voltages equal to those of conventional core arrays, at driving currents substantially less than those required by present small-core, coincident-current memories. (For more information, designate #57 on the Readers Service Card.)

MODEL 201 NUMERICAL CONTROL SYSTEM MEMORY / Westinghouse Defense and Space Center — Model 201, a modular unit which is housed in a seven-inch-high drawer, performs the same function, when used with a single-line reader, that previously required a block reader. The device's advantages are derived from its flexibility. Inputs can be in the form of slow-speed mechanical or high-speed photocell signals, and it can be adapted to any level of input power. Memory circuits can be closed by either logic signal level or contacts. The solid-state, expandable memory stores binary-coded-decimal, decimal, or any standard code. Control logic speed of the memory is fast enough to use with the highest speed reader presently available. (For more information, designate #55 on the Readers Service Card.)





L-400 MAGNETIC-DISC MEMORY SYSTEMS / General Precision/Librascope — Series L-400 consists of two models: the L-414, a single-disc memory file and the L-424, a two-disc memory file. Both models feature a flying-head per track and a non-wearing, plated-cobalt recording surface. They are self-contained systems ready for "plug-in" operation with computerized communications or control networks. The memories also are designed for use as original, on-line equipment in commercial or military computer systems. The photo on the left shows an L-424 disc memory which provides storage for more than 27 million bits of information. Shown at the right is the phonograph-like disc, which measures 24 inches in diameter, undergoing tests prior to assembly as the heart of high-capacity memory system. The disc can store nearly 7 million bits of information on either of its magnetically coated surfaces. (For more information, designate #54 on the Readers Service Card.)

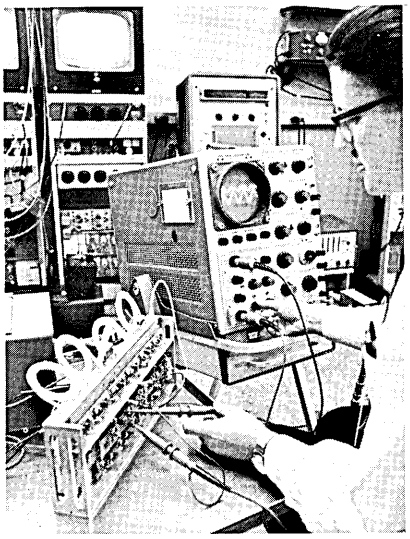
DATA TRANSMITTERS AND CONVERTERS

PULSE CODE MODULATION (PCM) SYSTEM / Bell Telephone Laboratories — This experimental pulse code modulation (PCM) system transmits 224 million bits per second over coaxial cable. The system converts television, voice, and data signals into a stream of digital pulses capable of being transmitted over transcontinental distances. This system includes circuitry for simulating the timing jitter (the smearing out of pulses in time) introduced by 4000 miles of line. Signals can be taken from the digital stream and new signals can be added as desired along the route.

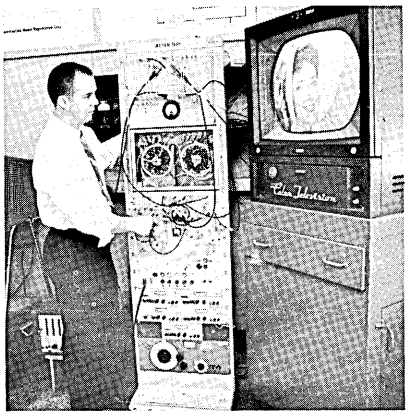
A PCM system samples the amplitudes of analog signals many times a second and represents these samples by groups of pulses. Streams of pulses representing various types of signals can be interleaved in time and transmitted over the same path. These pulses, which suffer distortion and attenuation during transmission, are regenerated by repeaters spaced along the transmission line. At the system's receiving end they are restored to their original analog form.

The system's transmitting terminal includes: (1) a television coder and auxiliary circuitry that converts samples of the analog signal, taken at more than 12 million times per second, into a 111 million-bit-per-second pulse stream; (2) a mastergroup coder and auxiliary circuitry that produce a 55 million-bit-per-second pulse stream; and (3) multiplexing equipment for combining these signals with two T1 signals and the output of a random pulse generator (simulating high-speed data). The multiplexer also inserts control bits in the high-speed pulse stream.

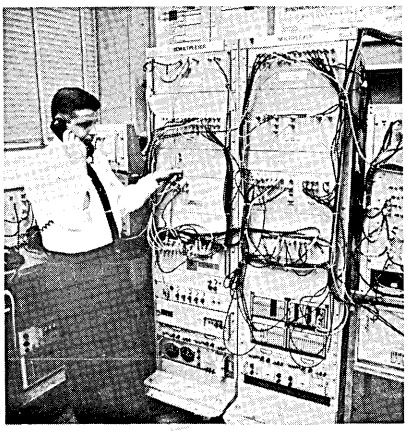
The receiving terminal includes equipment for reducing the jitter to tolerable proportions. The jittered pulse train is written into a digital store and read out at a smoothed rate, controlled by an oscillator locked to the line rate. The receiving terminal also contains demultiplexing equipment and the decoders which reconstruct the original analog signals. (For more information, designate #68 on the Readers Service Card.)



Veikko Saari of Bell Telephone Laboratories tests a laboratory model of a solid state coder. Such a device changes analog information to digital information for transmission over the experimental high speed PCM system.

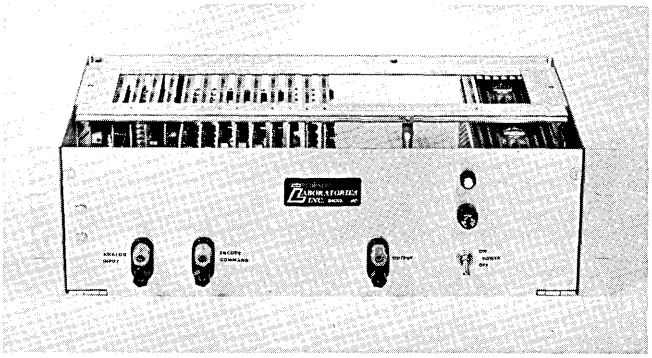


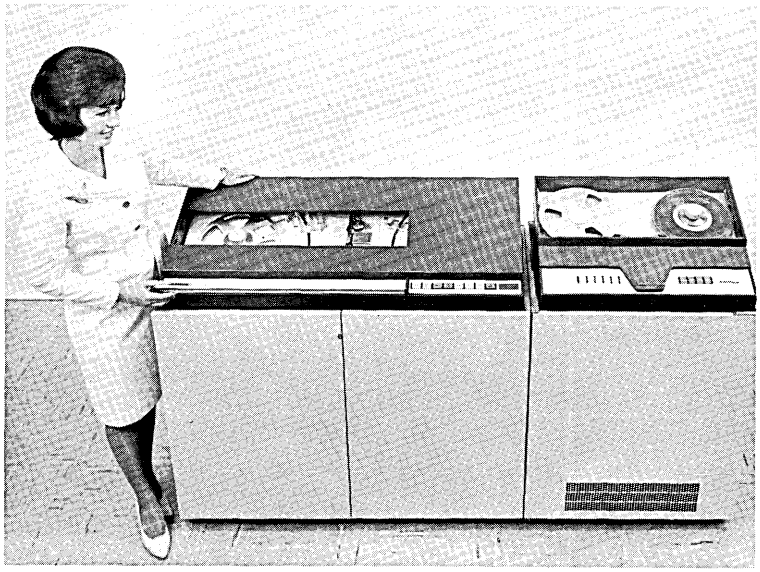
This equipment simulates the jitter (the smearing out of pulses in time) that would accumulate in a 4000 mile long pulse code modulation system. John Mayo of Bell Laboratories observes the effect of this jitter as it is automatically compensated for in the experimental high speed PCM system. The television picture on the screen is transmitted without distortion because of the "de-jitterizing" circuit.



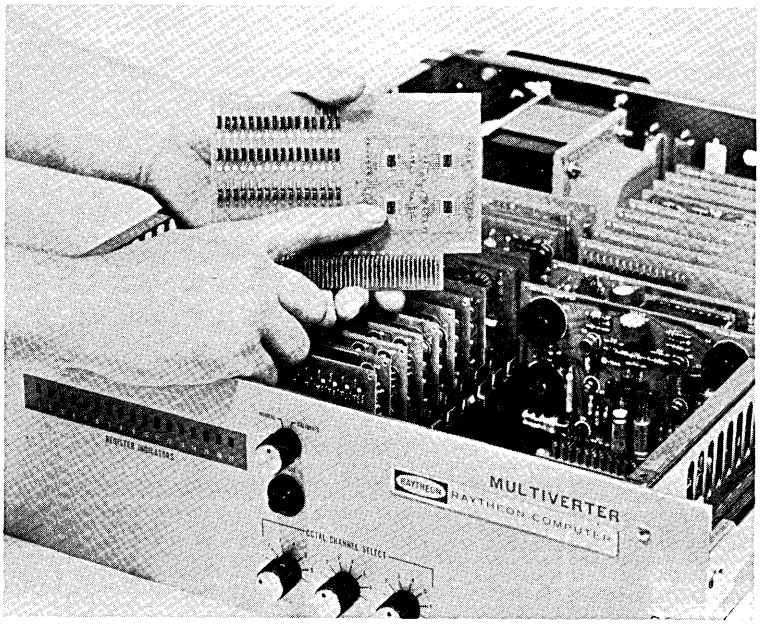
William Ballentine adjusts control on demultiplexer of experimental high speed PCM system designed at Bell Telephone Laboratories. The demultiplexer accepts a pulse stream of 224 million bits a second and separates the stream into component streams representing television, voice and data signals.

ANALOG TO TELETYPEWRITER DATA TRANSMITTERS / Towson Laboratories, Inc. — The unit consists of an analog to digital converter with an output code format suitable for operating standard teletypewriter printers and paper tape punches. The devices permit remote measurement of inventory or process operations using established telegraph facilities and equipment. Single or multiple input channels can be accommodated. Models are available to operate either 5 level Baudot or 8 level ASC II printers with numerical print-out and spacing operations. High speed models are available for computer data entry; standard units of this type provide bit rates up to 12,000 per second. Shown is the Model DT102, an 8 level ASC II code unit for use with Model 33 or 35 Teletype printers. (For more information, designate #64 on the Readers Service Card.)





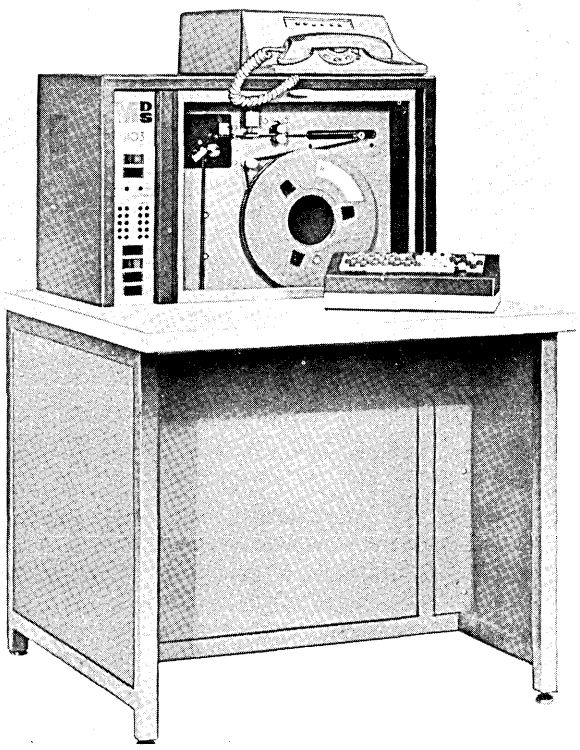
AMPEX PTS-1000 / Ampex Corporation — This new off-line system converts computer data from punched paper tape to magnetic tape, without tying up a computer. Capable of reading 1000 characters per second from 5, 6, 7, or 8-level punched paper tape, the PTS-1000 can convert data into IBM-compatible magnetic tape in any code format by following edit-instructions programmed in with the paper tape. Models are available to convert data on the currently used 7-channel magnetic tape or new 9-channel ASCII format. (For more information, designate #63 on the Readers Service Card.)



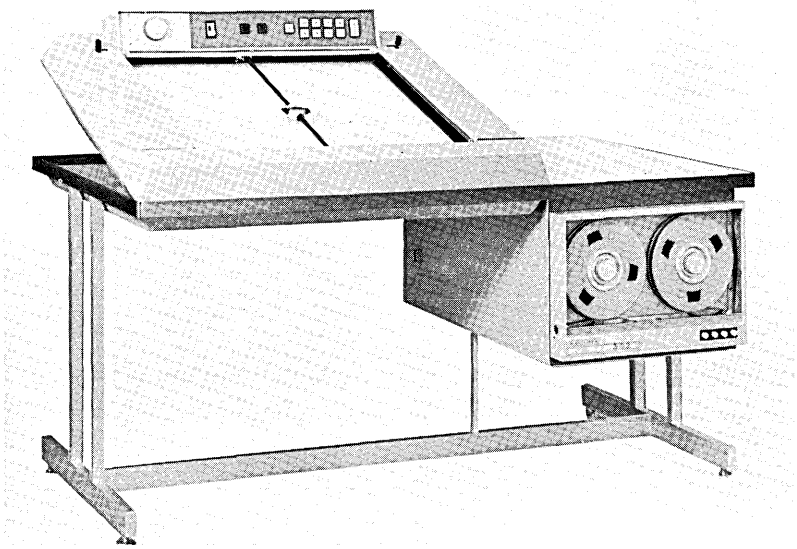
MULTIVERTER® DATA SYSTEM / Raytheon Company — The Multiverter® "data system in a box" combines in a single chassis an integrated circuit multiplexer, an advanced sample and hold amplifier, and an analog-to-digital converter. Included in the system are timing, sequencing and control logic. Operation of the Multiverter data system can be in either sequential or random address modes. In addition, "manual" or "calibrate" mode control switches have been provided for calibration and dynamic tests. (For more information, designate #66 on the Readers Service Card.)

DATA TRANSMITTERS AND CONVERTERS

MDS 1103 LDC DATA-RECORDER / Mohawk Data Sciences Corp. — The 1103 will originate, verify, transmit and receive data ... all on magnetic tape. It is designed for use with standard modems and transmissions systems. The device uses standard modems (Bell System 202C or equivalent); provides asynchronous operation at speeds up to 1200 bits per second on standard commercial circuits; uses ½" computer magnetic tape NRZ recording. (For more information, designate #65 on the Readers Sercice Card.)



MODEL 302 ANALOG PLOT DIGITIZER / CALMA Company — This device converts analog graphical information to coded digital tape for digital computer processing and analysis. Incremental coordinate data is generated without potentiometers or analog-to-digital voltage converters. The Model 302 has a 500 character/second, 556 bpi output incremental tape recorder and an overall maximum digitizing speed of 125 inches of analog plot per minute. (For more information, designate #67 on the Readers Service Card.)



Designate No. 6 on Readers Service Card ——→

How Operating System/360 can help you do more work per day

Operations Managers—More

throughput at no extra cost. Operating System/360 will release the full power of your computer to handle, efficiently, both scientific and commercial processing.

It will increase your work throughput measurably... and give you full time computing.

It will release your top-flight programmers from time-consuming trivia—let them use the full run of their ability—create more productive programs, by virtually eliminating the need for them to design "systems" functions.

Operating System/360 provides five versatile high-level languages. It minimizes concern about input/output device assignments—they're all done by the computer.

It reduces testing and debugging of new programs through built-in test features... releases your people from preparing often-used routines by providing a host of IBM created service and utilities programs, providing standard conventions that pave the way for standard communications that eliminate many human errors often caused by a lack of these standards.

Your company's programs will "live" longer because they can be easily updated, modified and tested.

Your computers will run continuously—thanks to automatic job scheduling.

Your computer will offer rapid job turn-around. You will get more jobs through per day.

You will be able to run many jobs concurrently with each job sharing the system's total resources.

You can run concurrent peripheral operations too. You can print on-line without tying up your precious central processor or carrying tapes to and from off-line systems.

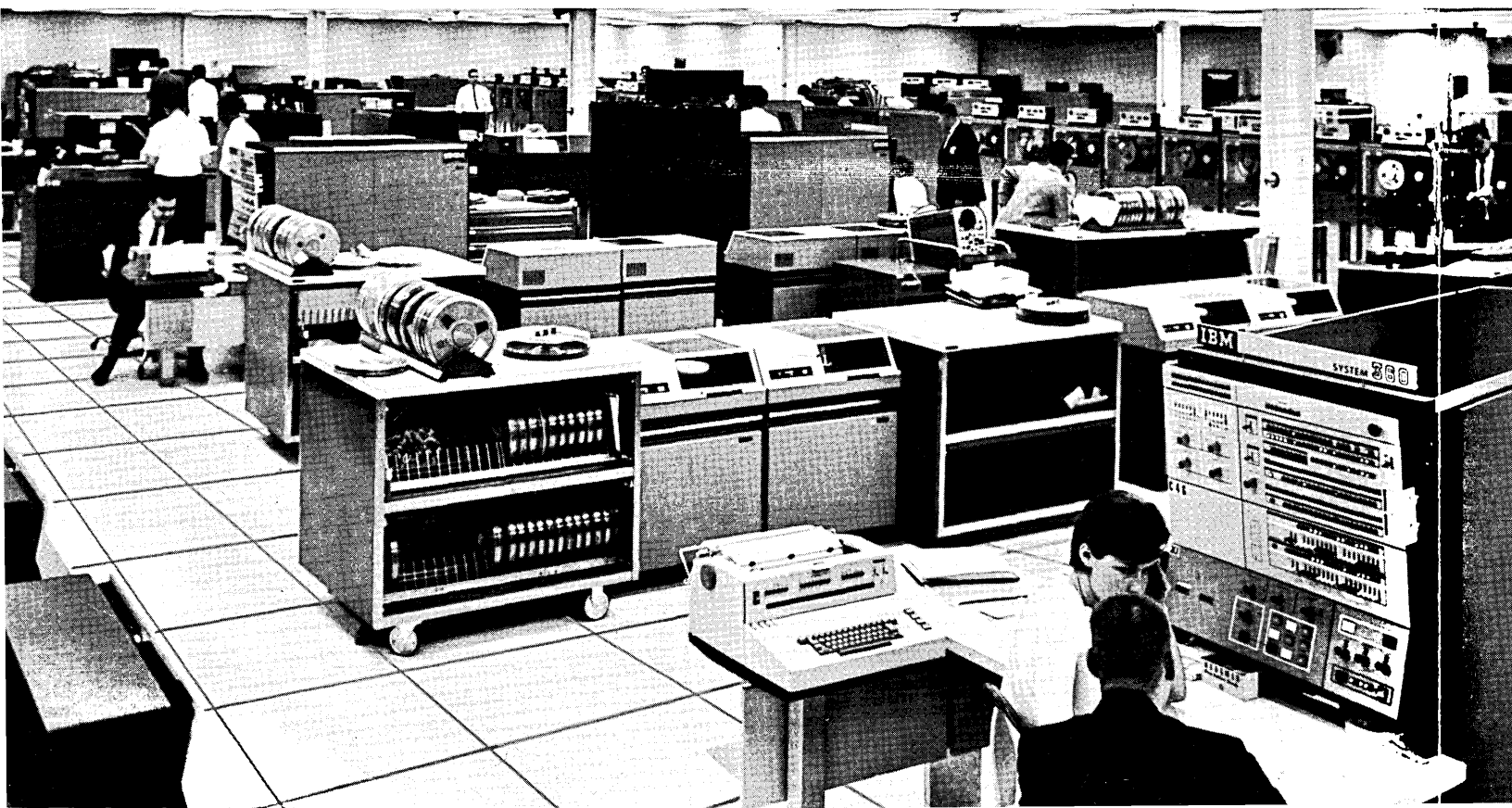
Your special jobs can be run at any time through a high priority coding that enables them to go to the top of the work input queue—and the interrupt can be a simple query or a big, complex processing job.

Programming maintainence, which may take 15% to 25% of your best people's time, is greatly simplified and takes less time because of system conventions—even when one person maintains programs written by someone else.

Your large programs can be divided into smaller sections, then overlayed to conserve valuable main storage space. This allows complex jobs to be done in a small machine.

And because of these and many other features of Operating System/360, all your jobs get rapid turn around—you get increased system throughput, you process more jobs per day, more efficiently.

Operating System/360 was born in this half acre room. This is one of the largest concentrations of computing power in the world—two SYSTEM/360 Model 30's, ten Model 40's, one Model 50, one Model 60, three IBM 1710's, four 1401's and a 7094. Eventually there will be close to 300 input/output units as well as special equipment.



Installation Managers—Process more jobs with faster job turn-around.

Operating System/360 will help you make full use of your computer and the people that run it. You'll be able to provide better service to more people in your company with the fastest job turn-around possible.

You'll be able to stack your jobs, have them run one after the other with immediate job-to-job transition—automatically.

Multitask control will enable you to get many jobs on the system at one time, even unrelated jobs. You'll have real efficient use of big-system ability.

Machine operators won't be bothered with time consuming bookkeeping—this manual job accounting is done automatically.

Computer idle-time will be greatly minimized: you'll have fewer setups and program loadings... standard operator methods and standard formula for job instructions... less human intervention, fewer errors.

You'll have a standard way to store and recall programs from the systems library.

You'll get much needed help in keeping track of data on tape reels and disk packs.

And with rapid test results, you'll save valuable programming time. You'll be able to add new applications without changing existing programs.

Now, you'll take full advantage of device independence. A single program can use card, tape, disk, or drum storage without rewriting.

You'll realize a rock-bottom minimum of personnel retraining and study time in order to meet demands of new applications or new system configurations.

And for the future you can grow right along with your installation expansion without rewriting programs.

Programmers—Create your best programs.

You'll have the benefit of five highly versatile languages to work with—FORTRAN, COBOL, PL/I (Programming Language/One), Assembler, and RPG (Report Program Generator). Now you'll have the right language for the right job.

There's a complete list of Service Programs like Sort/Merge, for fixed or variable length records in ascending or descending order, while using one or more storage devices... Linkage Editor for combining individual segments of programs that were individually compiled or assembled... Utilities for transferring data from one storage medium to another, editing and updating the system library, changing the indexing structure of the system library catalog.

You'll be free from scheduling input/output devices. Job control statements will call data and programs, and the computer will do scheduling and sequencing, automatically.

Operating System/360 will let you place data in the system library without a detailed location reference. Retrieval is accomplished by the system, automatically, through a simple symbolic notation.

You'll get test results back sooner, correct errors sooner, be on the air sooner.

Segmenting large programs for greater handling flexibility can help you by letting you divide large programs among two or more programmers.

System and installation growth will find your proved and tested programs still applicable.

SYSTEM/360—The Computer with a Future IBM®

Full time computing with these Operating System/360 programs

Control Programs

Supervisor,
scheduler
and data management
functions

Processing Programs

FORTRAN
COBOL
ASSEMBLER
PL/I
RPG

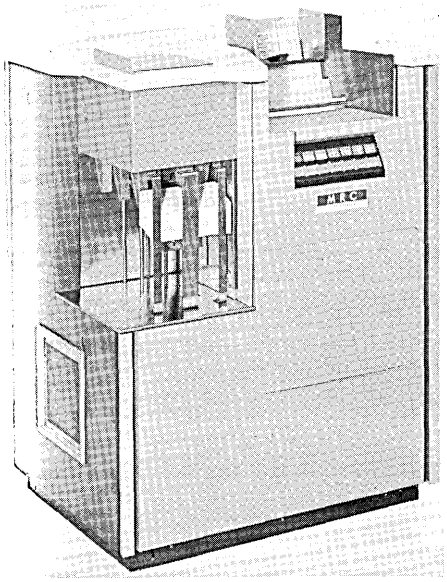
Service Programs

Linkage Editor
Sort/Merge
Testran

Graphic Programming Services

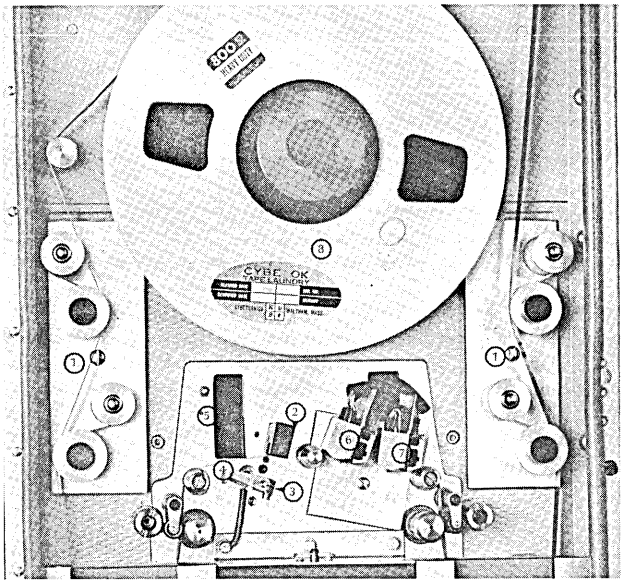
INPUT-OUTPUT EQUIPMENT

DATANET-760 KEYBOARD DISPLAY TERMINAL / General Electric Company — This device improves "conversation" between man and computer by providing a visual image of diagrams and designs as well as alphanumerical characters and symbols. The simple block diagram example (shown in photo at left) by DuPuy Cayce, data communications specialist, was communicated by a time-sharing system and portrayed from digital data extracted from storage in central computer memory. Such time-sharing capability enables users at many different locations to display the same information from the same source at the same time, when desired. (For more information, designate #71 on the Readers Service Card.)

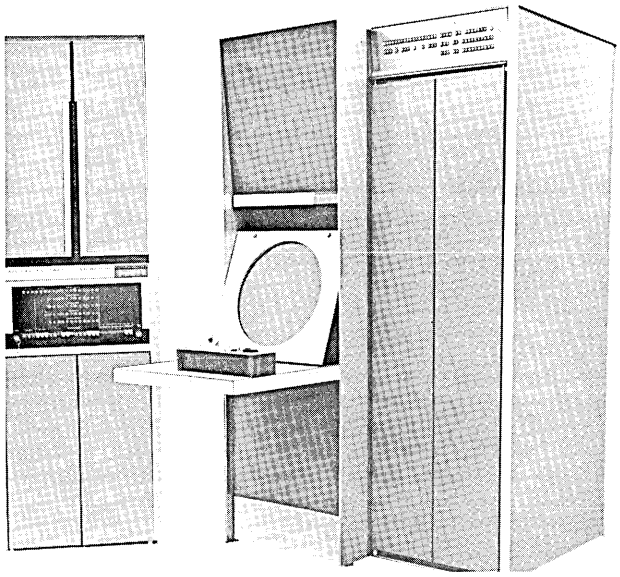


MCR 801 HIGH SPEED MARK SCANNER / Measurement Research Center, Inc. — The 801 can read up to 400 marked cards per minute while scanning both sides of the card at the same time. Additional versatility is offered through its ability to read punched holes and both sides of marked cards in one pass, and read alphabetic data from marks. When not being used as a mark scanner, it can be used as a standard card reader. The 801 is designed for use with existing magnetic tape computer systems and is installed with no appreciable systems changeover. The scanner transfers information directly from punched and/or marked card to the computer's magnetic tape system. One of the many unusual applications of this scanner enables programmers to write programs directly on cards using an ordinary lead pencil. Program changes can be made by simply erasing a pencil mark and making a new mark. (For more information, designate #82 on the Readers Service Card.)

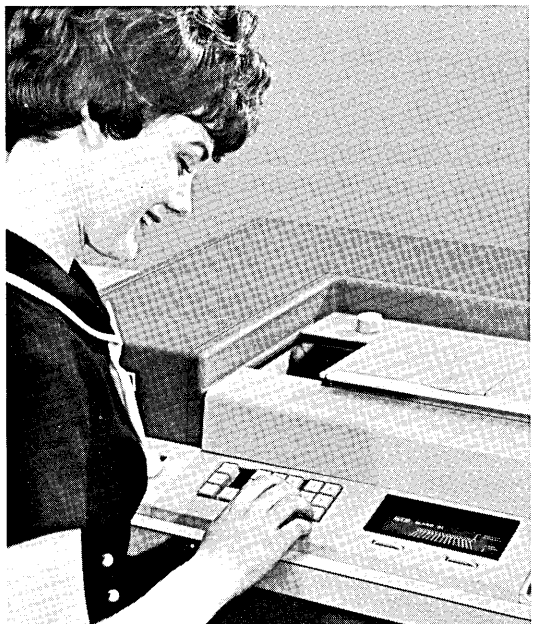
SC-1150M MILITARIZED TAPE TRANSPORT SYSTEM / Potter Instrument Company, Inc. — The SC-1150M is a high-speed, single-capstan digital tape transport capable of operating at bidirectional tape speeds to 150 ips at standard bit packing densities of 200/556 and 800 bpi with no program restrictions. The transport is a 7- or 9-channel compatible and can be used with new ASCII formats. Front access to all internal components of the system is provided for by mounting the transport on a hinged panel frame. The complete cabinet assembly accommodates all transport components, drive electronics, power supply and accessories that comprise the system. (For more information, designate #80 on the Readers Service Card.)



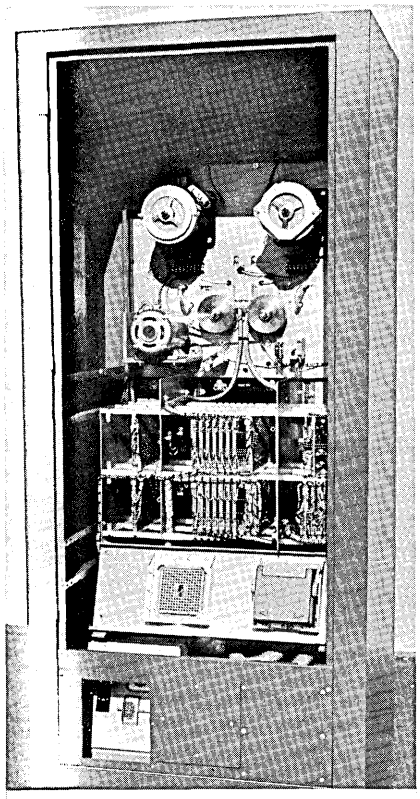
TAPE REHABILITATION SYSTEM / Cybetronics, Inc. — The Cybetronics CS-1 features high speed tape signal testing, buffing, cleaning and repair — all in one unit. It has automatic test and certify modes of operation. The CS-1 center certifies tape at 556 and 800 bpi with signal levels adjustable from 20 to 80% of full signal voltage. The picture shows the heart of a typical certifier system. It includes (1) the automatic cleaning stations before and after the certification area, (2) automatic scraping block with (3) actuator (4) work station area for manual tape inspection and repair, (5) parallel-focus inspection light for simple location of defects (6) signal and skew read/write head stack, (7) noise read/write head stack, (8) take-up reel featuring constant tension wind-per MIL W-T-0051. (For more information, designate #79 on the Readers Service Card.)



MODEL 338 CATHODE RAY DISPLAY SYSTEM / Digital Equipment Corporation — This device incorporates a small, high speed, general purpose computer as a buffer. Digital's Model 338 can be used both as a satellite to a larger computing system and off-line as a self-contained, self-generating display. The incremental CRT display will show a 0.15 inch spot on any one of 1024 x 1024 points in a 3-3/8 x 3-3/8 inch square. Random points can be plotted in 35 microseconds in the point mode. In the increment mode, up to 15,000 flicker-free points can be plotted at 1.5 microseconds per point. Vector mode provides up to 300 inches of vectors flicker-free, and the Character Mode allows the presentation of up to 1000 flicker-free characters. In Increment or Vector Modes, the distance corresponding to each increment is variable over 1, 2, 4, or 8 points, providing four possible character or symbol sizes. (For more information, designate #93 on the Readers Service Card.)



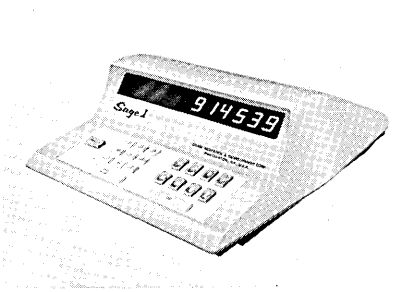
OPTICAL READER 420-2 / The National Cash Register Company — This new optical reader provides exclusive "on-line" technique for entering single characters with keyboard and magnified display of the entry line. The machine has a 16-key keyboard for re-entry of rejected characters and the entire reading process is controlled by six operating buttons. Internally programmable, the new optical scanner has automatic tape editing, 10-second tape change, selective line output, and four programs for variable output formats. Scanner reads 52 lines a second. (For more information, designate #81 on the Readers Service Card.)



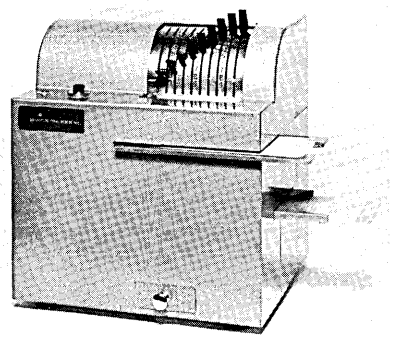
DATAMEC D3029 MAGNETIC TAPE UNIT / Datamec Division/ Hewlett-Packard Co. — This computer magnetic tape device shown at the left is "plug-in" interchangeable with the IBM 729-II and 729-V tape units. It offers computer system users the opportunity to replace higher cost equipment for on-line use with IBM computers. D 3029 performance characteristics, data rates and electrical inputs/outputs match the units supplanted. The physical plug connector is the same (as this rear view of the tape unit indicates). (For more information, designate #83 on the Readers Service Card.)

SPEED PUNCH 120 SERIAL CARD PUNCH / Uptime Corporation — This device can punch pre-coded data from a processor or receive data serially from a control unit, translate it into card code and punch in a column by column fashion at a speed of 160 columns per second, or 100 cards per minute if all 80 columns are punched. The SPEED-PUNCH 120 serial card punch has a card eject feature which increases the card rate, depending on the number of columns to be punched. Capacity of the input and output hoppers is 1000 cards. (For more information, designate #95 on the Readers Service Card.)

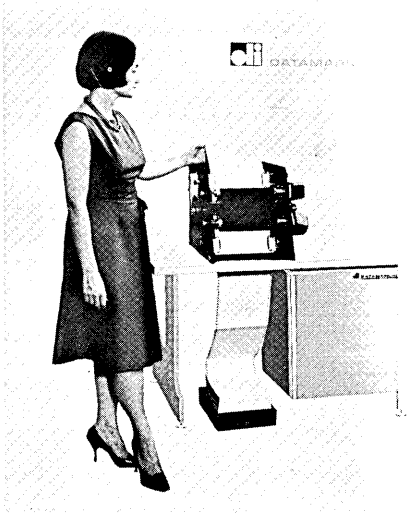
BR-90 VISUAL ANALYSIS CONSOLE / The Bunker-Ramo Corporation — The console is designed for use in data handling systems that require both off-line data manipulation and on-line man/machine communications. Keyboard buttons labelled in natural, problem-related terms actuate pre-programmed subroutines; the computer's response is in the form of alphanumerics or graphics on the CRT. Two new features of the BR-90 are stored program control and the rear-ported cathode ray tube (inset). In stored program control a basic processor within the console is used to perform all console functions. The rear-ported CRT allows the combining of electronic displays with photographic projects of fixed background data. Both electronic and photographic presentations are fully corrected; registration error is less than 1%. (For more information, designate #73 on the Readers Service Card.)



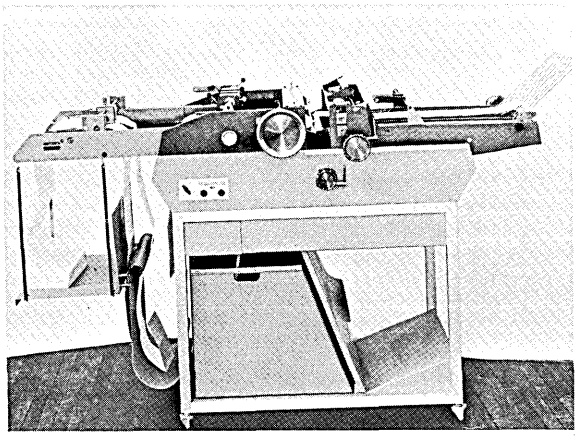
SAGE 1, ELECTRONIC CALCULATOR / Dero Research and Development Corp. — This low-priced electronic desk-top calculator is designed for general business use. Sage 1 uses a simplified 10-key keyboard, operates noiselessly, and performs computations in fractions of a second. The machine has a 20-digit capacity and results are displayed on a large, brightly illuminated screen. The Sage 1 memory enables storage and recall of entries or results, facilitating continuous calculations, and permitting the accumulation of products or quotients. No special instructions are required to learn to use the machine. Clear keys permit the correction of entries or the complete clearance of all registers. (For more information, designate #69 on the Readers Service Card.)



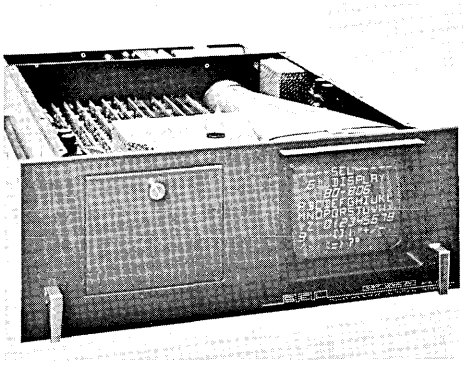
CARD READ- VARIABLE DATA PUNCH / Universal Time Punch, Inc. — A small modular unit requiring only a source of 115 volt, 60 cycle, electrical current, this 14 x 18 x 9" device can reproduce up to ten digits of numerical data from either a plastic 3-3/8 x 2-1/8 identification card or an IBM punched card which has been punched in Hollerith Code. The data can be reproduced into a second Tabulating Card, punching into and reading from fixed fields. In addition to the reproducing feature, an additional ten digits of numerical Variable Data can be punched using the Variable Data Levers. (For more information, designate #78 on the Readers Service Card.)



SERIES 300 LINE PRINTERS / Datamark, Inc. — Printers in the 300 Series are intended for the data communications industry and as an output device for small scale digital computers. They operate in the 300 lines per minute range. Two frame sizes are available; the smaller accommodates up to 80 columns, and the larger size accommodates up to 132 columns. The printer is supplied with a 64 character alphanumeric type font as standard; custom type fonts up to 128 characters are available on special order. It will operate with any data coding, including Fieldata. (For more information, designate #76 on the Readers Service Card.)

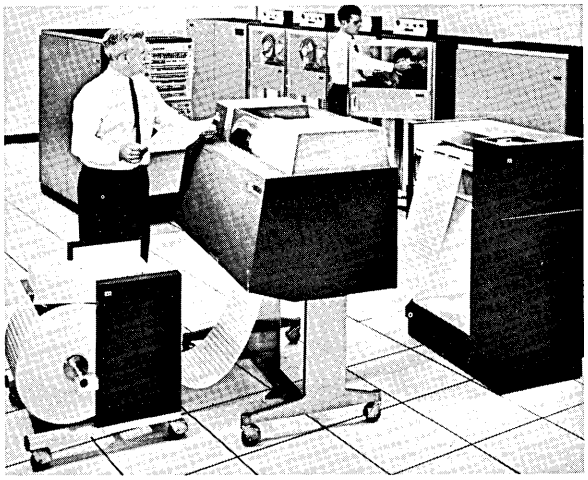


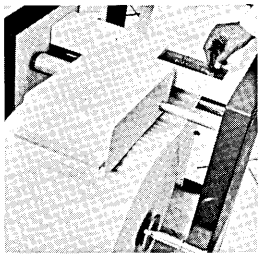
MODEL 310 INTERSTACKER / Moore Business Forms, Inc. — As forms are fed into the Model 310 Interstacker, they are midform slit so that two continuous webs of forms proceed toward a detacher infeed, one riding above and overlapping the other. The two webs are then pulled through the detacher section, and burst as a two-part form with alternate parts overlapping, achieving straight numbering or skipnumbering sequence as desired. The device is shown fitted to a Moore Model 400 Imprinter-Detacher. (For more information, designate #72 on the Readers Service Card.)

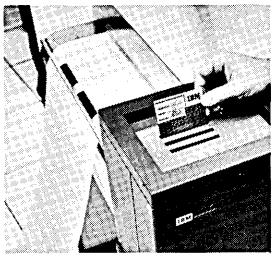


GENERAL PURPOSE 6-INCH CRT DISPLAY / Systems Engineering Laboratories, Inc. — SEL Model 80-806 is a compact electrostatic display with all logic designed of silicon monolithic integrated circuits. The CRT is suited for industrial and scientific uses which require alpha-numeric display, small screen monitoring for direct computer readout, data display for plotting, bar graph display, vector or dot display, remote monitoring and photo recording display. The device is capable of displaying up to 512 characters. As a vector or dot display more than 3800 dots or vectors can be displayed. (For more information, designate #77 on the Readers Service Card.)

DOCUMENT PROCESSING SYSTEM / IBM Corporation — This system electronically controls the size and shape of paper reports as they are printed by a computer. In the photo to the right, the new roll input device feeds roll paper (at speeds of up to 200 feet a minute) to a computer printer which, in turn, is linked to a high-speed document converter — enabling most computer printed documents to be ready for distribution immediately after leaving the printer. The roll input device (lower left of photo) allows varied-sized reports to be produced from the same stock roll without having to feed the computer printer different-sized business forms. The document converter is controlled by inserting interchangeable program cards (lower right of photo) which contain printed circuitry that enables the converter to precision-cut documents to desired shapes and sizes as they leave a computer printer. The solid-state converter can process 280 finished three-inch documents a minute. (For more information, designate #74 on the Readers Service Card.)



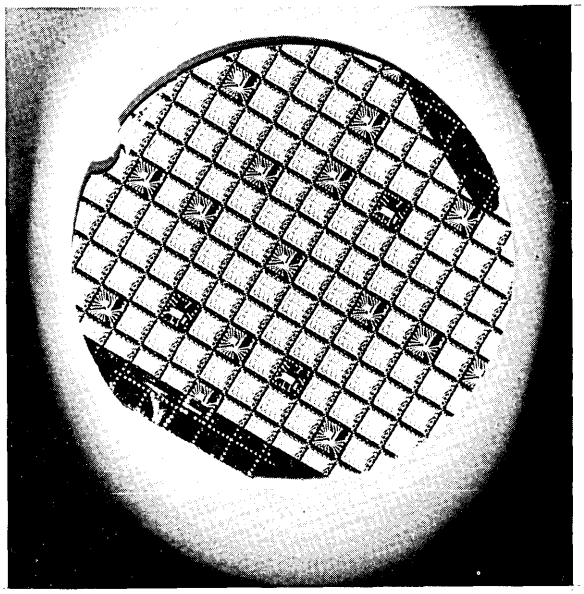




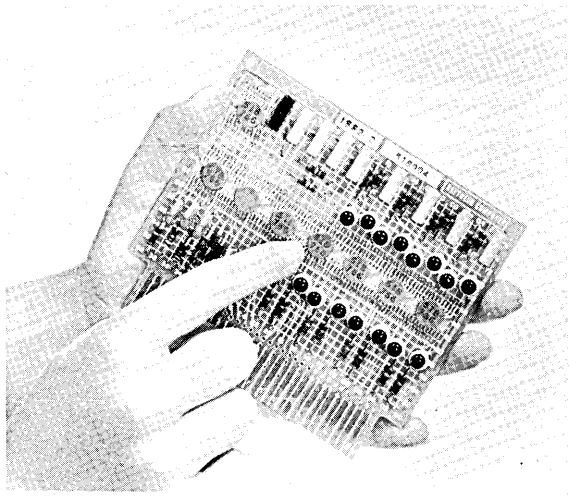
GENERAL PURPOSE DISPLAY SYSTEM (GPDS) / System Development Corporation — The General Purpose Display System (GPDS), (shown in photo at the left) a research project of SDC, investigates the capabilities of an on-line process building method for constructing display formats by a question-and-answer dialogue between the computer and its user. Utilizing a teletype, light pen or RAND Graphic Input Tablet, users can communicate with the computer. The computer responds with further questions prompting the user along the next step of the process in building a map, graph, table or geometric figure. (For more information, designate #70 on the Readers Service Card.)

INCREMENTAL DIGITAL RECORDER / Digi-Data Corporation — A new family of incremental digital recorders introduced by this company is believed to contain fewer moving parts than any other digital stepping recorder currently available. All of the recorders are capable of preparing fully IBM compatible magnetic tape. Data may be recorded asynchronously and at various rates, depending upon the model. Every recorder comes complete, ready to operate from normally available field signals. (For more information, designate #75 on the Readers Service Card.)

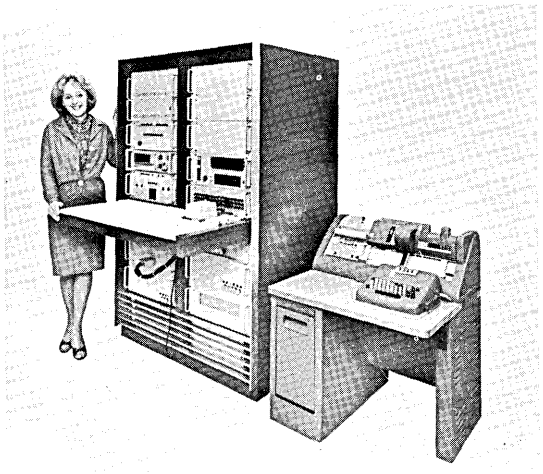
COMPONENTS



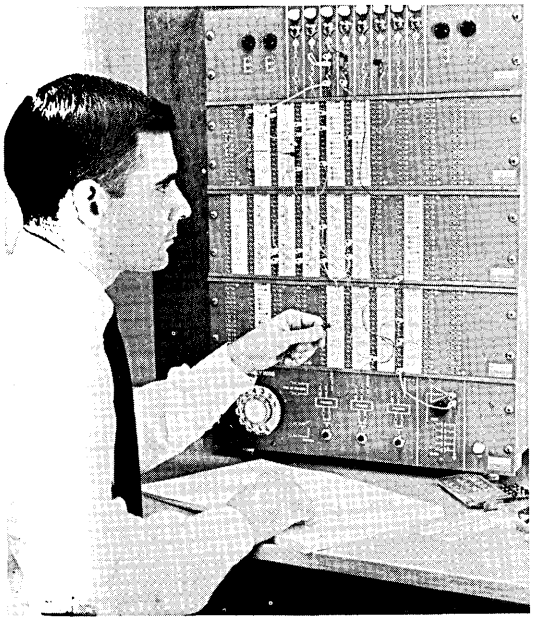
MONOLITHIC MEMORY CHIPS / IBM Corporation, East Fishkill Facility —IBM monolithic memory chips are fabricated on silicon wafers, eight-thousandths-of-an-inch thick. Up to 150 chips can be made simultaneously in one inch wafers such as this. The spider-like designs interspersed throughout the wafer are test areas which enable IBM to test the chips for various electrical parameters while they are being fabricated. (For more information, designate #91 on the Readers Service Card.)



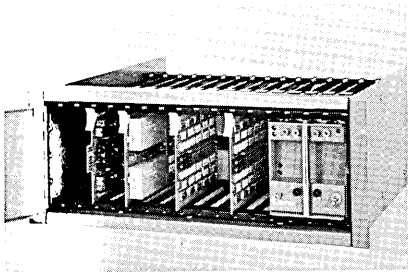
INTEGRATED CIRCUIT DIGITAL MODULES / Raytheon Computer — This series of integrated circuit digital modules offers guaranteed 1.5 volt noise rejection on clock lines, 30 volts on data lines. Operating from DC to 200 KC, the IC modules are compatible logically, physically and electrically with the more than 100 existing discrete component modules for 200KC, 1MC, 5MC and 20MC frequencies which the firm already offers as standard catalog items. The initial series of IC modules available included a decade counter; a 4-circuit and 12-circuit flip-flop; an 8- and 4-bit shift register; a 16-bit shift register (shown in photo); a dual 4-bit shift register; a dual 14-bit shift register; a dual 12-bit shift register; and a universal counter. (For more information, designate #85 on the Readers Service Card.)



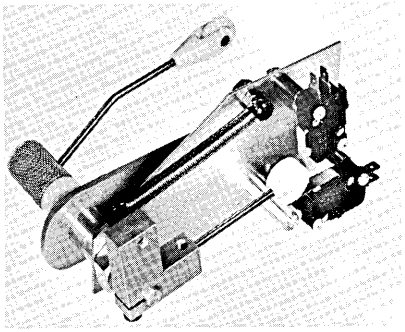
INTEGRATED CIRCUIT TESTER, MODEL 850A / Signetics Corporation — The 850A can test most of the integrated circuits on today's market including some of the recently introduced 16 terminal devices. The system is designed for easy input interfacing directly with a computer or with prepared magnetic tape, perforated tape and card-punch (shown at right of photo) programs. (For more information, designate #94 on the Readers Service Card.)



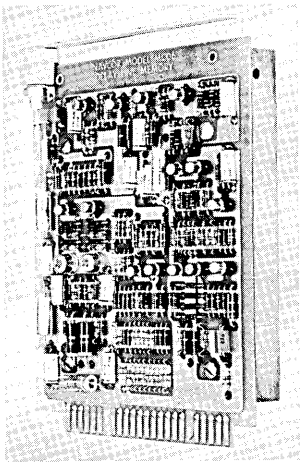
LOGIC LABORATORY / Digital Equipment Corporation — Following an experiment in workbook, the student forms different logic circuits by plugging panel connections on the Logic Laboratory. The device resembles a small telephone switchboard, complete with plug-in jacks and a standard telephone dial which serves as a pulse generator. The desktop unit is built around the same "FLIP CHIP" circuit modules used in full scale computers. The Logic Laboratory, with accompanying book, will allow schools to teach digital techniques, and also can be used by circuit designers themselves. (For more information, designate #84 on the Readers Service Card.)



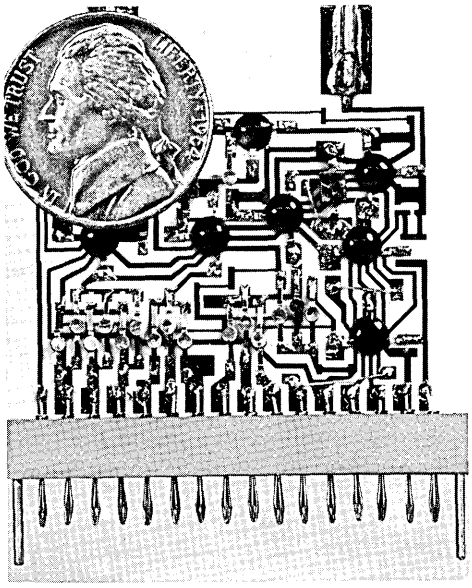
SERIES 500 ANALOG COMPUTER ELEMENTS / Zeltex Inc. — Analog ±100 volt simulation systems, instrumentation, and control systems requiring non-linear functions can achieve better than 0.05% accuracy with these all solid-state modules designed for compatible operation, minimum number of components and flexibility. The series includes the Model 510 dual channel operational amplifier, the Model 502 multiplier (shown) and the Model 530 sine-cosine generator. (For more information, designate #89 on the Readers Service Card.)



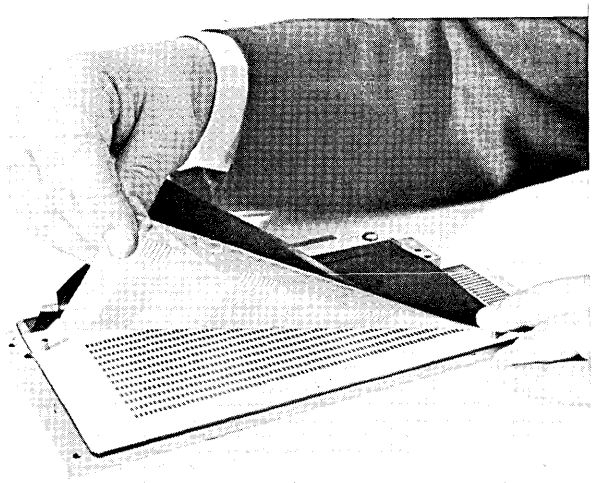
TAPE SUPPLY INDICATING UNIT / Cycle Equipment Company — The roller at the top lifts against the punched paper tape on a reel and moves in or out as the amount on the reel changes. The two switches shown are first, a preliminary indication by the top switch that the tape supply is either extremely low or that the tape supply is extremely high by sounding a buzzer or lighting a light; the second original switch shuts off the tape supply or coordinate equipment. This is for unattended installations or those which are not watched continually. (For more information, designate #88 on the Readers Service Card.)



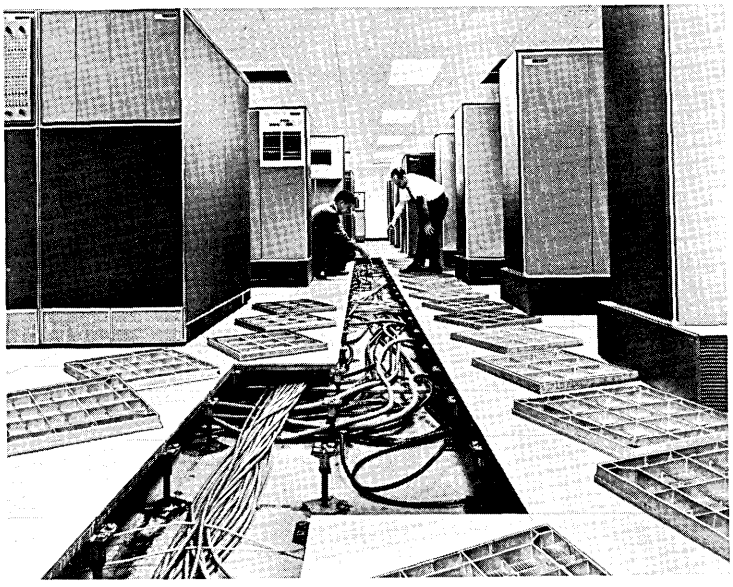
MODEL 06 DELAY LINE MEMORY MODULE / Navigation Computer Corporation — Model 06 is one of a complete new line of 1-megacycle system logic modules, available in both germanium and silicon versions. The Model 06 can be used to store up to 2000 bits of information for 2 milliseconds. The information can be recirculated to increase the storage period, or, in the case of shorter records, can be recorded repetitively to decrease the access time. A flexible array of input gating is incorporated on the module, and readout is via standard flip-flop outputs. (For more information, designate #86 on the Readers Service Card.)



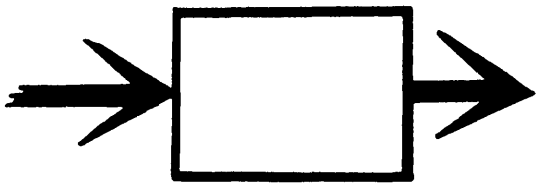
HYBRID THIN FILM CIRCUITS /The Bunker Ramo Corporation — Bunker-Ramo Hybrid Thin-Film capabilities include the fabrication of a computer circuit on a glazed aluminum oxide substrate. The substrate material facilitates dissipation of the unusually large amount of energy expended by the circuit — in this case, five watts. (For more information, designate #90 on the Readers Service Card.)



ELASTIC DIAPHRAGM SWITCH TECHNOLOGY (EDST) / IBM Corporation, Advanced Systems Development Division — EDST allows a whole array of pre-wired electrical switches to be fabricated in a few simple operations. Here protective rubber sheet and film with printed conducting paths on its under surface are lifted to reveal spacer sheet with hole at each switch location. Under the spacer is a board with another set of printed conductors on its upper surface. The experimental assembly shown was developed to read IBM punched cards. It is used with a special plate having embossed bumps which push through holes in the card and operate corresponding EDST switches underneath. (For more information, designate #92 on the Readers Service Card.)



FLOATING FLOOR / Floating Floors, Inc., Subsidiary of National Lead Company — The free access Floating Floor consists of an assembly of interchangeable aluminum or steel panels mounted on adjustable pedestals. The system provides underneath space of any desired height for the accommodation of cables, ducts, and other service lines. Easily removable panels facilitate quick access to cables, allow for expansion, and lower maintenance costs. The Floating Floor was developed as the technical solution for an inexpensive and practical method of installing automatic data processing equipment in buildings used by industry and commerce. (For more information, designate #87 on the Readers Service Card.)



Management Education

One of the major problems which faces a new data processing installation is explaining the initial difficulties and costs to top management. In many cases, corporate presidents, agency heads, and other executives have been given a fairly rosy picture by the manufacturers and by data processing management. When the inevitable difficulties of testing, conversion, and economic payout appear, no one is ready to accept responsibility, and top management wonders what has gone wrong.

Top management needs a considerable amount of education, if it is to support data processing effectively, and understand and control the problems and costs involved. Such management education is of vital importance to the continuing success of the installation, and to the *effective* use of the technology. The major reasons for such education are:

- Management must understand the problems, to cope with them and provide effective solutions,
- Management must recognize the potential of data processing,
- The increasing commonality of the data base requires interdepartmental integration, which in turn requires management direction,
- Executives must be aware of the lead times involved in data processing, to provide organization-wide long-range planning,
- Management must understand the need to spend money for research, equipment planning, standards, and documentation,
- Management must evaluate and control the installation's performance, and
- Management must avoid making unreasonable demands on the resources of the installation.

The objectives of a good management training course must recognize these factors. Such a course must mix hardware fundamentals with planning steps and with an evaluation of the impact of data processing. An outline for a successful course could be as follows:

A. The Nature of Automation
   1. Types of automation
   2. General impact

B. Information Processing Systems
   1. Types of systems
   2. Stored programming concepts

C. Computer Classification
   1. By type
   2. By size
   3. By function

D. Components of Computers
   1. Input
   2. Output
   3. File storage
   4. Main storage

E. Communicating with Computers
   1. Data representation
   2. Language levels
   3. Personnel functions
   4. Software

F. Planning Steps — Feasibility
   1. The feasibility study
   2. Equipment selection
   3. Contract negotiation

G. Planning Steps — Prerequisites
   1. Personnel selection
   2. Personnel training
   3. Organization structure
   4. Standards development
   5. Scheduling and budgeting
   6. Site requirements

H. Planning Steps — Implementation
   1. Requirements
   2. Systems design
   3. Programming

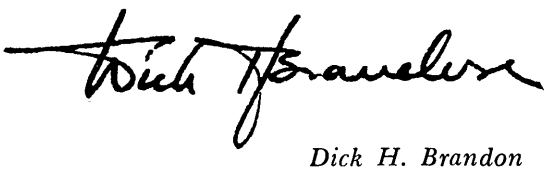
I. Planning Steps — Installation
   1. Conversion
   2. Systems testing
   3. Take over
   4. Audit

J. The Role of Management
   1. Data processing management
   2. User management
   3. Top management

Today it is estimated that there are 23,000 computers installed in 14,000 installations. By 1970 it is expected there will be 51,000 computers in 35,000 installations. This implies that between now and 1970 we must educate:

20,000 new data processing managers
35,000 top executives
35,000 middle managers.

This is a formidable task. It should be started now.



Dick H. Brandon
Contributing Editor

c & a
CAPITAL REPORT

A Special Report from C&A's Washington Correspondent

The House version of the Brooks Bill passed the Senate on the last night of the first session of the 89th Congress, October 22. In a surprise move that caught everyone off-guard, including the staff of the Senate Committee on Government Operations, which expected to hold hearings on the bill next year, the bill reached the floor of the Senate at 8:30 p.m., faced no opposition, passed unanimously, and was sent to the President for his signature. As we go to press it has not been signed into law, but there is no reason to doubt the President's approval.

H. R. 4845, as the Brooks Bill is formally called, sets up a revolving fund in the General Services Administration to finance the rental and purchase of computers by any Government agency. This is the only controversial part of the bill; some think it gives GSA powerful control over computers since GSA holds the computer pursestrings; but others say that individual agencies will still decide for themselves what they want, and that direction for Government management will continue to come from the Bureau of the Budget.

In addition to the revolving fund, the bill: authorizes a perpetual inventory of computers, also in GSA; encourages computer sharing; and gives the Government a better bargaining position by providing for volume acquisition of the components that make up general-purpose computers.

The Bureau of the Budget took the occasion of the October Business Equipment Manufacturers' Association show in New York to warn computer manufacturers against keeping their mouths shut on Government computer matters, especially when their future business is at stake.

Gordon Osborn, chief of the Bureau of the Budget Management Improvement and Research Branch, told BEMA's Data Processing Group that computer manufacturers had been invited to comment on the Government's selection procedures and only four responded. He again invited the others to respond, but said those that don't will have no reason to complain about these procedures in the future.

Osborn also told the manufacturers that letters were going out to them asking for opinions on whether the American Standard Code for Information Interchange should be incorporated into Government procurement specifications.

"The overall problem caused by lack of an acceptable standard demands a solution," he said, "and we will try our best to achieve it with minimum difficulties for all of us . . . But we've got to have standards, and we're going to have them. If you sit around ignoring our request for comments, don't complain when standards show up in procurement specifications."

The BOB official also noted a marked improvement in contract negotiations between manufacturers and the General Services Administration. He said all GSA contracts were either signed or agreed to by July 1 this year. The negotiations usually drag on for months.

The Department of Defense found additional users for more than $32 million worth of computing equipment in the fiscal year that ended June 30, 1965, through its ADP Equipment Reutilization Screening Office. This was the first year of operation for the office, which is located in the Defense Supply Agency, and the year was extremely successful; the office placed 97 per cent of the used computers that passed through its hands. Clement M. Aldrich heads the group.

Because of its large investment in computers, the Government has ordained that all agencies and departments consider excess equipment as the first source of acquisition in satisfying their computer needs. Once a piece of equipment — complete computer or component — becomes excess to an agency, it is reported to either the DOD Screening Office or, in the case of civil agencies, to the General Services Administration. Regular bulletins are circulated to advertise the equipment.

Equipment on lease by one Government agency can be purchased by another to take advantage of reduced prices that result from accrued purchase options and lease credits. Defense said it save $6 million by doing this. For example, there was a leased IBM 1401 that an agency planned to send back to IBM. Under the new screening program, it was moved to the Armed Forces Institute in Madison, Wisc. The Institute used rental credits in the equipment to purchase some of its components at an estimated savings of $58,514.

JAMES TITUS

"ACROSS THE EDITOR'S DESK"

Computing and Data Processing Newsletter

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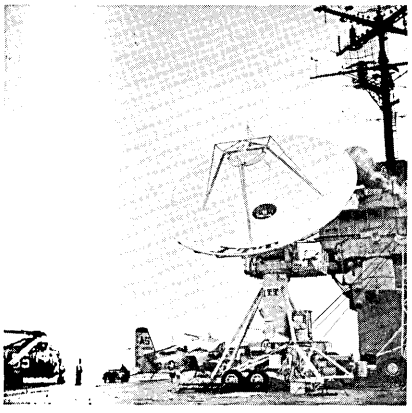
APPLICATIONS

ASTRONAUTS RECOVERY TRANSMITTED ON LIVE TV

The first live television coverage of manned spacecraft recovery will be beamed to the world by a transportable space communication station placed aboard the aircraft carrier U.S.S. WASP by International Telephone and Telegraph Corporation. The TV pictures will be sent from the carrier-based station to land via the "Early Bird" Communication Satellite (see Computers and Automation, May 1965, p. 49) which hovers above the Atlantic Ocean.



— AT SEA - Earth station antenna designed and engineered by ITT Corporation stands ready on deck of U.S.S. Wasp to relay first live television coverage of astronauts recovery. Signals will be sent via Early Bird satellite.

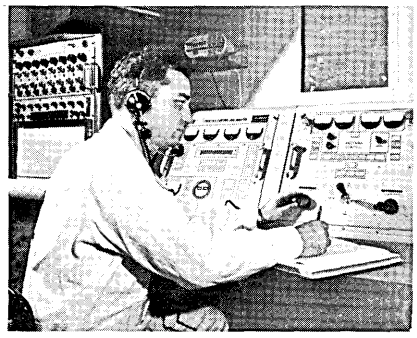
Successful completion of this unusual operation will prove several interesting technical facts: The transportable space station is compatible with carrier and Gemini operations from the point of view of no radio-frequency interference and no interference with the physical operations aboard the ship. It also will prove that a satellite can be tracked successfully from a moving platform.

The space terminal is a complete satellite communication and control center capable of handling television, multichannel duplex telephone, teleprinters, facsimile, and data transmission.

Briefly, here's how the telecast will work:

As the recovery operations get under way, cameras on board the U.S.S. Wasp will televise the recovery operations there and relay the pictures live to the ITT transportable earth station aboard the aircraft carrier. The signals will then be transmitted by the earth station to the "Early Bird" satellite which will re-transmit them to the satellite ground station in Andover, Maine. From Andover the signals will be sent to Europe via the satellite and by microwave to New York for distribution to the networks of the American Broadcasting Company, the Columbia Broadcasting System, and the National Broadcasting Company.

Supplementing the three-cushioned satellite communication "shot" will be a vast array of radio circuits, undersea cables and landlines, interlaced to form one of the world's most elaborate communications chains.



— Control Panel of the ITT transportable space station is manned by engineer Arthur H. Chaplin during satellite acquisition operations.

STUDENT LOAN REQUESTS GET "FAIR HEARING" FROM IBM COMPUTER

Students applying for Pennsylvania college loans and scholarships this fall got a fair hearing from an unexpected source — an IBM computer. The computer, the first to be used in such a program, screened student requests to the Pennsylvania Higher Education Assistance Agency for funds. The result, says Executive Director Kenneth R. Reeher, is for more "consistent" decisions.

According to Mr. Reeher, "There are 190 checkpoints in each

application. To cover each personally when you're dealing with 12,000 to 15,000 applications, you're bound to miss a few, and it will reflect in the final decision." The computer, however, impartially reviews and judges each application only on its merits. "We've built things into the system that guarantee every student a fair hearing," Mr. Reeher explained.

For instance, in analyzing a family's income to determine an applicant's eligibility, the system, among other things, makes allowances for a working mother and the age of the parents. Part of a working mother's income is discounted and additional allowances are made if she has children at home who require a baby sitter. Also parents, after they reach a certain age, are permitted to put money aside for retirement rather than into college educations for their children.

Though the computer determines an applicant's needs, its decision is not binding. Each applicant is entitled to a review of his case by a professional staffer. Most of the computer's findings, however, have been upheld on appeal.

The system was designed by the Agency in cooperation with The Service Bureau Corporation, whose IBM 1460 computer processes the applications. The computer can process an application in seven seconds compared to the 45 to 50 minutes it tapes a professional evaluator. As a result, an applicant receives an answer to his request before school opens regardless of the volume received by the Agency.

Pennsylvania's College Assistance Program is one of 17 such state aid programs in the country. The first loan was awarded in 1964 and during the first year 5000 applications were processed. This has about tripled and when scholarships are added to the program, it is expected some 50,000 to 60,000 applications will be handled annually. Thus far, more than $8 million in loans have been granted, including $5 million of it by computer since last July.

(See also "Computers and Automation", November 1965, page 7.)

ENGLISH LANGUAGE TO BE CATALOGUED AND ANALYZED USING COMPUTERS

The English lanugage could change as a result of a Purdue University graduate engineer who is applying a computer to determine precise meaning of words. Says William M. Fisher, who is researching linguistics for his master's degree: "New words could easily be formed, idiomatic expressions may be eliminated, there may be no need for such people as UN translators."

All this won't come as a direct result of Fisher's work, but as he delves into precise meanings of some 6,000 English adjectives and nouns he thinks it all is possible.

The problem of what words really mean is most important in scientific and engineering fields where computers are used to translate from other languages. Scientists continually find problems knowing exact word meanings as they try to interpret scientific findings in foreign technical journals, he points out.

An example is the English word "spring". It can be a bubbling spring, a coiled spring, or as a verb meaning to bounce. Such problems occur in other languages also, he says.

Fisher hopes to classify some 3,000 adjectives and "at least that many" nouns according to various coded terms which represent the meanings of words. When programmed into a computer, it will be impossible to use words wrong in context with others.

The first step in the project is to get the standard meanings in use and Fisher will gather this in tests among native speakers of English. He will be able to check syntax as well as meaning in the test.

Then comes the task of categorizing on the computer to turn out a new type "dictionary" for English. Fisher is conducting his work under an IBM Fellowship. He says, it is because of the rapid and diversified growth in the use of computers that the whole project is possible.

Fisher already has researched most English semanticists and he takes exception to most of them. Many approach linguistics as an inexact science or for theoretical purposes. He feels that his engineering background can be applied to the study of language meaning. In fact, he says, we must know what words mean with more precision in order to keep semantics equal to the rapid technological and scientific developments today.

That's where some of the possible extensions of his pioneering work may lead.

If computers continue to be miniaturized, it may be possible for international space teams to explore together. They'll speak into a computer which will report a verbal translation immediately.

DATA NETWORK TO CONTROL AUTOMOBILE PARTS DISTRIBUTION

American Motors has solved one of the automobile manufacturing industry's most perplexing problems — "on-time" supply of replacement parts and accessories to a nationwide network of dealers. The solution is an IBM computer controlled data network with the capability of starting needed parts on their way to any of 3,000 Rambler dealers within minutes after an order is received.

The Zone Order Processing system (ZOP), first of its kind in the automotive industry, provides tight, central control over Rambler parts distribution from any of 24 zone locations, two regional warehouses and the big Milwaukee parts plant, according to Michael J. Lonergan, American Motors corporate director of systems and data processing.

The problem was that with 55,000 parts available to a dealer, only 11,000 of these could be supplied through zone warehouses. When the order included a part other than those locally available parts, it had to be filled either from regional stock or from the central warehouse in Milwaukee (which sometimes took a week or more).

Under the ZOP system, which utilizes an IBM 1440 computer with 1050 data communications terminals, order processing is under way within 30 minutes of receipt.

When an order is received in the zone, a tabulating card is punched for each part number listed.

This deck of cards is put into the card read hopper of an IBM 1050 data transmission unit. Every 15 minutes, the IBM 1440 computer in the Milwaukee central warehouse automatically places a telephone call to the zone and asks the device if it has an order to transmit. If the answer is yes, the cards are transmitted to the memory of the Milwaukee computer.

There, the computer activates a program which determines the price of the parts, the optimum shipping location (zone, region, central warehouse), sets up an account receivable and stores invoicing information. Printing devices in the selected shipping locations are activated and shipping lists are typed out. All orders are shipped the same day received, regardless of shipping point.

CUPID — A COMPUTER?

A few specialized companies have set computers to playing Cupid, by choosing compatible mates scientifically for a growing number of clients. While some may consider this a bit cold-blooded, the companies defend it as being considerably more rational than other methods.

"The fact is that most people put more thought into choosing a cigaret brand than they do in picking a wife or husband", says Michael Fortuna, director of Michigan Scientific Introduction Service, Inc. To put things on a better-thought-out basis, the Michigan concern, which operates much like other companies in the field, pairs off its clients according to data compiled from psychological tests and questionnaires. Some 150 pertinent facts thus learned about a client (ranging from height and weight to dominant or submissive tendencies) are punched into a computer card. The machine then uses those characteristics to select between 10 and 15 persons the client might be interested in dating or marrying. Names, addresses and phone numbers of women are given to the men they are mechanically matched up with, and from then on the romance is left to the two of them.

Scientific Marriage Foundation of Indiana, operates a bit differently. It takes applications by mail and sends one of 2500 participating clergymen to interview each client before arranging any introductions. Dr. George Crane, founder, says the non-profit organization currently introduces from 1500 to 2000 persons monthly. He adds that he knows of only 10 divorces occurring among the more than 10,000 marriages the computer has helped produce since 1958.

EASTERN AND IBM DEVELOPING DIGITAL AIRBORNE MAINTENANCE RECORDING SYSTEM

Eastern Airlines and the IBM Corporation have teamed up to develope a new, integrated circuit, digital airborne data processing and recording system. The agreement calls for design, delivery and installation of the complete digital data acquisition and processing system according to a four-phase program.

Phase I, of the program is already aloft — a digital "record only" system in operational testing aboard an Eastern Boeing 727 Whisperjet. In Phase II, beginning about September 1966, a miniature processing computer will be added to the Whisperjet installation to provide real-time data reduction in flight. Phase III will be a period of detailed evaluation of experience obtained in the first two stages to establish full economic feasibility as well as final design criteria for Phase IV — quantity production of the system and fleet installation now slated for early 1967.

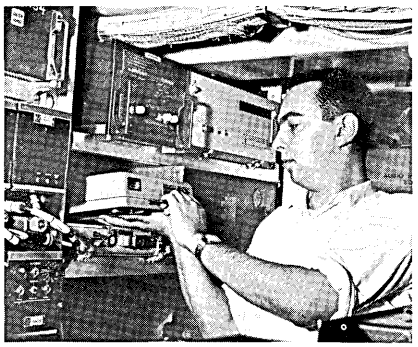
Design goal is to provide a digital computer system, packaged in a ½-ATR box and weighing about 40 pounds excluding recorder and display units, that is capable of monitoring about 300 key airframe, engine and sub-systems parameters.

The Eastern-IBM system will check many elements at least as frequently as once every second, record the data obtained, and by on-board computer processing, provide real-time information immediately useful to the cockpit crew for improved flight management. At the end of the flight, ground maintenance personnel will find ready detailed data isolating potential or actual faults.

A truly successful airborne data recording and analysis system is the giant step the airline industry needs in its progress towards the long-sought goal of replacing time-controlled maintenance and overhaul with a more efficient, economical on-condition maintenance philosophy. Real-time performance trend analysis would largely eliminate two of the principal problems of the time-controlled system: unscheduled removal of components for suspected failure (one-third to one-half of which later test O.K.), and arbitrary removal and overhaul-for-time of components that are performing satisfactorily. Real-time monitoring would prevent on-condition items from running to failure, yet insure maximum life short of that.

As presently planned, the Eastern-IBM system is capable of measuring up to 296 different parameters of engine, airframe and sub-systems operation.

The data acquisition is complete and computer-ready data is available for processing — in Phase I every tape is being processed on EAL's IBM 7074 at Miami. Beginning with Phase II much of the data reduction will be accomplished by the on-board computer.



— The four principal units of the Eastern-IBM AIDS test installation are shelf-mounted in the Whisperjet's electronic equipment bay. Change of tape is accomplished by simply disengaging the top portion of the Tape Recorder containing tape reels from the bottom section containing tape drive and wiring.

The airborne computer addition is within the present "state of the art". In its final form it is expected to weigh about 15 pounds.

Newsletter

FULL COMPUTER CONTROL OF A NUCLEAR REACTOR

Toshiba (Tokyo Shibaura Electric Co.), one of Japan's leading electrical companies, has applied an electronic computer system to run automatically all operations of an atomic reactor.

Toshiba achieved automatic operation of its research reactor at its Central Research Laboratory near Tokyo with the cooperation of the Nippon Atomic Industry Group Co., Ltd., after several years of research in the development of computer control.

Under the new system, all reactor operation from pre-operational check, start-up, change of reactor power, to shut down, is automatically controlled by the computer.

A Toshiba computer (TOSBAC 3225A) is used as a central brain in the operation. Attached to it is a satellite computer known as the alarm scanner. The scanner continuously monitors the interior condition of the reactor at the speed of 5,000 points per second.

In case any deviation is discovered in the established values, a scanner flashes an emergency signal and stops the reactor.

Because of strict safety regulations, there are approximately 1,200 pre-start operational checks in the operation of a reactor. In the automatic process, the main computer is used to memorize the complex operation, including measuring and inspecting of reactor control instruments.

This system also makes possible quick and safe operation of the reactor under a fully automatic process thus eliminating the need for skilled technicians to supervise and control reactor operations. Through application of the computer system, the pre-operational check time of the reactor has been cut in half.

COMPUTER PREDICTS DRUG PRODUCT SALES

By devising a computerized model of the drug market, executives are now able to predict the future success or failure of a new product based on its performance over the first three months. The new concept was pioneered by Warner-Chilcott Laboratories, a division of Warner-Lambert Pharmaceutical Company.

E. Rex Smyth, Warner-Chilcott's director of marketing research and planning, termed his program as an "early warning system" which would provide management with advance information on their products and those of competitors and allow them to take appropriate action in terms of promotion, production, purchasing and capital outlays.

He pointed out that if the computer indicated that a new product was definitely going to make the grade, additional support could be channeled behind it with even better results. Similarly, if the evidence indicated the drug would not be successful, the company could stop throwing good money after bad.

The same principle holds true for competitive products. Computerized data would tell management whether another company's product was worth battling or whether it should be ignored.

During a feasibility study, the model demonstrated its ability to predict the yearly sales of some thirty previously marketed drugs on the basis of three month's figures.

NEW CONTRACTS

FROM	TO	FOR	AMOUNT
U. S. Air Force Ballistic Systems Division, Norton Air Force Base, San Bernardino, Calif.	Philco Corporation, Aeronutronic Division, Newport Beach, Calif.	A re-entry measurements program (RMP) including developing and building payload experiments and a standardized payload deployment system. Experiments are to be flown on Atlas missiles launched from Vandenberg Air Force Base, Calif., down the Pacific Missile Range.	$30 million
Edison Electric Institute	C-E-I-R, Inc., Arlington, Va.	Continued assistance in collecting data and analyzing the differences in time of occurrence of simultaneous demands for electric power of individual electric utility systems. Present and future analysis will be based on hourly load data prepared by 143 electric utility systems, including investor-owned, Federal, state, municipal and cooperatively owned.	—
U. S. Air Force and the National Aeronautics and Space Administration	Federal Electric Corporation, Paramus, N.J. and FEC's subsidiary, ITT Technical Services, Inc.	FEC - $1.2 million add-on contract for its instrumentation services to NASA's Merritt Island Launch Area, Kennedy Space Center, Fla., which calls for scientific programming services. FEC's subsidiary - $1.2 million, fixed-price contract for base support services at U. S. Air Force Plant 42, Production Flight Test Installation at Palmdale, Calif.	$2.4 million
U. S. Air Force	General Kinetics Inc., Arlington, Va.	Leasing of Model 97 Magnetic Tape Testers	about $¾ million
U. S. Navy's Electronic Supply Office, Great Lakes, Ill.	Radio Corporation of America, Lancaster, Pa.	Production of super-power tubes to be used in shipboard equipment	$2,027,000
General Dynamics Corp.	Cubic Corp., San Diego, Calif.	Apollo tracking ship buffering equipment	$1,026,109

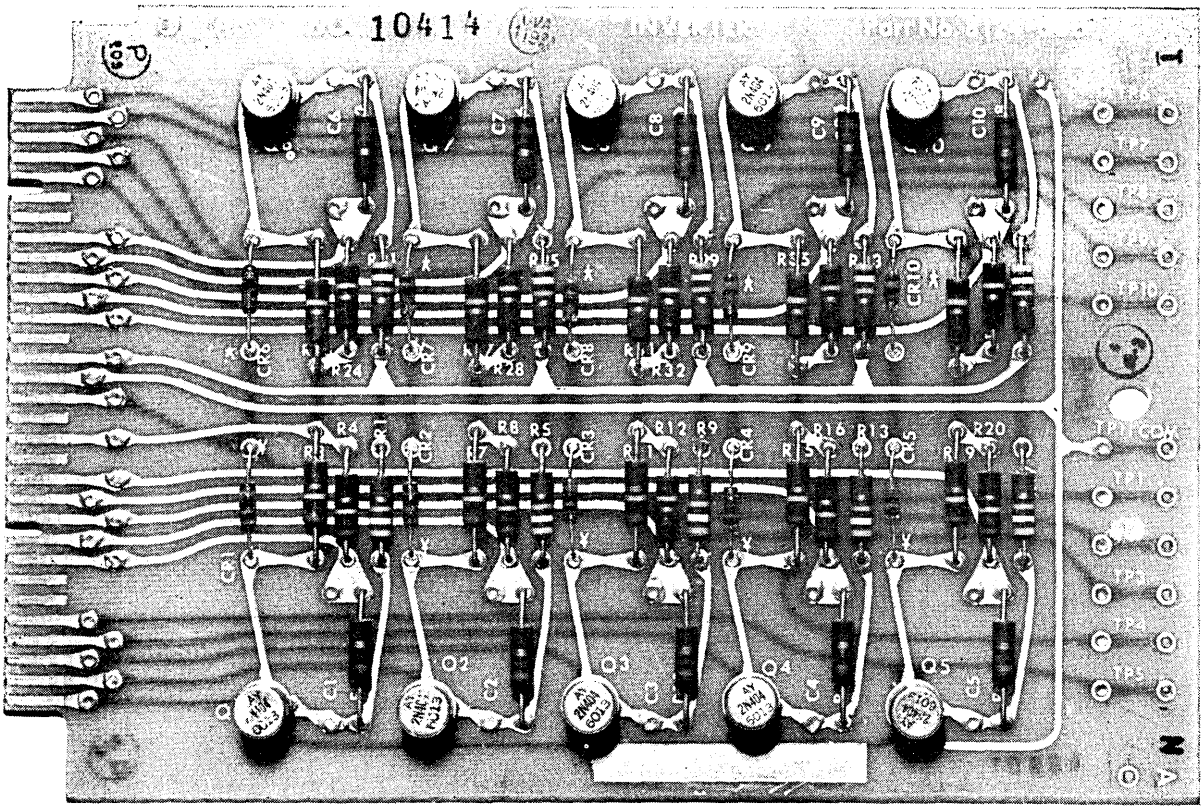
FROM	TO	FOR	AMOUNT
U. S. Arms Control and Disarmament Agency (ADCA)	Dunlap and Associates, Inc., Darien, Conn.	Design and development of an information retrieval system	—
Alameda County, Calif.	Cubic Corporation, San Diego, Calif.	Production and delivery of 80 Votronics vote counters and collateral equipment in a "lease with option to purchase" contract	$2.3 million
U. S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.	The Bunker-Ramo Corporation, Canoga Park, Calif.	To give mobility to the Automatic Photomapper the company is now developing for the Army under a $1 million contract	$745,000
Aeronautical Systems Division of the Air Force Systems Command	Sylvania Electric Products Inc., a subsidiary of GT&E	Advanced airborne data processing equipment components and spare parts	$3.3 million
Reynolds & Co., New York, N.Y.	The Bunker Ramo Corporation, Canoga Park, Calif.	High speed computerized order processing network, known as TOPS (Teleregister Omni Processing and Switching) which will process and transmit buy and sell orders directly into the nation's exchange trading floors	—
General Dynamics/Electronics Division, Rochester, N.Y.	Tally Corporation, Seattle Wash.	2000 punched paper tape perforators and readers to be installed in systems to expand the Department of Defense's Autodin (automatic digital network) communications network	$1,200,000
Defense Communications Agency	Technical Operations, Inc., Arlington, Va.	Contract extension on project MARS (Military Analysis and Research Support) including research on a more powerful computer language to rapidly simulate a war situation	$353,386
Aerospace Research Laboratories, Wright-Patterson AFB, Ohio	Avco Corporation, Research and Advanced Development Division, Wilmington, Mass.	A two-year renewal contract to study radiation from high temperature arc-heated gases. Measurements obtained will furnish important data in the development of Intercontinental Ballistic Missiles	$204,012
Air Force Development Center, Holloman Air Force Base, N.M.	Sylvania Electric Products Inc., a subsidiary of GT&E	Design and development of electronic equipment which will track and photograph rocket sleds traveling at speeds of 4000 mph	$94,000
National Aeroanutics and Space Administration, Manned Spacecraft Center, Houston, Texas	Avco Corp., Research and Advanced Development Div., Wilmington, Mass.	Development of instrumentation to measure the chemical composition of micrometeorites in deep space. Program calls for a cluster of balloons (nicknamed "Moon Balloons"), each inflated with a mixture of inert gases, to be deployed from an orbiting satellite	$98,000
Naval Air Development Center, Johnsville, Pa.	Sylvania Electronic Systems, a division of Sylvania Electric Products Inc., Needham, Mass.	A miniaturized magnetic tape system which will be used aboard anti-submarine aircraft to store data from radar, sonar and sonobuoy devices	$150,000

NEW INSTALLATIONS

AT	OF	FOR	FROM	AMOUNT
National Aeronautics and Space Administration, Fla. and Va.	GE-635 computer (Fla.) GE-625 computer (Va.)	Processing and analyzing space vehicle and rocket performance in real-time	General Electric Co.	over $5 million
North American Life and Casualty Co., Minneapolis, Minn.	IBM System/360 Model 40	Nucleus of management information system	IBM Corporation	—
First Federal Savings and Loan Association, Waterbury, Conn.	NCR 315 computer and NCR teller consoles	On-line customer service and daily trial balances, statistical reports, etc.	National Cash Register Co., Dayton, Ohio	—
Greyhound Corporation, Chicago, Ill.	Datanet-30 communications computer	Centralization of the bus lines' entire message-handling operation	General Electric Co.	—
Allegheny Airlines, Washington, D.C.	IBM System/360 Model 40	Programmed aircraft maintenance and parts inventory control	IBM Corporation, White Plains, N.Y.	—
New Era Data Systems, Inc., New York, N.Y.	Honeywell 200 computer system	Expansion of data conversion and optical scanning services	Honeywell EDP	—
The Matrix Corp., West Coast Information Processing Center, Los Angeles, Calif.	GE-635 computer system	Expanding firm's scientific and engineering computation work to include business and commercial services and later broadening into a full-scale time sharing service	General Electric Co., Phoenix, Ariz.	$2.5 million
Telecomputations, Inc., Washington, D.C.	IBM System/360 Model 40	Teleprocessing service	IBM Corporation	—

Newsletter

AT	OF	FOR	FROM	AMOUNT
American Airlines, Inc.	Electronic Retina® Computing Reader	Automating computer data input in a variety of accounting and statistical applications	Recognition Equipment Inc., Dallas, Texas	—
Frisch's Restaurants, Inc., Cincinnati, Ohio	NCR 315 computer system	Payroll, general ledger accounting, order entry and billing; eventually the center of an automatic re-ordering system for all outlets in the four-state restaurant chain	National Cash Register	—
Computer Usage Co., Inc., New York, N.Y.	IBM System/360 Model 40	Replaces 1400 series equipment	IBM Corporation	—
Citizens Federal Savings & Loan Association, Dayton, Ohio	NCR 315 computer system	Processing savings and mortgage loan accounts and providing financial reports	National Cash Register Co., Dayton, Ohio	$500,000
Philco Corp., WDL Division, Computer Center, Palo Alto, Calif.	Philco 212 computer	Expanding computing requirements and providing full range of computer service to industry — replaces 210	Philco Corporation	—
Tokai Bank of Nagoya, Japan	IBM System/360 Model 40	Centralization and speeding up of its operations	IBM Corporation, Poughkeepsie, N.Y.	—
Rensselaer Polytechnic Institute, Troy, N.Y. (Amos Eaton Hall)	IBM System/360, Model 30	Varied range of operations from classroom and research work to administrative and accounting tasks; ultimately a complete 'management information system' is planned	IBM Corp., White Plains, N.Y.	over $1 million
New York Times, New York, N.Y.	Honeywell 200 data processing system	Automating entire general accounting and related paperwork	Honeywell EDP, Wellesley Hills, Mass.	—
Oklahoma Publishing Company, Oklahoma City, Okla.	Two IBM 1130s	Setting type for all editions of its daily newspapers	IBM Corporation	rental, about $1500/month
Professional Data, Inc., Lubbock, Texas	Honeywell 200 data processing system	Increased data processing capacity, new and expanded services to clientele	Honeywell EDP	$5265/month rental
State National Bank of Alabama, Decatur, Ala.	IBM System/360 Model 30	Processing customer accounts	IBM Corporation	over $500,000
Eli Lilly and Company, Indianapolis, Ind.	IBM System/360 Model 30	Microbiological testing, pharmacological studies, toxicological research, physical chemistry, clinical trial investigations and for statistical analysis	IBM Corporation	—
U. S. Steel Corporation, Pittsburgh, Pa.	B8500 information processing system	Applications ranging from scientific computation and message handling to on-line real time order entry	Burroughs Corp., Paoli, Pa.	—
Vanity Fair Mills, Inc., Monroeville, Ala.	IBM System/360 Model 30	Inventory control, order processing, and style trend interpretations	IBM Corporation	—
Georgia Institute of Technology, Atlanta, Ga.	NCR 500 computer system	Use by the controller's division at the university	National Cash Register Co., Dayton, Ohio	over $100,000
Lockheed Propulsion Company, Redlands, Calif.	IBM System/360	Research and development activities aimed at the design of better, more efficient solid propellant rocket motors	IBM Corporation	—
Allstate Insurance Companies, Skokie, Ill.	IBM System/360 Model 40	Total information system	IBM Corporation	—
Ohio State Treasury, Columbus, Ohio	NCR 315 computer system	Processing state warrants, various statistical data, and other operations of the State Treasury	National Cash Register	—
Spiegel, Inc., Chicago, Ill.	IBM System/360 Model 30	Preparing nearly two million customer statements each month	IBM Corporation	—
Standard Oil Company of California, San Francisco, Calif.	IBM System/360 Model 30	Use as the programming and testing base for other Model 30's and a Model 65 to be installed in 1966. These systems will comprise Standard's San Francisco Computer Center and be connected to other systems in company's nationwide operations	IBM Corporation	—
Dow Chemical Company, Freeport, Texas	EAI 8800 Scientific Computing System	Plant simulation and optimization as well as process control training of Dow personnel	Electronic Associates, Inc., West Long Branch, N.J.	—
Northrop Corporation, Hawthorne, Calif.	IBM System/360 Model 65	A corporate information processing service for all company activities	IBM Corporation	
New York State Police, Public Security Bldg., Albany, N.Y.	UNIVAC 418 Message Switching System	Establishment of a direct line of communication between 78 teletype-equipped State Police stations and the 68 municipal and sherriff's stations — will store registration numbers of stolen cars and license plates	Sperry Rand Corp., UNIVAC Div., New York, N.Y.	—



When this circuit learns your job what are you going to do?

For one thing, you'll be looking for another job. And a *different kind* of job at that. Today, new machines and new methods are eliminating some jobs permanently. They do the work better and more efficiently than men.

That's progress. But progress is also creating *new* jobs, *new* opportunities for those who can qualify. Just remember . . .

You won't get tomorrow's jobs with yesterday's skills

To qualify for tomorrow's jobs, you'll need new skills, new abilities. And you can get them by re-training *now*.

Don't wait for a circuit to replace your job . . . and you. Start re-training now . . . and have a better job before it happens. For information about re-training for tomorrow's jobs, visit the local office of your State Employment Service.

Train now for tomorrow's jobs

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Newsletter

ORGANIZATION NEWS

ACM ESTABLISHES PROFESSIONAL STANDARDS FOR MEMBERSHIP

The Association for Computing Machinery (ACM), whose headquarters are in New York, has established professional membership qualifications. The ACM was founded in 1947 as the international professional society of the computing community, and has been open to all persons everywhere who expressed an interest in the computing and information processing professions.

The new professional membership qualifications effective July 1, 1966, were overwhelmingly approved by the 14,000 plus members. Requirements include a bachelor's degree or equivalent level of education from an accredited institution or at least 4 years experience in the arts and sciences of information processing. Endorsement by two members of the Association is also required. Another new category, Associate Membership, was created for other interested persons and carries with it all of the advantages of membership except the right to vote. Associate Membership provides a mechanism for those who are not yet qualified for full membership to prepare themselves for the professional level. The ACM, through its Educational and Professional Development Committees, will assist all Associate Members in attaining their professional status. Student Membership and Institutional Membership were not affected by these changes.

ELECTRONIC SYSTEMS CENTER

Creation of an Electronic Systems Center to coordinate and develop systems design, computer programming and data processing operations at the New York Stock Exchange has been announced.

The new department will be responsible for coordinating all of the Exchange computer activities, the operation and maintenance of all existing data processing systems and equipment, and the design, development and implementation of improved methods of data handling and processing, including the acquisition, installation and operation of new computer systems.

SDS FORMS CANADIAN SUBSIDIARY

Scientific Data Systems, Los Angeles, Calif., has formed a new wholly owned subsidiary, Scientific Data Systems of Canada, Ltd.

Scientific Data Systems of Canada, Ltd. will sell the company's computers and systems throughout Canada. The Canadian subsidiary is the company's first wholly owned foreign operation.

NCR EXPANSION IN VENEZUELA INCLUDES LARGE DATA CENTER

The National Cash Register Company, Dayton, Ohio, has announced plans to expand its Caracas, Venezuela, operations with a seven-story building addition and a data processing center which will have the largest capacity computer in Venezuela.

The data center will use an NCR 315 system to perform a wide variety of processing jobs for business firms, manufacturing plants and banks.

The new portion of the NCR building in Caracas will house classes in data processing, as well as the company's Latin American support personnel for electronic data processing. Also included will be a printing plant specializing in business forms.

CONTROL DATA CANADA LTD. ACQUIRES DIVISION FROM COMPUTING DEVICES OF CANADA LTD.

William C. Norris, president of Control Data Corporation, and Charles F. Hembery, president of Computing Devices of Canada Ltd., have jointly announced the acquisition of the Computer Systems Division of Computing Devices by Control Data Canada Ltd., a subsidiary of Control Data Corporation. The acquisition of the business and assets of the Computer Systems Division was for an undisclosed amount of cash.

COMPUTING CENTERS

APPLIED LOGIC TELE-COMPUTING CENTER

Applied Logic Corporation, Princeton, N.J. has opened a major tele-computing center offering general purpose computing to both the scientific and the business communities. Known as the Applied Logic Tele-Computing Center, the new facility makes it possible for scientists, engineers, mathematicians, and businessmen to utilize an advanced large-scale, scientifically oriented PDP-6 computer without leaving their laboratories and offices.

Via remote Teletype units and TWX lines, users communicate directly with the computer. This enables them to operate the computer whenever the need arises without the delays common to less advanced systems. The computer responds in a fraction of a second.

Clients also have the option of using the computer through Teletype facilities at the center itself. Either arrangement enables them to enter program and other information in confidential files within the computer.

The center, designed to accommodate the entire range of data processing tasks, also is well suited for man-machine problem solving. For applications involving graphic capabilities, a cathode ray display and a light pen will be available.

The center's staff is composed of mathematicians, programmers, and engineers broadly experienced in computer operations and mathematical research. Their services include consultation on adaptation of existing programs and development of new programs.
(For more information, designate #96 on the Readers Service Card.)

GE COMPUTER DEPARTMENT NOW OFFERING TIME-SHARING SERVICE

General Electric Company's Computer Department, Phoenix, Ariz., has announced that it is offering time-sharing computer service at its New York and Phoenix service centers.

New G-E computer systems, called GE-265's, were installed at both computer centers in October. As many as 40 users can be on-line to computers simultaneously at each site. Via long-distance lines, users can obtain direct access to the computer system at New York or Phoenix from terminals in their own offices.

Warner R. Sinback, Manager of General Electric's Information Processing Business, foresees users in Boston, Chicago and Philadelphia, for example, using the G-E time-sharing system in New York. Users located as far west as San Francisco, or as far north as Denver may wish to use the Phoenix-based system.

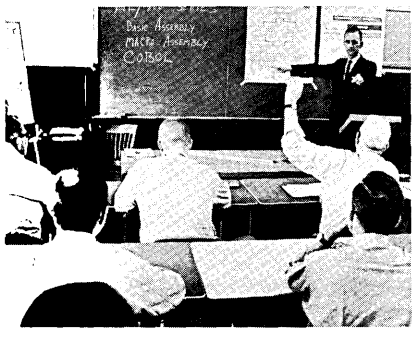
A minimum rate of $350 a month will be charged, allowing up to 25 hours access to the GE-265 system. Charge for time in excess of 25 hours will be at a reduced rate of $10 an hour or approximately 17 cents a minute.

The new G-E system will use the simplified time-sharing programming language, BASIC, developed jointly by Dartmouth College, Hanover, N.H., and General Electric. ALGOL also is available on the GE-265 system.
(For more information, designate #97 on the Readers Service Card.)

EDUCATION NEWS

COMPUTER PROGRAMMING COURSE AT U. S. PENITENTIARY

A new era in prisoner rehabilitation has been disclosed in an announcement by the U. S. Penitentiary, Atlanta, Ga., and the General Electric Company. A course in computer programming is now be-



ing taught to 23 inmates, by the General Electric Computer Department, as part of the prison's stepped-up program to equip prisoners with the occupational skills required in today's society.

The course will combine 120 hours of classroom instruction with practical experience in writing actual computer programs.

Within 10 days after announcing last spring that the course would be offered, Assistant Supervisor of Education Rex F. McMullan received more than 300 inquiries regarding qualification and application. On the basis of prior education, age, behavior record, and length of time until release (each inmate had to have enough time remaining to complete the 40 week classroom instruction), 37 men were selected to take a General Electric computer programming aptitude test. Because of classroom limitations, the 23 with highest scores were finally chosen.

"Test results compared very favorably with men having 10 to 15 years of business experience in the outside world," said GE instructor George R. Smith. He added that one inmate, by getting 71 of 72 words correct on a word association test, had the highest score ever achieved on the test.

After nine class sessions, the inmates were demonstrating an ability to cope successfully with the material being taught. Their average score on three examinations is 98.8%. On one test, 18 students scored 100, and the lowest score on any of the tests was 83.

Gaining experience in computer programming, the most extensive phase of training, will begin once the classroom period ends next May. It is then planned to have the inmates write programs to automate some of the penitentiary's administrative work.

When released from the institution, graduates of the course will be able to offer prospective employers not only classroom accomplishments and actual experience, but also a standard General Electric computer programming diploma and a letter certifying their achievements in the course. A log of each man's proficiency, detailing kinds of programs written, computer languages used, and equipment utilized, will be kept for employers to refer to.

Terming the voluntary involvement of industry in the penitentiary's rehabilitation efforts a "very healthy sign", Warden Olin G. Blackwell said the staff of General Electric's Computer Department "volunteered to administer and teach the course on their own time and at their own expense."

On the basis of the inmates' enthusiasm and achievements to date, General Electric is preparing to continue the course as part of the penitentiary's rehabilitation program. Also the course may be expanded next year to include computer maintenance and repair, and a school in system design and analysis.

GEORGIA STUDENTS AMONG FIRST IN NATION TO HAVE COMPUTER CLASSES

Georgia's two-year technical schools, under the aegis of the State Department of Education and local boards of education, have accelerated their data processing education programs by becoming among the first in the nation to acquire advanced, high-speed computers for classroom use.

Georgia's recently-established DeKalb and Marietta-Cobb Area Vocational-Technical Schools have installed Honeywell 200 computers. Their purpose is to help meet the growing demand in Georgia for people able to understand and operate computers and apply them to the complex data processing problems of business, industry, government and education.

Jim Cherry, DeKalb county school superintendent, described the schools' two-year courses in data processing technology as series of building blocks, each block broadening and supporting the students' growing competence in operation, use and control of office and business machines.

During the students' first year in school, they study concepts fundamental to the use of computers and punched card tabulating equipment, plus elementary accounting, business and data processing mathematics and communication skills.

The second year concentrates heavily on computer programming, programming systems, computer applications, business systems design and development — with the focal point of the various courses being actual work with the Honeywell 200. Other courses during the two years cover advanced accounting, economics,

business psychology and business statistics.

The course culminates in a data processing field project for which the student actually works with a business or industrial firm and studies its data processing requirements.

Graduates of the data processing program will not only have the "book learning" that might have been their total education at other schools — they will also have working, practical experience in operating, using and applying data processing techniques.

SOFTWARE NEWS

GE-APT

General Electric Company has revealed that the computer program, GE-APT (Automatically Programmed Tools), prepared for the large-scale GE-600 series computers has been completed and is operating successfully at the company's GE-625 installation in Schenectady, N.Y.

The program compiles instructions for numerically-controlled machine tools at the large Schenectady plant and translates into machine language the multiple dimensions and variables of intricate parts. It has been in operation here for several months, where complex castings are machined for the company's Large Steam Turbine plant.

Because of the GE-625's multiprogramming capability, machine shops using APT can produce perforated tape at significantly less cost than has been possible with previous computers. Availability of the new APT program for the 600 is expected to extend the use of numerical control to many smaller machine shops where computing costs have been prohibitive, according to G-E engineers at the Computer Department.

The 600-line's ability to accept data communicated to it from distant points by remote stations such as Teletype terminals, and to return the processed data to the sender means that small machine shops can use the computer directly from their places of business.

The new 600 program is the first to handle effectively the complicated mathematics involved in instructions for parts having more than two dimensions.

APT stands for Automatically Programmed Tools. The basic system was first coded experimentally by Massachusetts Institute of Technology in 1955. In 1957, the Aerospace Industries Association joined with MIT in further development of basic APT. Today, the Illinois Institute of Technology Research Institute has responsibility for the long-range development and sponsorship of the broad APT program.
(For more information, designate #99 on the Readers Service Card.)

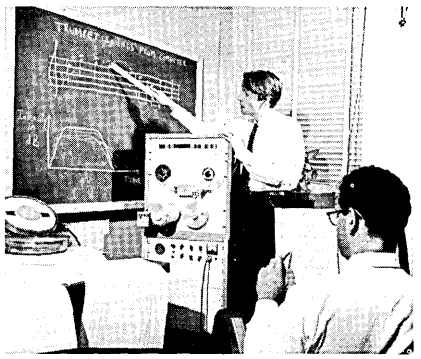
SPECIAL COMPUTER PROGRAM PRODUCES TRUMPET SOUNDS

Trumpet-like sounds indistinguishable from the sounds of the trumpet itself have been synthesized through a computer at Bell Telephone Laboratories. It is believed to be the first time the sound of any musical instrument has been generated with such fidelity by a computer. Brass timbre have proved particularly difficult to reproduce in the past.

Jean Claude Risset, a 27 year-old French physicist and composer on visit to Bell Laboratories for the past year, achieved the trumpet effect by using a special computer program. The program was devised by Max V. Mathews and refined by Joan E. Miller, both of Bell Labs. Mr. Risset's findings were presented at a meeting of the Acoustical Society of America in St. Louis on November 3.

In the study, Mr. Risset recorded trumpet tones on magnetic tape in Bell Labs anechoic chamber, a room in which reflections and extraneous noises are reduced to a minimum. Each recorded tone was then converted into digital form and the digitalized version was fed to an IBM 7094 computer. The computer analyzed each tone for its frequency spectrum to show the relative amplitudes of the frequency components comprising the tone. The spectra were displayed by the computer in graphic form.

From these displays and with the aid of the special program, the computer then produced similar spectra. It generated numbers which were then converted to electrical signals. These signals were fed to a loudspeaker, resulting in the reconstituted tones.



— Jean Claude Risset demonstrates a trumpet tune synthesized by a computer at Bell Telephone Laboratories. Here he follows a simple Henry Purcell trumpet composition on the board while listening to the computer-generated version played back on tape.

In listening to the computer-generated tones, 20 persons, several of whom were professional musicians, were unable to tell the difference between the computer trumpet sound and the real one.

The results indicate that computers will be able to produce a wide variety of experimental, musical sounds unlike any musical instruments in use. Composers and instrument makers lately have shown an interest in quality synthetic music.

The study provides acoustics researchers with a fresh understanding of the features in a sound wave that give an instrument, or a human voice as well, its natural, distinctive quality.

So far, only single tones have been synthesized in the study. Mr. Risset believes, however, that with the present computer program, it should be possible to synthesize multi-tones as well as entire orchestral passages. But its real value, musically speaking, is in producing novel timbre. In doing this, the computer itself would act as a prime musical instrument.
(For more information, designate #100 on the Readers Service Card.)

AUTOMATED MANUFACTURING PLANNING

IBM Corporation has introduced a new computer technique, Automated Manufacturing Planning, which allows a manufacturer to automatically convert engineering designs into precise manufacturing instructions.

The new concept captures the basic cause-and-effect logic of the manufacturing process. This logic is then used to identify the operations necessary to produce a part or assembly, and the exact sequence in which these operations must be performed.

Automated Manufacturing Planning, which may be used with any IBM computer, also specifies the raw material form to be used, the methods and time standards involved and, by extending these, provides detailed estimates of total production costs.

The first company to use the technique is Rollway Bearing Company, Inc., of Syracuse, N.Y., a leading manufacturer of straight cylindrical roller bearings. The technique is being implemented at Rollway in a joint project with IBM.

The new technique can be used in the manufacture of many other products besides roller bearings. Any company that has a product line composed of "families" of parts, or any company that uses similar manufacturing methods for a group of parts, can use the logical decision approach in automating the planning function. The documentation and programs required to implement Automated Manufacturing Planning are available without charge to all users of IBM computers.
(For more information, designate #98 on the Readers Service Card.)

NEW LITERATURE

PRINCIPLES OF AUTOMATIC DATA PROCESSING

Principles of Automatic Data Processing, a 93-page softbound introduction to business data processing, has been published by the Data Processing Management Association.

Designed to serve as a brief but comprehensive orientation for students and the general public, the book will be used as the student text for DPMA's "Future Data Processors" and "Executive Seminars" programs.

Beginning with a chapter which answers the question "What is data processing?" the text covers in turn basic punch card processing, electronic data processing, number systems, concepts of computer equipment and programming, and ends with an illustration of a typical computer application in business. A ten-page glossary of data processing terms and a short bibliography are included.

Principles of Automatic Data Processing is available from DPMA Headquarters, Park Ridge, Ill., at $1.25 per copy.

PERSPECTIVES ON OPTICAL SCANNING

Optical scanning and its form requirements are the subjects of a new brochure being issued by The Standard Register Company. Basic facts about the "machine with an eye" that can read up to 90,000 documents an hour and increases data processing speed and accuracy are covered in this 16-page, fully illustrated, colorful brochure, PERSPECTIVES ON OPTICAL SCANNING.

The booklet is presented as a layman's introduction to optical scanning, describing how the concept helps relieve the bottleneck of modern automated business communications. It takes the reader through the basic story of optical scanning — what it is, how it works, where it can be applied — leading up to the importance of business forms in systems incorporating these techniques. Printing, ink, type style and other factors are covered in this digest of facts on electronic speed-reading.
(For more information, designate #101 on the Readers Service Card.)

ELECTRONICS TECH BRIEF ISSUED BY NASA

Computers can turn out more readable reports by using lower case as well as capital letters, the way human typists do — but it slows them down, according to a Tech Brief issued by the National Aeronautics and Space Administration. Tech Brief 65-10286 describes a 120-character "print chain" that can be substituted for the 48-character chain now widely used in printers attached to medium to large computers.

Devised under contract to NASA by Myron B. Jonsberg and William W. Hand of Documentation, Inc., Bethesda, Md., the new chain can be used by any organization desiring more readable machine-compiled reports. Inquiries regarding it may be addressed to the Technology Utilization Officer, NASA Hq., Washington, D.C. 20546.

STANDARDS NEWS

ISO COMMITTEE APPROVES WORLD-WIDE STANDARDS FOR INFORMATION INTERCHANGE

World-wide standards for information interchange received penultimate approval at meetings in Tokyo, Japan, October 20-22, of technical committee 97 of the International Organization for Standardization (ISO). Final step in readying the standards for computers and information processing for global use will be the approval of the 51 member nations of ISO.

Included in the proposed international recommendations are coded character sets, magnetic ink character recognition (MICR), optical character recognition, paper tape, the programming languages FORTRAN and ALGOL, and flow chart symbols.

The coded character sets for international use will include the American Standard Code for Information Interchange, X3.4-1963. The magnetic ink character recognition fonts, E-13B (developed in the USA) and CMC 7 (developed through Bull-General Electric S.A.), will be processed simultaneously in ISO.

The E-13B font is covered by American Standard X3.2-1963 and is the font which is used at the bottom of bank checks for machine reading and accounting purposes. The font CMC 7 uses a different principle for reading the printed characters. E-13B is used for banking purposes in approximately six countries so far, and CMC 7 in about four.

ISO/TC 97 was unable to support one method of printing magnetic

characters and, as a result, both techniques will be advanced for final approval. Each country can thus select the one system it prefers.

International optical character recognition involves two approaches to standardization of optical characters. One has standardized a moderately stylized font which can use low cost reading equipment with slightly higher printing cost. The other has a non-stylized font (e.g. elite or pica) having lower printing cost and expensive and very sophisticated reading equipment. Within the United States the choice is the former and in some of the European countries the latter is the preference. Rather than select one over the other, technical committee 97 approved both fonts as draft ISO recommendations, leaving the choice as to use to each country.

The FORTRAN language for information processing is intended to accommodate business communications, and the ALGOL scientific communication. The ASA has not yet approved American Standards in either of these fields. The X3 committee, working under ASA procedures, is near agreement in submittal of American Standards in these basic machine language fields.

Similarly, the flow chart symbols adopted by the technical committee at the Tokyo meeting are the same as the recently approved American Standard on this subject.

R. G. Chollar, vice president of National Cash Register Company, served as chairman of the ISO/TC 97 Tokyo meeting. V. Henriques of Business Equipment Manufacturers Association was technical adviser to the secretariat and V. G. Grey of ASA, secretary.

The sessions of the international technical committee on computers and information processing brought together 60 delegates from 12 countries, including the United States which holds the secretariat for the activity through the American Standards Association, and four international organizations. The USA national activity is conducted through ASA project X3, the administrative leadership of which is provided by the Business Equipment Manufacturers Association.

In addition to the group from the United States, there were delegations from the national standards organizations of Australia, France, Germany, Italy, Republic of Korea, Japan, Netherlands, Sweden, Switzerland, United Kingdom and the USSR.

The international organizations represented were: the International Telegraph and Telephone Consultative Committee (CCITT), the International Electrotechnical Commission, the Universal Postal Union, and the European Computer Manufacturers Association.

BUSINESS NEWS

FINKE PREDICTS RECORD YEAR FOR EDP IN '66

Walter Finke, President of Honeywell EDP and former Chairman of BEMA, provided an optimistic prognosis for the computer industry during his annual review of BEMA activities during the 65 BEMA Show in New York at the end of October.

Mr. Finke related that "the best estimates of current performance and future trends (for the data processing industry) look highly favorable.

"The cumulative value of installed computing equipment by the end of 1965 will approximate $7.5 billion, representing a net increase of $1.5 billion in the cumulative base. Actual gross shipments this year are forecast at $1.75 billion.

"The $250 million gap between gross shipments and net cumulative increase indicates the rapidity with which first-generation computers, those of vacuum-tube design, were obsoleted and displaced during the year.

"Of greater significance, this gap is the first clear indicator of the growth of the second-generation computer replacement market. This replacement of early second-generation computers by newer models was of substantial size for the first time in 1965, with estimates of displaced second-generation models ranging between 500 and 1000 units. As shipments of new equipments peak in 1966, the rate of attrition among second-generation models will increase dramatically.

"On a unit basis, by the end of this year approximately 27,000 computers will be in operation. Of these, about 20,000 will be full-size data processing systems, and about 7,000 will be of the desk-size variety. Markets for both types expanded in orderly and healthy fashion during the year, and are up from approximately 16,000 and 5,000 units respectively at year's end last year.

"Next year promises to be the greatest in the industry's history. More than 8,000 units of all types will be shipped, which is approximately 1,000 units more than were shipped in the record year of 1964. The average daily installation rate for the entire year will approach three dozen systems.

"The major factors producing next year's record forecasts are: first, it will be the first time that the new offerings will be deliverable in massive quantities; second, backlog rates in 1965 have been climbing as users completed their evaluations of the new units and placed orders; third, marketing activities within the industry will be intensified now that the newest systems are deliverable and demonstrable.

"Finally, the general economic expansion has spurred capital spending plans to a $52 billion rate; the same confidence that inspires investment in new plant and equipment also inspires investment — on either a lease or purchase basis — in computing systems."

CALCOMP INCREASES SALES

California Computer Products, Inc., reports net income of $57,739 on gross revenues of $1,007,405 for the first quarter of fiscal 1966, ended October 3, compared with earnings of $107,307 on gross revenues of $830,507 for the same period last year.

Lester L. Kilpatrick, president, reported that "research and development expenditures of $159,648 were written off in the quarter. No research and development expenses were written off in the same period last year."

Sale of digital plotters and plotting systems during the quarter increased 50% over a year ago, bringing proprietary product sales to about 90% of the total, compared to 73% in the first quarter of fiscal 1965, Kilpatrick said.

POTTER ACHIEVES RECORD BACKLOG

Potter Instrument Co. reports that its order backlog was $9,540,000, a record high, as of October of this year. This is up from $8,457,500 recorded this past June.

This backlog is composed of orders from 27 different customers, President John T. Potter notes. It consists of tape handlers, paper tape readers, line printers, random access memories, precision coordinate measuring machines and other products.

First half 1965 shipments will probably exceed $7,500,000 up some 57% over last year's first half shipments of about $4,800,000, Mr. Potter added.

FABRI-TEK SALES UP, PROFITS DROP

Fabri-Tek, Inc., a supplier of magnetic core memories, reports sales of nearly $9.7 million for the first six months of its current fiscal year. This is an increase of more than 50% over the comparable period in 1964.

Net earnings did not fare as well as sales. They were down about 20% to $570,515.

HONEYWELL EDP HAS NEW PRICING PLAN

Honeywell Inc. has announced major changes in its rental and purchase policies for EDP systems.

The new policies "reflect the product and technological stability now becoming evident in the computer industry," and are designed to make attractive longer-term rental and outright purchase of Honeywell's Series 200 data processing systems, the company reports.

Some rental and purchase prices have been reduced, while others have been increased, effective on all new proposals starting today, November 15, 1965. Some prices remain unchanged.

Four types of purchase plans are available. Users purchasing a Series 200 system outright obtain a substantial price advantage. On a presently priced $300,000 H-200, for example, the savings could amount to $22,500. Purchasers at the end of six months of rental would receive a smaller reduction plus 100 per cent credit for all rentals. Those purchasing at the end of 12 months rental would receive the same reduction plus 80 per cent credit for all rentals. All figures above will vary depending upon the actual configuration.

Users electing to purchase after 12 months of use but before two years receive no purchase price reduction, but obtain a 60 percent purchase option credit on all rentals paid.

Rental contracts have also been changed. Rental prices for one-year contracts have been increased on all proposals issued after this date, and on all one-year contracts subject to renewal after the appropriate notice period.

Hourly usage span, however, has been increased from 176 to 200 hours on the one-year plan, producing in most instances a lower cost-per-hour of use availability. There is no change on the standard three-year rental agreements Honeywell now offers.

New four- and five-year rental agreements will produce significant savings to users. Under a four-year plan, savings in rental amounts to $2,000 annually, or $8,000 for the life of a contract, based on a $300,000 list price system. For five-year contracts, savings amount to $6,000 annually, or $30,000 for the contract life.

Honeywell's use-purchase plan, for acquiring a computer on an installment basis, remains unchanged.

A general increase in maintenance charges for purchased systems was also announced. The new rates vary with individual pieces of equipment.

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.

In general, manufacturers in the computer field do not officially release installation and on order figures. The figures in this census are developed through a continuing market survey conducted by associates of our magazine. This market research program develops a documented data file which now corers over 85% of the computer installations in the United States. A similar program is conducted for overseas installations.

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

AS OF NOVEMBER 10, 1965

NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS
Advanced Scientific Instruments	ASI 210	Y	$2850	4/62	24	1
	ASI 2100	Y	$3000	12/63	6	1
	ADVANCE 6020	Y	$2200	4/65	5	4
	ADVANCE 6040	Y	$2800	7/65	1	7
	ADVANCE 6050	Y	$5000	10/65	0	3
	ADVANCE 6070	Y	$10,500	10/65	1	6
	ADVANCE 6080	Y	$7000	1/66	0	0
Autonetics	RECOMP II	Y	$2495	11/58	49	X
	RECOMP III	Y	$1495	6/61	11	X
Bunker-Ramo Corp.	BR-130	Y	$2000	10/61	158	6
	BR-133	Y	$2400	5/64	8	7
	BR-230	Y	$2680	8/63	15	X
	BR-300	Y	$3000	3/59	38	X
	BR-330	Y	$4000	12/60	34	X
	BR-340	Y	$7000	12/63	20	X
	BR-530	Y	$6000	8/61	14	X
Burroughs	205	N	$4600	1/54	53	X
	220	N	$14,000	10/58	44	X
	E101-103	N	$875	1/56	155	X
	B100	Y	$2800	8/64	90	28
	B250	Y	$4200	11/61	106	5
	B260	Y	$3750	11/62	235	25
	B270	Y	$7000	7/62	155	15
	B280	Y	$6500	7/62	94	18
	B300	Y	$8400	7/65	22	75
	B5000/B5500	Y	$20,000	3/63	46	9
	B8500	Y	$200,000	2/67	0	1
Clary	DE-60/DE-60M	Y	$525	7/60	344	4
Computer Control Co.	DDP-19	Y	$2800	6/61	3	X
	DDP-24	Y	$2500	5/63	68	8
	DDP-116	Y	$900	4/65	30	40
	DDP-124	Y	$2050	2/66	0	4
	DDP-224	Y	$3300	3/65	13	15
Control Data Corporation	G-15	N	$1000	7/55	326	X
	G-20	Y	$15,500	4/61	26	X
	160*/160A/160G	Y	$1750/$3400/$12,000	5/60;7/61;3/64	439	1
	924/924A	Y	$11,000	8/61	29	X
	1604/1604A	Y	$38,000	1/60	60	X
	1700	Y	$2200	5/66	0	18
	3100	Y	$7350	12/64	38	36
	3200	Y	$12,000	5/64	87	18
	3300	Y	$15,000	9/65	4	60
	3400	Y	$25,000	11/64	20	22
	3500	Y	$30,000	6/66	0	3
	3600	Y	$58,000	6/63	46	10
	3800	Y	$60,000	11/65	0	27
	6400	Y	$40,000	1/66	0	8
	6600	Y	$110,000	8/64	7	9
	6800	Y	$140,000	4/67	0	4
Digital Equipment Corp.	PDP-1	Y	$3400	11/60	60	2
	PDP-4	Y	$1700	8/62	55	2
	PDP-5	Y	$900	9/63	112	3
	PDP-6	Y	$10,000	10/64	9	6
	PDP-7	Y	$1300	11/64	32	44
	PDP-8	Y	$525	4/65	75	302
El-tronics, Inc.	ALWAC IIIE	N	$1820	2/54	21	X
Electronic Associates, Inc.	8400	Y	$7000	6/65	2	6
Friden	6010	Y	$600	6/63	289	180
General Electric	115	Y	$1375	12/65	0	400
	205	Y	$2900	6/64	40	12
	210	Y	$16,000	7/59	54	X
	215	Y	$6000	9/63	53	3
	225	Y	$8000	4/61	140	2
	235	Y	$10,900	4/64	58	8
	415	Y	$7300	5/64	80	65
	425	Y	$9600	6/64	42	52
	435	Y	$14,000	10/64	19	24
	625	Y	$41,000	12/64	10	35
	635	Y	$45,000	12/64	11	39
General Precision	LGP-21	Y	$725	12/62	100	X
	LGP-30	semi	$1300	9/56	305	X
	RPC-4000	Y	$1875	1/61	65	X
Honeywell Electronic Data Processing	H-120	Y	$2600	12/65	0	190
	H-200	Y	$5700	3/64	670	210
	H-400	Y	$8500	12/61	125	5
	H-800	Y	$22,000	12/60	87	4

NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS
Honeywell (cont'd)	H-1200	Y	$6500	2/66	0	40
	H-1400	Y	$14,000	1/64	12	2
	H-1800	Y	$30,000	1/64	14	6
	H-2200	Y	$11,000	11/65	0	48
	H-4200	Y	$16,800	2/66	0	8
	H-8200	Y	$35,000	3/67	0	1
	DATAmatic 1000	N	$40,000	12/57	4	X
IBM	305	N	$3600	12/57	172	X
	360/20	Y	$1800	12/65	0	3700
	360/30	Y	$7200	5/65	300	3100
	360/40	Y	$14,500	4/65	250	850
	360/44	Y	$12,000	9/66	0	350
	360/50	Y	$28,000	8/65	7	360
	360/60	Y	$48,000	11/65	0	12
	360/62	Y	$55,000	11/65	0	5
	360/65	Y	$46,000	1/66	0	110
	360/67	Y	$49,000	9/66	0	22
	360/75	Y	$78,000	11/65	0	78
	650	N	$4800	11/54	255	X
	1130	Y	$850	11/65	0	1500
	1401	Y	$4500	9/60	6800	220
	1401-G	Y	$2000	5/64	1150	75
	1410	Y	$14,200	11/61	740	35
	1440	Y	$3300	4/63	2450	300
	1460	Y	$9000	10/63	2100	250
	1620 I, II	Y	$2500	9/60	1700	20
	1800	Y	$3700	12/65	0	115
	701	N	$5000	4/53	1	X
	7010	Y	$22,600	10/63	160	40
	702	N	$6900	2/55	8	X
	7030	Y	$160,000	5/61	7	X
	704	N	$32,000	12/55	41	X
	7040	Y	$18,000	6/63	112	8
	7044	Y	$35,200	6/63	75	18
	705	N	$30,000	11/55	61	X
	7070, 2, 4	Y	$27,000	3/60	342	7
	7080	Y	$55,000	8/61	75	X
	709	N	$40,000	8/58	11	X
	7090	Y	$63,500	11/59	46	1
	7094	Y	$72,500	9/62	135	8
	7094 II	Y	$78,500	4/64	90	30
ITT	7300 ADX	Y	$18,000	9/61	9	6
Monroe Calculating Machine Co.	Monrobot IX	N	Sold only - $5800	3/58	150	X
	Monrobot XI	Y	$700	12/60	580	120
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	370	50
	NCR - 315-RMC	Y	$12,000	9/65	10	50
	NCR - 390	Y	$1850	5/61	1075	45
	NCR - 500	Y	$1500	10/65	15	560
Philco	1000	Y	$7010	6/63	20	0
	2000-210, 211	Y	$40,000	10/58	18	1
	2000-212	Y	$52,000	1/63	9	1
	2000-213	Y	$68,000	9/66	0	1
Radio Corporation of America	Bizmac	N	$100,000	-/56	3	X
	RCA 301	Y	$6000	2/61	620	7
	RCA 3301	Y	$11,500	7/64	44	18
	RCA 501	Y	$14,000	6/59	99	2
	RCA 601	Y	$35,000	11/62	5	X
	Spectra 70/15	Y	$2600	11/65	0	80
	Spectra 70/25	Y	$5000	11/65	0	70
	Spectra 70/35	Y	$7000	4/66	0	16
	Spectra 70/45	Y	$9000	3/66	0	80
	Spectra 70/55	Y	$14,000	5/66	0	22
Raytheon	250	Y	$1200	12/60	175	5
	440	Y	$3500	3/64	13	4
	520	Y	$3200	10/65	1	5
Scientific Data Systems Inc.	SDS-92	Y	$900	4/65	25	40
	SDS-910	Y	$2000	8/62	150	18
	SDS-920	Y	$2700	9/62	96	13
	SDS-925	Y	$2500	12/64	11	28
	SDS-930	Y	$4000	6/64	73	30
	SDS-9300	Y	$7000	11/64	17	8
Systems Engineering Labs	SEL-810	Y	$750	9/65	2	12
	SEL-840	Y	$4000	11/65	0	3
UNIVAC	I & II	N	$25,000	3/51 & 11/57	29	X
	III	Y	$20,000	8/62	88	1
	File Computers	N	$15,000	8/56	19	X
	Solid-State 80 I, II, 90 I, II & Step	Y	$8000	8/58	295	X
	418	Y	$11,000	6/63	50	30
	490 Series	Y	$26,000	12/61	75	51
	1004	Y	$1900	2/63	3150	200
	1005	Y	$2400	2/66	0	80
	1050	Y	$8000	9/63	245	125
	1100 Series (except 1107)	N	$35,000	12/50	12	X
	1107	Y	$45,000	10/62	29	1
	1108	Y	$50,000	9/65	3	19
	LARC	Y	$135,000	5/60	2	X
				TOTALS	30,215	15,214

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 IBM 7044, 7074, and 7094 I and II's are not for new machines but for conversion from existing 7040, 7070 and 7090 computers respectively.

READERS' AND EDITOR'S FORUM

(Continued from page 13)

copyrighted programs. Unfortunately, the professional societies do not seem interested either.

II.

James M. Detmer
New Canaan, Conn.

In the article *Copyrighted Computer Programs* Mr. Banzhaf states "(Prior to the recent decision) . . . the lack of legal protection made it impossible to market a program as a product." It would seem we have done the impossible! Let me relate some of the facts surrounding a successful job of marketing a program, a job for which much credit goes to Art Phinney of Century, Inc., New York, N.Y. The program itself is my development.

During 1963 and 1964 Art and I promoted the sale of a computer program called LOG70, intended for users of IBM 7070 series equipment. We contacted about 300 installations, mostly by telephone and mail, and succeeded in selling 45.

The program was priced at $350. To obtain a demonstration, the prospect had to agree in writing to return all materials if not purchased. Upon sale, the customer signed an agreement prohibiting distribution outside his organization. While clearly marked as our product, none of the materials was Copyrighted.

We were frequently asked about protection for our product. We relied altogether on the integrity of the people we dealt with, and we were not the slightest bit disappointed. In the one case of disclosure outside a customer's organization, we received a prompt purchase order from the recipient of LOG70, as soon as he identified what he had as our product. The exchange occurred between friendly operators at different installations; if we had covered each geographical market completely, one at a time, this situation could not have developed.

Perhaps the very reasonable price tag discouraged illicit trade; why risk embarrassment over $350? In any case, I would not hesitate to try it again with another program . . . Copyrighted? Sure . . . but let me stress that the problem to be faced is 90% sales and 10% protection.

ONE ERROR IN YOUR PROGRAM

Georgia M. Nagle
Computation Center
Mass. Inst. of Technology
Cambridge, Mass. 02139

Many New England colleges and universities participate in the use of the IBM 7094 at M.I.T.'s Computation Center. A visiting staff member from one of these colleges asked to use the phone on my desk. This was the conversation I overheard (all in a monotone): "Hi, Sal . . . It'll be about another hour before I can get home. Don't wait supper on me . . . By the way, I only had one error in my program . . . Good? What do you mean, good? One error in your program is like one bullet in your brain."

VP - EDP

in

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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.

CALENDAR OF COMING EVENTS

Dec. 3-4, 1965: 6th International SDS Users Group Meeting, Dunes Hotel and Country Club, Las Vegas, Nev.: contact Dr. Robert J. Stewart, Jr., Cyclone Computer Center, Iowa State University, Cedar Falls, Iowa

Jan. 31-Feb. 4, 1966: International Symposium on Information Theory, UCLA, Los Angeles, Calif.; contact A. V. Balakrishnan, Dept. of Engrg., Univ. of Calif., Los Angeles, Calif. 90024

Feb. 2-4, 1966: 1966 Convention on Aerospace and Electronic Systems, International Hotel, Los Angeles, Calif.; contact William H. Herrman, Hughes Aircraft Co., Culver City, Calif.

Mar. 21-24, 1966: IEEE International Convention, Coliseum & New York Hilton Hotel, New York, N. Y.; contact J. M. Kinn, IEEE, 345 E. 47 St., New York, N. Y. 10017

Mar. 24-26, 1966: 4th Annual Symposium on Biomathematics and Computer Science in the Life Sciences, Shamrock Hilton Hotel, Houston, Tex.; contact Office of the Dean, Div. of Continuing Education, Univ. of Texas Graduate School of Biomedical Sciences at Houston, 102 Jesse Jones Library Bldg., Tex. Medical Center, Houston, Tex. 77025

Mar. 29-31, 1966: ACM Symposium on Symbolic and Algebraic Manipulation, Sheraton-Park Hotel, Washington, D. C.; contact Miss Jean E. Sammet, IBM Corp., 545 Technology Sq. Cambridge, Mass. 02139

Apr. 26-28, 1966: Spring Joint Computer Conference, Boston Civic Center, Boston, Mass.; contact AFIPS Hdqs., 211 E. 43 St., Rm. 504, New York, N. Y. 10017

May 3-5, 1966: British Joint Computer Conference, Congress Theatre, Eastbourne, Sussex, England; contact Public Relations Officer, Institution of Electrical Engineers, Savoy Place, London, W.C.2, England

May 10-12, 1966: National Telemetering Conference, Sheraton-Boston Hotel at Prudential Plaza, Boston, Mass.; contact IEEE, 345 E. 47 St., New York, N.Y. 10017

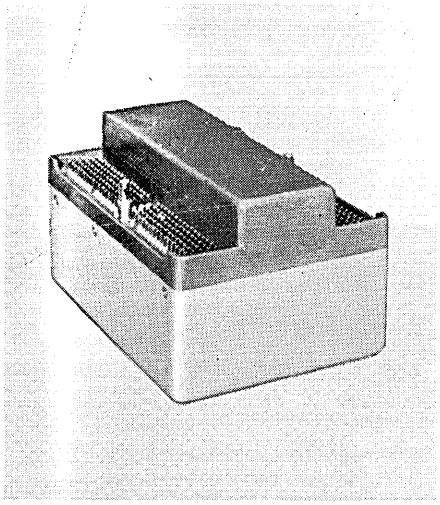
May 16-20, 1966: Australian Computer Conference, Canberra, A.C.T., Australia; contact S. Burton, Honorary Secretary, P.O. Box 364, Manuka, A.C.T., Australia

May 18-20, 1966: 29th National Meeting of the Operations Research Society of America, Los Angeles, Calif.; contact Dr. John E. Walsh, System Development Corporation, 2500 Colorado Ave., Santa Monica, Calif. 90406

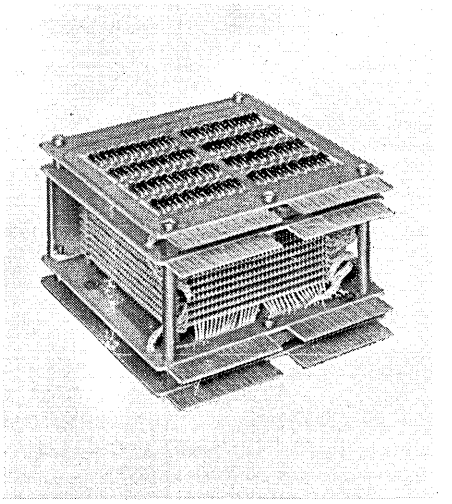
May 30-June 1, 1966: National Conference of the Computing and Data Processing Society of Canada, Banff Springs Hotel, Banff, Alberta, Canada; contact Mr. K. R. Marble, Mgr., Systems and Computer Services Dept., Western Region, Imperial Oil Ltd., Calgary

June 15-17, 1966: 1966 IEEE Communication Conference, Sheraton Hotel, Philadelphia, Pa.; contact Lewis Winner, 152 W. 42nd St., New York, N.Y. 10036

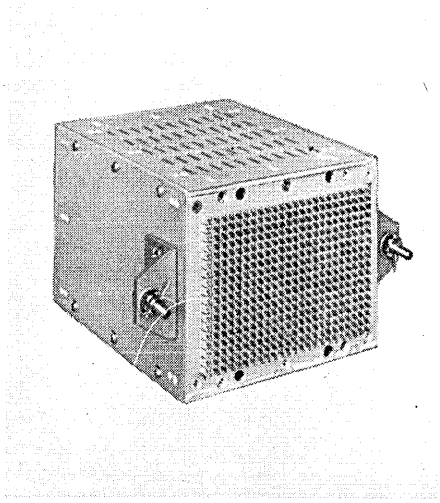
June 20-26, 1966: 3rd Congress of the International Federation of Automatic Control, London, England; contact American Automatic Control Council, c/o Dr. Gerald Weiss, Electrical Engineering Dept., Brooklyn Polytechnic Institute, 333 Jay St., Brooklyn 1, N. Y., or IFAC Secretary, Postfach 10250, Düsseldorf, Germany



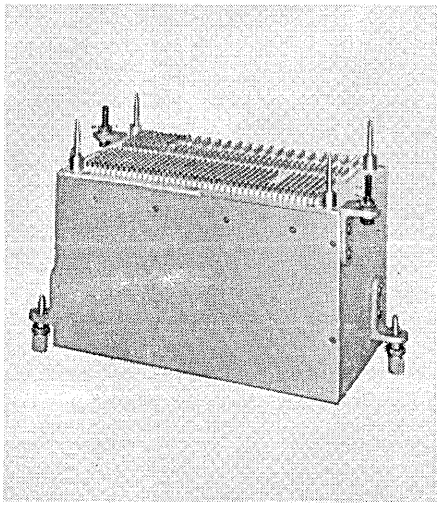
Customer: Control Data Corporation
128 x 64 x 12 capacity, temperature controlled stack for Polaris program



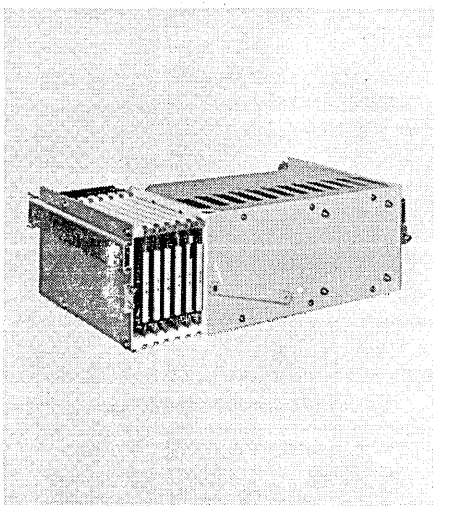
Customer: Honeywell
64 x 64 x 9 stack for H-200 computer



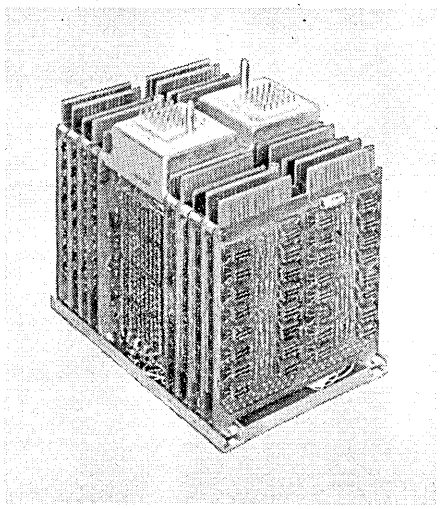
Customer: General Electric Company
2048 x 74 stack for 635 computer



Customer: Bunker-Ramo Corporation
16,384 x 16 stack for BR 133 computer



Customer: Dynatronics
2048 x 19 stack for simulator system



Customer: Honeywell
128 x 128 x 9 stack for H-2200 computer

Whatever you need in a core memory stack . . . FABRI-TEK can build it!

These stacks are typical of the diverse requirements our customers ask us to meet. Their problems range from speed to packaging, from temperature to size.

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Your stack design may not look like any of these, but it's a good bet we've built its cousin.

Put Fabri-Tek memory technology to work on your stack problems. Write Fabri-Tek Incorporated, Amery, Wisconsin.

Phone: 715-268-7155. TWX: 510-376-1710.

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