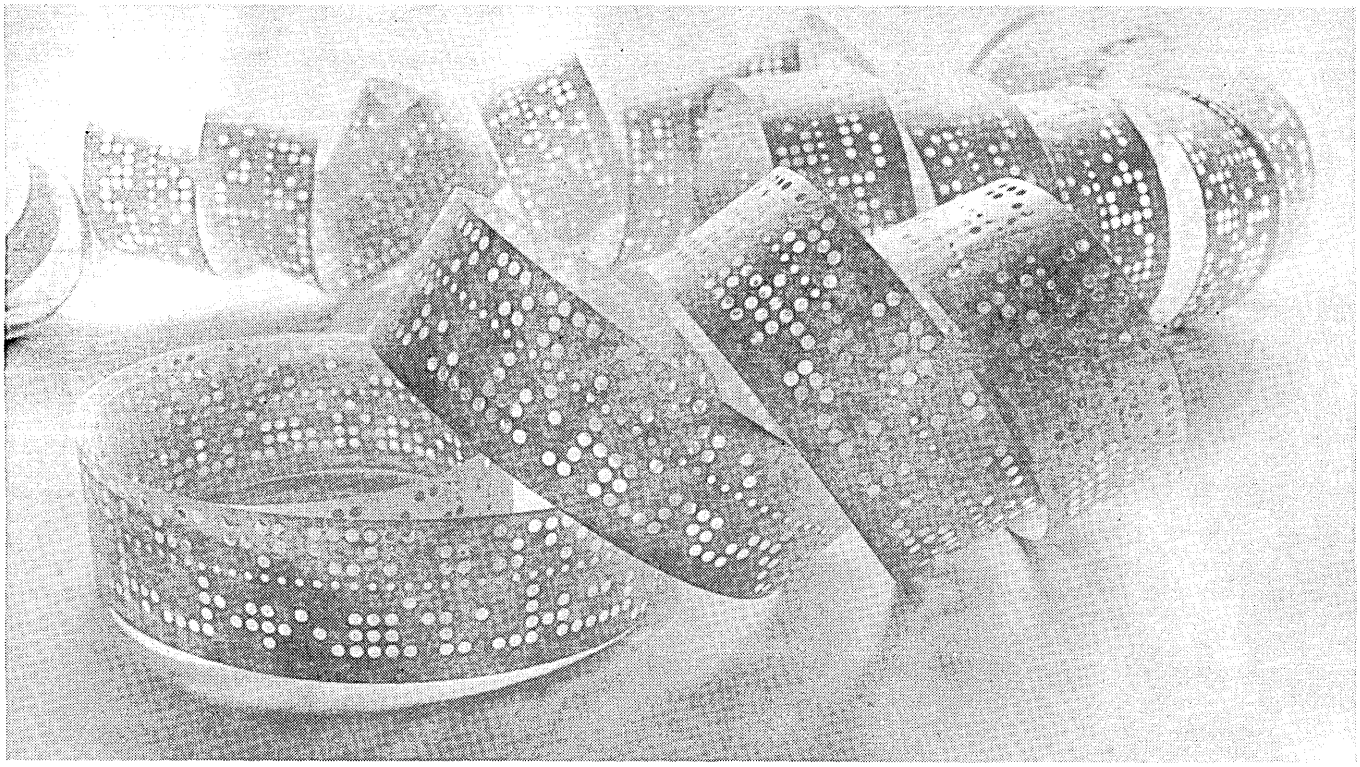
September, 1966

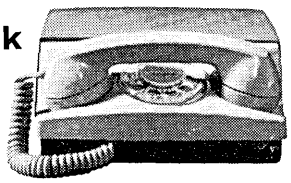
computers and automation

Simulator for computer operation



Clark Equipment Company gets data from 127 sales offices, 4 manufacturing plants, and a major warehouse as soon as it's recorded

Bell System communications is the vital link



Bell System data communications services link Clark's distant locations to a centralized computer center at Buchanan, Michigan. The result is better management control of all activities—sales, inventory, purchasing, production, payroll and accounting.

With current and accurate information, Clark management can quickly adjust to changing marketing conditions. Important orders get priority scheduling for production and shipment. And yet, purchasing, production and inventories stay at optimum levels.

An integrated information system of this size uses computer switching with store and forward capabilities. The fully automatic Clark system polls satellite stations, receives and transmits messages, assigns priorities, and converts different speed and code formats to one standard code. Other features of the switching unit provide the necessary supervisory control of the network.

Consider the economies a real-time, integrated information system can bring to your business with automatic data processing linked with fast, reliable communications.

Today's dynamic competition requires many companies to consider organizing for data processing in some phase of their operations. It's important to start organizing communications at the same time.

So when you think of data communications, think of the Bell System. Our Communications Consultant is ready and able to help you plan an integrated information system.

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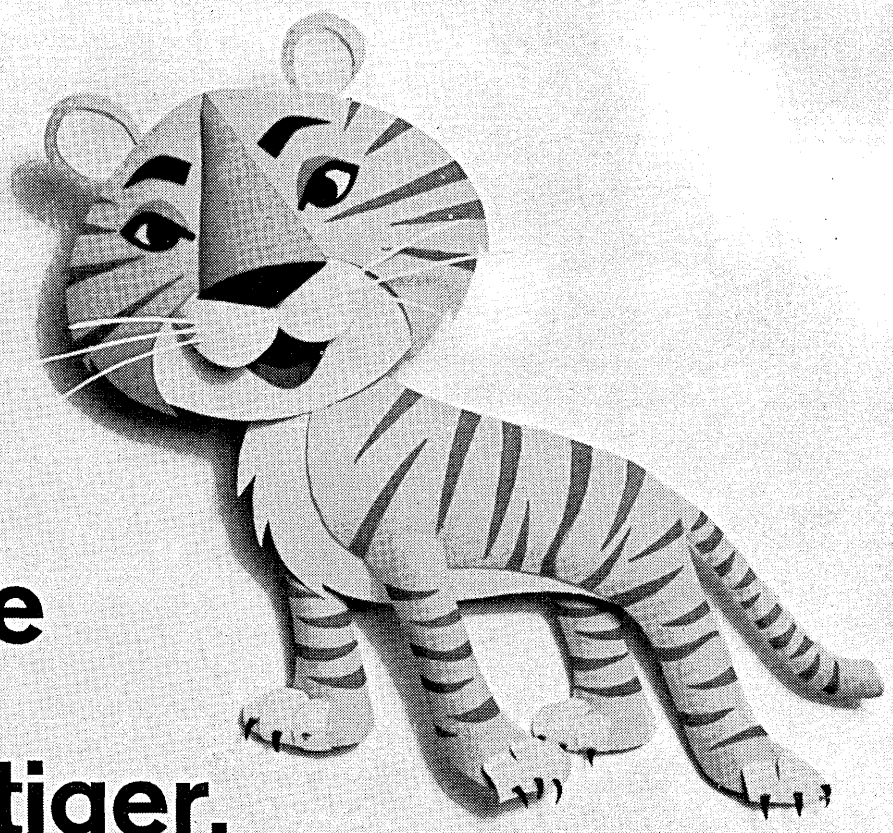

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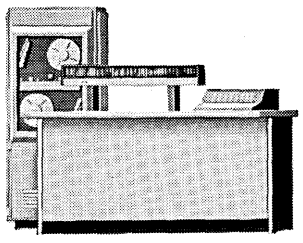

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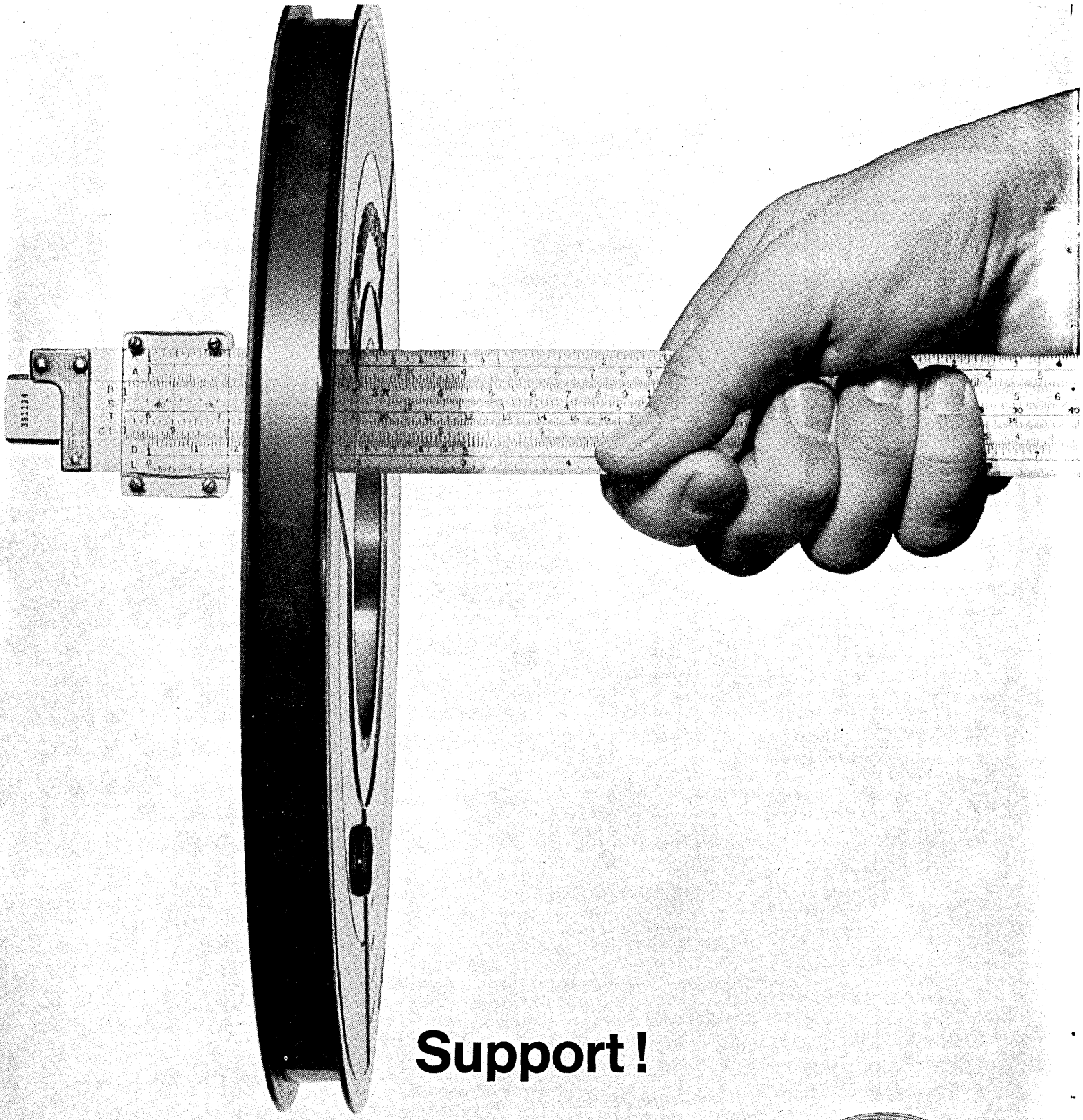

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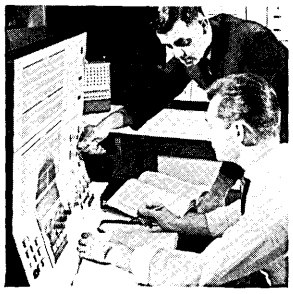
The front cover shows a simulator which duplicates the operation of an IBM System 360, Model 30 computer console. It is used in the training of customer engineers. For more information, see page 43.



computers and automation

SEPTEMBER, 1966 Vol. 15, No. 9

In This Issue

Special Feature: Jobs and Careers in Data Processing

In Every Issue

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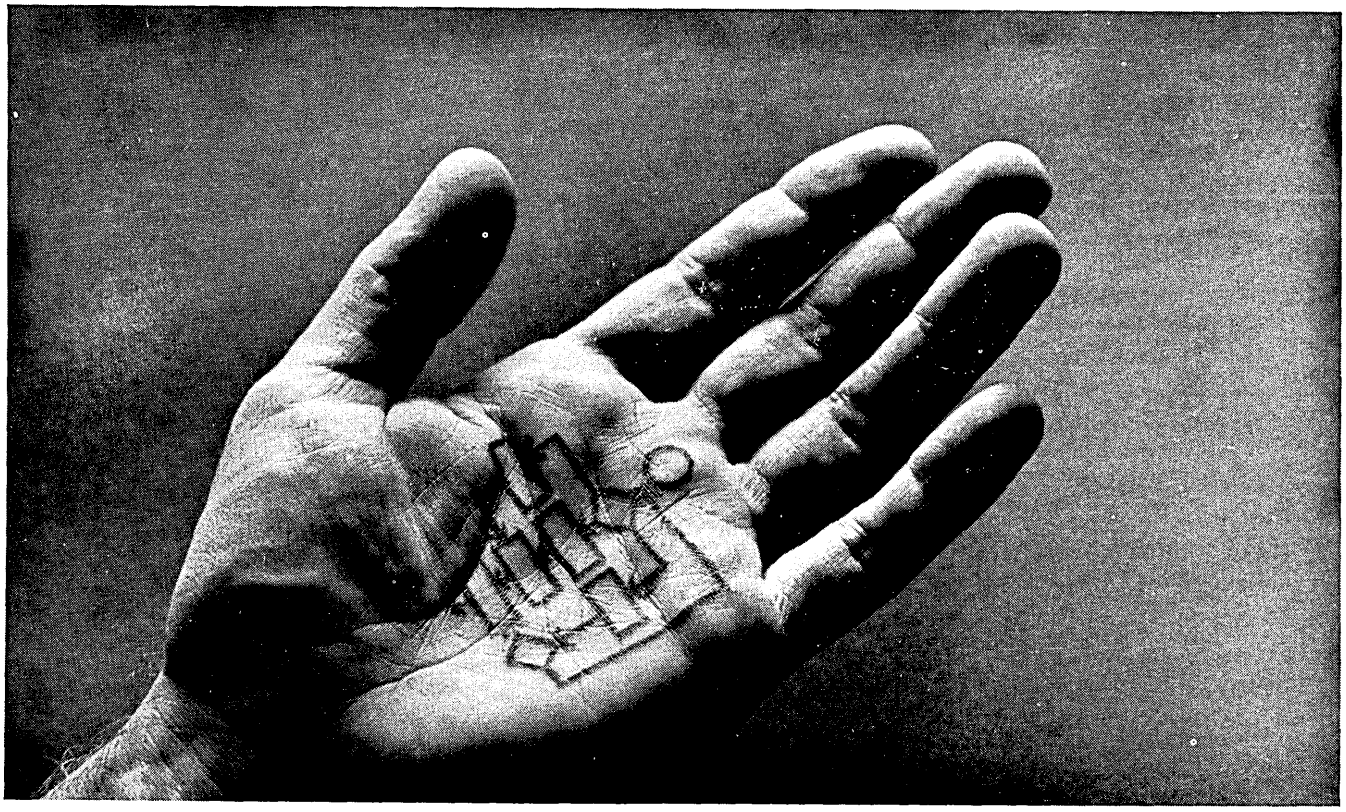

Ever tried programming your future?

Sorry. Not even an IBM computer can do that yet—there are too many variables, too many unknowns. The point is, your future is up to you.

That's why you owe it to yourself to look at these points:

- IBM is the leader in the major growth industry—information processing and control.
- Programmers work closely with hardware designers.
- They are continually exposed to all the aspects of advanced programming.
- They have the chance to grow within the company, to take on new responsibilities.
- They realize all the accompanying rewards, both professionally and personally.

If you're a concerned, go-places programmer, this data could be an important factor in your "master program" for the future. Consider these points of fact. Then consider the many diversified career opportunities available at IBM's Federal Systems Division in Bethesda, Maryland, in the areas listed: Real-Time Scientific Systems, Information-Retrieval Systems, Management Information Systems, Research.

The positions require a B.S. or B.A. degree or equivalent, and at least one year's experience in information handling or programming.

To obtain more information about your future chances with IBM, write, outlining your experience, to: Mr. J. E. Martone, Dept. 539W, IBM Corporation, 18100 Frederick Pike, Gaithersburg, Maryland.

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Bootstrapping a Career in the Computer Field

Much of this issue contains articles and comments on one of the large questions currently facing the field of computers and data processing:

How shall we get enough people to man the computers?

One of the important avenues is the very old-fashioned one: entering the field, and learning as you go along.

For example, many medical doctors are nowadays finding out that advanced instruments and computers to handle them are becoming essential to investigations that they want to do. So they enter the computer field: they learn enough about a computer and a programming system so that they can accomplish what they want to do. In business applications, the usual rule is: Take a man who knows the business and teach him programming and systems — it is easier than taking a man who knows programming and systems and teaching him the business. Out of hundreds of kinds of contacts like these, there comes a flow of people making careers in the computer field, finding it congenial and drawn by the opportunities.

I would estimate that by far the largest number of people with careers in the computer field have entered it informally. Often they have had formal training in other fields; but when they entered the computer field, they absorbed the necessary information informally as they went along.

One of the most important, widely used, and effective methods for gaining a job or a career in data processing is:

FINDING OUT BY YOURSELF

— that is, not in a school, not by means of a course, not in a class, not through formal instruction or training resting on what a teacher decides, but by picking up information, reading, asking questions, and studying, all under your own steam.

Consequently, a very important kind of help that people, societies, and corporations in the computer field can provide in order to have more people become computer persons is to help organize systematic information for efficiently learning about computers by themselves. Already the Data Processing Management Association has established an examination for a Certificate in Data Processing, and a syllabus of readings for prospective students studying for that examination.

For example, suppose I want to study the programming of business problems. It would help me a great deal to know the half dozen best books to read, the parts I should especially study, and the glossary of key terms that I should surely learn. Also, since I might have access to a computer at odd times, I would be glad to know some simple well-selected sample problems to try on the computer. Thus I would get a first-hand feel for the speed and the idiocy of the machine.

Another kind of help that would be highly desirable is a network of informal tutors. Many people enjoy teaching, and helping an earnest student. Suppose every student in the computer field could easily find an associate who knew more than he did, and who would willingly spend an hour with him once a week. This informal tutoring would help him over the obstacles of unanswered questions. It would also help him to keep his attention on the main track.

A third kind of help would be free access for a serious student to a computer, to the extent of perhaps an hour a week. If this were a time-shared computer, an hour of access might use a minute of computer time, and the cost would be perhaps $3. Surely many companies and organizations could afford to provide free help to serious students to the extent of $3 a week of computer time for each. The government could help bear the cost of this time at universities, schools, training centers, etc. A program that actually runs brings a great surge of satisfaction to the student programmer and provides proof of understanding.

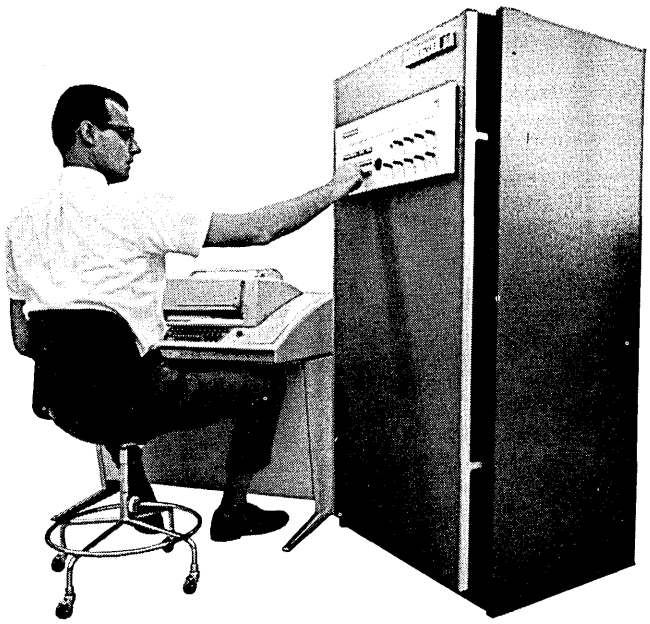
The computer field would do well to direct some attention to help for serious students who are studying computers informally and on the side. This would help greatly in solving the great question:

How shall we find the people to harness the power of the computer?

Edmund C. Berkeley

EDITOR

SDS announces Sigma 2, a fat-free computer designed for systems.



Sigma 2 is a small, very fast, extremely reliable real-time computer with highly sophisticated software.

It costs $26,000 with Model 35 Teletypewriter, paper tape reader and punch, 4 fully buffered automatic I/O channels, and 4,096 words of core memory.

Memory is expandable to 65,536 words, all of which can be directly addressed. Cycle time is 900 nanoseconds.

Sigma 2 does multiprogramming and multiprocessing. It can control a real-time situation in the foreground while simultaneously performing a general-purpose job in the background—all with full memory protection. Re-entrant software greatly multiplies speed and efficiency. Sigma 2 can change its environment from one program to another in 4 microseconds.

With 20 input/output channels available, Sigma 2 can carry on many I/O operations simultaneously and very rapidly—up to 6,000,000 bits per second. A full word can be read in or out directly without the use of an I/O channel.

Memory protection is extremely flexible. Under program control, Sigma 2 can dynamically alter areas of protection while the machine is running. It takes only 2 microseconds to change protection for 4,096 words. Yet it is impossible for a background program to gain access to areas of memory under foreground protection.

Sigma 2 contains about ⅓ as many components as comparable machines. Integrated circuits, modular design and a unique logical organization make this possible. As a result, Sigma 2's standard of reliability is far beyond anything previously known in the industry. Even its typewriter is the most rugged machine on the market.

Sigma 2 is designed to handle such critical real-time applications as aerospace and industrial control, nuclear experimentation, and communications switching and control, and at the same time do general-purpose computation.

Also, Sigma 2 can serve as a local or remote satellite to its big brother, Sigma 7. It can use Sigma 7's memory in addition to its own, and it can operate all the Sigma 7 peripherals.

Software for Sigma 2 includes Basic Control Monitor, Basic FORTRAN, SDS FORTRAN IV, Real-Time Batch Monitor, basic and extended assemblers, and a library of mathematical and utility programs.

The first Sigma 2's will be delivered (with software) in 1966.

SDS

Scientific Data Systems, Santa Monica, California

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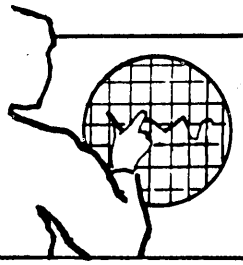


c & a MARKET REPORT

COMPUTER CUSTOMER LOYALTY STUDY INDICATES IBM, UNIVAC HAVE NET LOSS OF CUSTOMERS TO COMPETITORS.

IBM, although it is having success in switching some computer customers of each of its major competitors to its equipment, is experiencing a net loss of customers in the process. This was one trend indicated by the results of a computer customer loyalty study just completed by The International Data Corp., Newton, Mass.

The study examined the brand of computer equipment being ordered by current computer users who have had at least three years of experience with their current equipment. The study determined the number of such customers who were ordering their new computers from the manufacturer of their current equipment vs. ordering from a competitor. The complete study covered a random selection of 559 computer users with new computers on order in the metropolitan areas of Chicago, Cleveland, Los Angeles, Minneapolis, New York, Philadelphia, and San Francisco.

The results of the study indicate that Univac is suffering the severest loss of customers at the current time, with 13 of the 21 Univac customers surveyed switching to IBM equipment, and two to GE equipment. Most of the switching users were Univac 1004 users, who have IBM 360/20's or 360/30's on order. However, these orders were placed prior to the recent announcement of Univac's low cost computer line, the 9000 series. The effect of this new line in helping Univac boost its retention of current customers is not yet reflected in the marketplace.

Honeywell appears to be the most successful in wooing away IBM users, capturing 11 of the 32 IBM users going elsewhere. Most of these switchers currently have IBM 1400 series computers installed, with H-200's on order.

Control Data has been relatively successful in capturing orders from current users of competitive computers. Since most of CDC's computer replacement sales are for medium- or large-scale computers, the dollar value of this competitive activity is substantial.

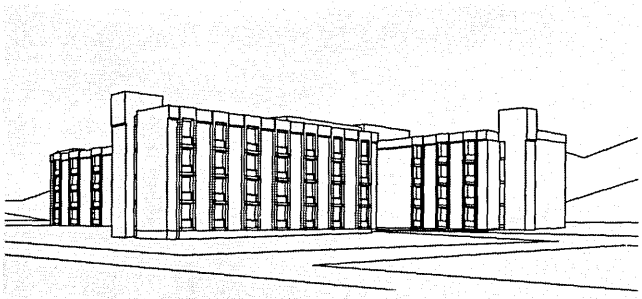
The study did not cover the ordering preferences of firms putting their first computer on order. Firms such as NCR, Honeywell, Burroughs, IBM and Univac, which offer attractively priced small computer systems stand to benefit most from this new customer activity. Orders from such first computer customers account for 15%-20% of the value of the total computer industry backlog, IDC estimates. Traditionally, IBM captures over 80% of this new business.

A summary of the results of the study appears below:

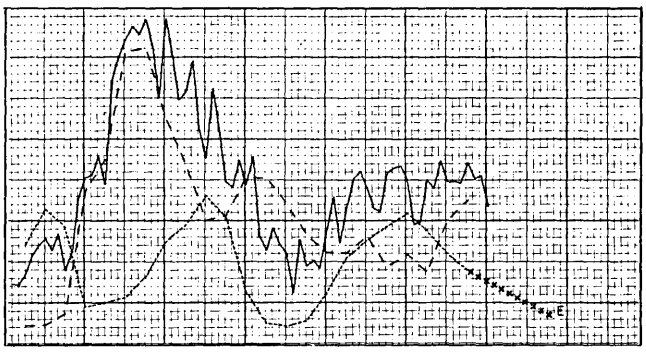
SUMMARY - CUSTOMER LOYALTY PROFILE

VENDOR	(1) # Customers Switched from Competitors	(1) Customer Switched from	(2) # Customers Lost	(2) Customer Switched to	(3) # Customers Ordering New Product Line	% Competitive Gain or Loss of Customers (1) - (2) / (2) + (3)
BURROUGHS	3	3 IBM	1	1 IBM	6	29%
CONTROL DATA	5	4 IBM 1 GE	1	1 IBM	1	200%
GE	9	6 IBM 2 UNIV 1 HON	1	1 CDC	8	89%
HONEYWELL	11	11 IBM	5	3 IBM 1 GE 1 UNIV	9	43%
IBM	20	1 BUR 1 CDC 1 GE 3 HON 1 RCA 13 UNIV	32	3 BUR 4 CDC 6 GE 11 HON 1 NCR 4 RCA 3 UNIV	396	-3%
NCR	1	1 IBM	0		11	9%
RCA	4	4 IBM	1	1 IBM	9	30%
UNIVAC	4	3 IBM 1 HON	15	13 IBM 2 GE	6	-52%

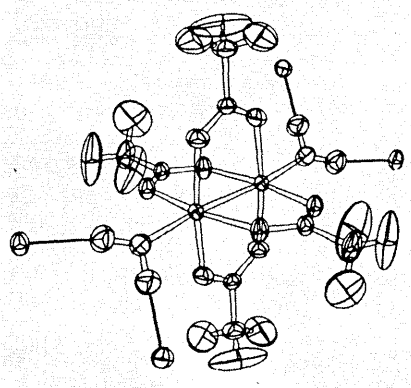
Would you believe a CalComp plotter and any computer can draw pictures like these in seconds?



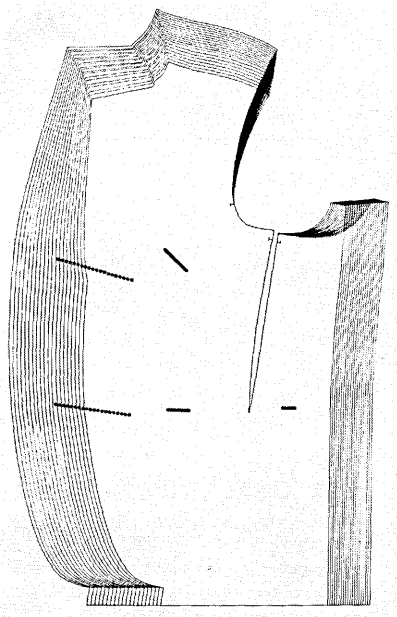
a perspective sketch of your new plant



statistical trend charts



molecular structure diagrams



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MORE TRAINING PROGRAMS NEEDED AT ALL LEVELS TO AVERT PERSONNEL SHORTAGE

Fred R. Raach
Vice President and General Manager
Data Processing Division
UNIVAC Div. of Sperry Rand Corp.
Blue Bell, Pa.

"Any person who graduates today from a four-year liberal arts college without being instructed in the use of computers has been severely cheated."

— R. Louis Bright

Much has been written about the population explosion in the world and the possible dire effects on mankind if it remains unchecked. But another type of explosion is also taking place about which comparatively little has been heard. This is an explosion of needs for trained personnel in the data processing industry; if this great increase in needs is not dealt with well, it may seriously retard the growth of our economy.

For example, in the software area alone, requirements for manpower in 1970 are estimated to be three times the 150,000 analysts, programmers and operating personnel in data processing today.

The urgency of meeting the demand for EDP personnel at all levels is rising rapidly not only in the United States but also in Europe. Despite the saving in manpower through technological changes eliminating some routine programming, the shortage in needs for programmers is expected to be acute over the next few years.

A rapid growth in manpower needs is also anticipated in the area of sales and field maintenance in parallel with the upsurge in computer demand and installations. In the hardware area, in research and development, in design engineering and manufacturing, the growth in needs is not expected to be as pronounced. Because of the rapid advances in technology over the past few years, further breakthroughs are not expected to arrive as fast as heretofore. But counterbalancing this is the fact that the computer industry is and will continue to be in severe competition in the recruitment of engineers with other so-called "glamor" industries such as aerospace.

With these needs facing us, what can industry, government, and educational authorities do to meet the challenge?

Assistance to High Schools

Certainly, an expansion of in-plant training courses, such as the UNIVAC Division has been engaged in for many years, is indicated. Even more assistance than is presently being given to local high schools in various parts of the country could be rendered by industry in setting up training programs and providing equipment.

To date, the number of computers installed in the nation's high schools is small compared to the great need. However, many far-seeing educators are well aware of the problem but severely handicapped by lack of funds. Currently, our educational systems are facing mounting costs to maintain even their regular curricula. To add EDP courses, hire instructors and purchase or lease equipment is out of the question financially for many school districts, already forced to ask almost yearly for boosts in local school taxes.

Funds

A possible source of funds might be more state and federal educational grants to the schools to enable them to organize such courses. In addition, the scope and variety of jobs available in EDP should be brought to the attention of teachers, guidance counsellors and even school board members. The U.S. Department of Labor "Occupations in Electronic Computing Systems" publication lists 70 job categories in the field ranging from Application Engineer to Verifier Operator.

Regional Computing Centers for Education

Recently Dr. R. Louis Bright, Associate Commissioner for Research of the U.S. Department of Health, Education, and Welfare in comments before a meeting of the Association for Educational Data Systems stated that the impact of the computer on society has been "vastly underrated." He urged that all high school and college students be given a course in the social implications of computers and "what they can do and what they can't do."

Stating that the U.S. Office of Education will be "working hard" in the next two or three years to spread the use of computers in the nation's schools, Dr. Bright suggested that major regional computing centers, possibly under Federal sponsorship, might be organized. Referring to the need for college instruction, Dr. Bright remarked that "any person who graduates today from a four-year liberal arts college without being instructed in the use of computers has been severely cheated."

Summer Training Courses

To help fill the instruction void in the high schools, a number of institutions have organized summer computer training courses for teenagers. In Philadelphia, the Franklin Institute has conducted an "Introduction to Computers" course for some eight years in which UNIVAC personnel have acted as instructors. For six years, the University of Pennsylvania has had an eight-week cooperative summer project in computer mathematics for high school pupils and teachers. This program, sponsored in part by a grant from the National Science Foundation, includes a basic course in desk size digital computers, instruction in abstract algebra, linear algebra, formal mathematical logic and number theory. An extension and expansion of these types of summer programs would benefit the training situation and help in securing a better all-round understanding of what computers can do.

College Programs in Computer Science

At the college level, an encouraging start has been made at some institutions, notably Case Institute of Technology, in organizing undergraduate programs in computer science. Graduates of these programs can now enter the EDP industry without the need for long in-plant training courses. Such an undergraduate program has been prepared by the Association for Computing Machinery's Curriculum Committee on Computer Science. Composed of educators from a number of colleges, the Committee has recognized that although a good deal of computer knowledge can be extended through broadening existing programs, such as mathematics and electrical engineering, a sizeable area of work does not fit into any existing field. For this reason, the Committee has advocated that Computer Science become a distinct field of study.

Greater contact between college educators and industry executives would also be helpful for a mutual exchange of information. In the past, this has often been difficult to achieve because of the crowded calendars of both groups. However, such meetings, effected perhaps through joint industry-education seminars, would be invaluable.

Types of Training Required

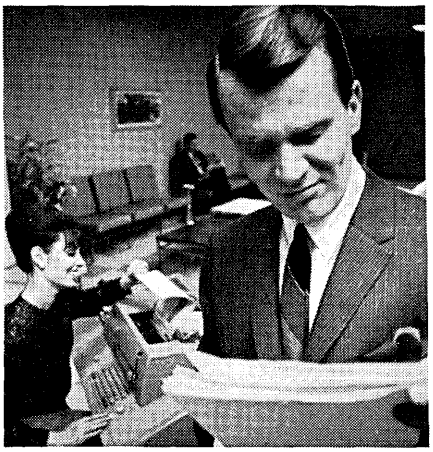
In parallel with the growing needs for personnel, the type of training required for persons entering careers with the EDP industry is changing. For example, in the sales area the kind of equipment being sold today is more complicated and sophisticated than that offered a decade previously. The early need for a person in sales with a flair for selling to which could be superimposed a company training program has changed. Today a more technically oriented person is needed. Although the complexity and amount of software has been growing, many of the programming routines have become more standardized and compartmentalized resulting in some cases in a lessening of the educational requirements once demanded. In any event, a reevaluation of the qualifications required for programming positions might reveal that industry is in many instances asking for considerably more knowledge than is needed to perform the work today.

Systems Analysts

One of the greatest expansions in job opportunities will come in the need for such technical sales support personnel as systems analysts. This demand is inevitable with the rising number of computer installations and the increase in the number of small businesses now able to afford a computer system. The systems analyst works closely with the sales representative, sizes up the work to be done and lays out the computer's assignment. Other sales support specialists, including programmers, instructors for customer employees, and customer service engineers, will also be in heavy demand.

As computer installations increase, the requirement for field maintenance personnel will keep in step. To provide for these technicians, in-plant training can be complemented by an expansion in the courses offered by technical institutes. Assistance in this area has been made by some companies organizing Technical Training Centers, open to all, in the cities where their plants are located.

To deal with what has been described as perhaps the most critical problem facing the data processing industry during the next five years, we will need a maximum drive at all levels to increase training programs in computer technology. With mobilization of all of our resources, we can conquer this manpower dilemma and thereby ensure that continued upward momentum of our economy will not falter because of lack of effort in this area.



HOW TO COLLECT, INTEGRATE AND DISTRIBUTE DATA

If any one symbol can represent the rapid changes of the "sizzling sixties," it's the computer. Data processing has won not only wide acceptance as a vital function of efficient business operations, but is growing more sophisticated with greater reliance on real-time operations.

In turn, this reliance on real-time processing has placed renewed emphasis on data communications. Data must be available quickly for management to make timely, accurate decisions. And, regardless how sophisticated your data system may be, Teletype sets remain the simplest, most reliable and least costly terminal equipment for collecting, integrating and distributing data.

The integration of communications within data processing systems has helped solve many business problems by:

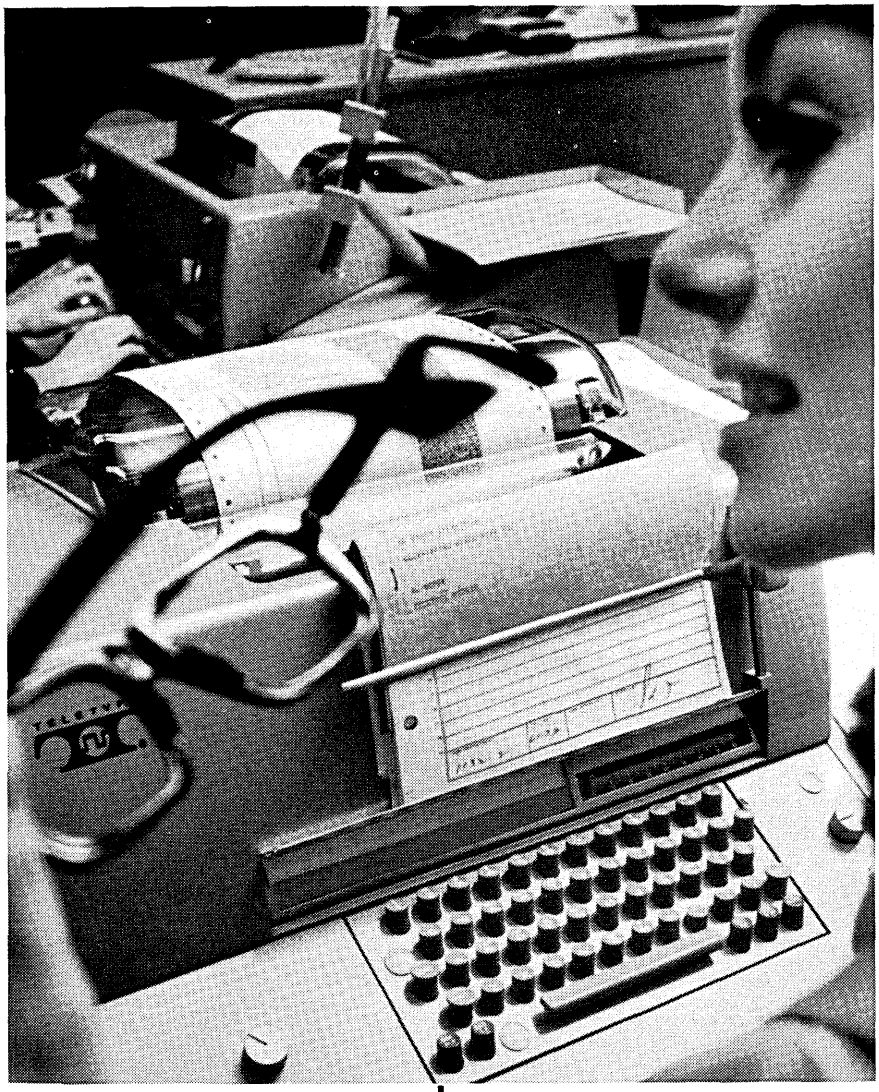
- Assuring management of adequate, timely information to make accurate decisions,
- Eliminating the costly errors caused by duplicated paperwork,
- Speeding distribution by cutting costly paperwork,
- Reducing customer complaints, and
- Enabling management to communicate quickly with remote computer centers.

Getting data in time for decisions Nothing can be as useless to you as information that arrives too late. Wrong decisions are made. Production is slowed. Deliveries are late. Customers are dissatisfied or lost. Yet, none of these situations need ever exist.

Using Teletype machines for communications within a data processing system, assures you of getting information where you need it — when you need it. You'll be able to make better informed, more timely decisions that could spell the difference between profit and loss.

This problem faced a New Jersey food processor, who had been receiving sales and inventory statistics by mail from its two branch offices. By the time these reports were processed, the information was too old to use in reaching important management decisions. The processor had Teletype ASR (automatic send-receive) sets installed at all three locations. Now, daily statistics are received in minutes and processed into up-to-date reports. This reduces inventory costs and enables the processor to close its books eight days earlier each month.

Eliminating duplicate paperwork errors How often do errors in order processing result in producing the wrong size or quantity? How often have prices been misquoted or customers lost due to incorrect shipments? These are typical problems



resulting from errors caused by duplicating data from one department to another. You can eliminate these situations with a system that speeds the handling and processing of data by including Teletype communications equipment.

Sales order information can be prepared on Teletype machines, reviewed, and transmitted directly to Teletype receiving sets in other departments. In addition to sending each department accurate information, Teletype sets can selectively "edit" this information. Thus, such data as order numbers can be sent to all departments, while cost data is directed only to accounting, billing and management departments.

This is what a metal products manufacturer did to cut order processing time 75 percent. By using Teletype ASR sets, minutes after an order comes in the data is sent to shipping and production departments—each receiving only the data it needs. A few of the resulting benefits include in-stock items shipped the same day, production orders scheduled three to seven days faster, overtime reduced, and errors greatly reduced.

Moving inventory faster Many companies are finding that profits are being eaten away by high inventory and distribution costs. They often find themselves having to justify a high inventory on the grounds it's needed to meet fluctuating customer requirements.

Yet, other companies have cut inventory costs while keeping a larger selection of stock on hand. They have learned that an effective data communications system eliminates inventory that stands idle waiting for slow-moving paperwork. By using Teletype equipment to link business machines with existing channels of communications, they are provided with instant, accurate data collection, integration, and distribution. Thus, they can handle a larger volume of business faster with more efficiency and less error.

Due to the rapid decay of critical radioactive pharmaceuticals, a national drug company had a serious inventory problem. To solve it, the firm had Teletype machines installed at all of its 26 branches to provide the necessary speed, efficiency and written verification required to plan production and delivery of these drugs. Now orders are instantly received by a Teletype set, and prepared, packaged and shipped almost immediately.

Reducing customer complaints Today, customer service is often the deciding factor in who gets the order. Yet, rapid expansion has greatly strained the capacities of many companies to properly service their customers. This is why computers and data communications have become so important in speeding the order processing, production and shipping operations. And, regardless of the distance, Teletype equipment plays an important role in the gathering and forwarding of information needed for fast service.

Many banks are relying on data communications equipment to improve the efficiency of their customer services. A midwestern bank uses a Teletype ASR set to transfer funds, to notify customers when loan payments are due, to speed transmittal of correspondence, and for many other related functions.

Solving your communications problems There are many other applications in which Teletype equipment helps improve business operations, such as using Teletype sets to link companies to a remote computer center on a time-sharing basis. You can see why Teletype equipment is made for the Bell System and others who require reliable, low cost communications.

Our brochure, "WHAT DATA COMMUNICATIONS CAN DO FOR YOU," further explains how an effective data communications system can cut your costs while building your profits. To obtain a copy, contact: Teletype Corporation, Dept. 88J, 5555 Touhy Avenue, Skokie, Illinois 60076.

TELETYPE

DATA PROCESSING CAREERS DEMAND NEW APPROACHES

Harold Jarrett
Director, Educational Services
The National Cash Register Company
Dayton, Ohio

"The process of regular retraining and continual familiarization with new developments should never end, and is vital."

In the data processing industry, we have heard the word "shortage" applied to technically trained personnel over and over again as if it were a matter of raw numbers. The implication seems to be that a "shortage" can be filled by simply luring employees away from more ordinary jobs. But this is not the type of shortage faced in the computer industry today.

The lack of electronic data processing technicians — especially programmers and systems analysts — cannot be solved simply by moving employees around and retraining them, because the shortage is as much qualitative as quantitative.

In fact, the industry needs more people with experience, and at the moment, there are just not enough to go around. Nor can experienced people be created overnight.

For the industry to realize its full growth potential, employers need to look long and hard at their operating philosophies. If these philosophies can bend to meet the situation, the picture is less grim. Also, some new techniques promise significant contributions toward a permanent solution to the problem.

The Training Needed

There are two major areas involved. One is the training of manufacturers' technical people who install and help program the equipment. The other is on-the-job training for customer's staff, which is also the responsibility of the manufacturer.

In order to get an installation started, our experience with the medium-scale computer NCR 315 has shown that 5 to 10 people must be trained for each system. We have already trained about 3000 programmers for this system alone, mostly customer personnel rather than manufacturer employees.

How to Find People

In general, our philosophy in training is to seek people within the customer's organization, and to discourage the hiring of "computer experts" from outside. The expert from outside who doesn't know the customer's business is likely to spend considerably more time in training than the non-technical person from within. When he finally gets to know the business, he may job-hop again, to a competitor; after all, he had no particular loyalty to begin with.

As a first step, we recommend testing the customer's employees for the special aptitudes needed, and we supply the testing techniques. If the right aptitudes can be found, and they usually can be found, we think it is much to the user's advantage to give technical training to these selected people.

Manufacturer's Schools

The company operates a number of different schools for its customers. For new personnel in the user's computer room, lessons cover the fundamentals of data processing; basic concepts, basic logic, applications, flow charting, and so on. Also, there are the usual courses such as the computer system, its compiler language, other languages that a customer may want to use, etc.

There are also advanced software schools — generally running about a week in duration — to provide details, for example, of the programs which NCR supplies as part of its software packages. Sometimes an advanced session is arranged in which the instructor acts merely as a consultant, answering questions from the audience. Other sessions are more formal.

Our most advanced training programs are directed toward gaining analytical knowledge in testing, debugging, and maintaining a library of programs. The lessons also involve learning computer programs for these techniques. Although

these courses are highly recommended, not every user sends people for them.

At NCR we attempt to provide training on a continuing basis. At our EDP schools in Dayton and on the east and west coasts, the programs cover everything from servicing the equipment to programming and customer services.

Programmed Learning

One great need is speeding up of the initial training. A new technique that helps is programmed learning. The methods used in this psychological response system are geared to high-speed results; in fact, the whole technique is aimed to speed up the learning process by "reinforcement" of correct responses.

When learning programs have been put together by professionals, we have found the results to be gratifying. We expect to use a great deal more of this type of training aid.

For several years, we have been using "reinforced learning" courses to teach the operation of a complex electronic bank proof machine, and also to teach programming and operation for our small computers. The courses are on audio tape, can be given to a number of trainees at once, cut training time in half, and have been enthusiastically accepted by both customers and trainees.

The key to the success of the reinforced learning courses — and of any thoroughly debugged, professional programmed learning method — is that the material is presented in very small amounts, one step at a time, with the individual trainee selecting the pace. By presenting the correct answer after each small increment, the new knowledge is "reinforced."

Although the audio reinforced learning method is ideal for teaching complex subjects to large numbers of people, it does not lend itself to every training job. We have already begun to use some printed programmed learning materials and expect to use this media more extensively in the future.

Other possibilities include courses on video tape, greater emphasis on regional seminars, and courses presented by film cartridges.

Teaching Systems Analysis

The best place to learn the capacity to deal with real systems is the job; as in medicine or law, there is no substitute for actual experience. The technical employee will also realize that he cannot consistently advance his career without consistently broadening his knowledge.

One tool which has proved to be of great value for both NCR and its customers is called BEST (Business Electronic Systems Technique). BEST is a systems language developed by NCR that reduces many computer programming efforts to a fraction of the time formerly required. Basically, BEST is used as a program generator. A BEST programmer, using specially coded sheets, uses the language in a highly structured form; operations are performed on a systems level rather than a micro level. As a result, accurate coding is assured, and the speed of new program generation is measured in days instead of months.

Anyone with a general knowledge of business systems can become proficient at BEST by taking an 80-hour course that we have developed.

How to Keep People

The problem of holding technical people is tied to training. Although the manufacturer is bound to provide at least initial on-the-job training as well as later tools, maximum cooperation from the user is essential if the training is to be effective for the user in the long run.

Although some executives have said, for example, that it is necessary to train 60% more people than are needed, to allow for drop-outs, job switching, and the like, we have found that the problems of keeping systems and installation personnel are no different from the problems of keeping any highly trained group.

Basically, if a man is getting good training, good experience and regular advancements, he tends to stay on the job.

It is desirable that users provide regular retraining and continual familiarization with new developments. The process never ends, and it is vital. In order to retain employees who have been trained at high cost, management must provide continuing educational opportunity, with no restrictions on how far an individual can advance.

Orientation of Management

Finally, from the standpoint of a manufacturer of the equipment, we think that more customers should make sure that their management has adequate orientation on the computer system. We can help provide this grounding, but obviously only if it is accepted by management.

Management needs to have this knowledge in order to oversee efficiently the data processing operation. For example, when an EDP supervisor says it will take two months (or six months) to accomplish a job, management should be able to understand why — and also to know whether or not this is a valid answer.

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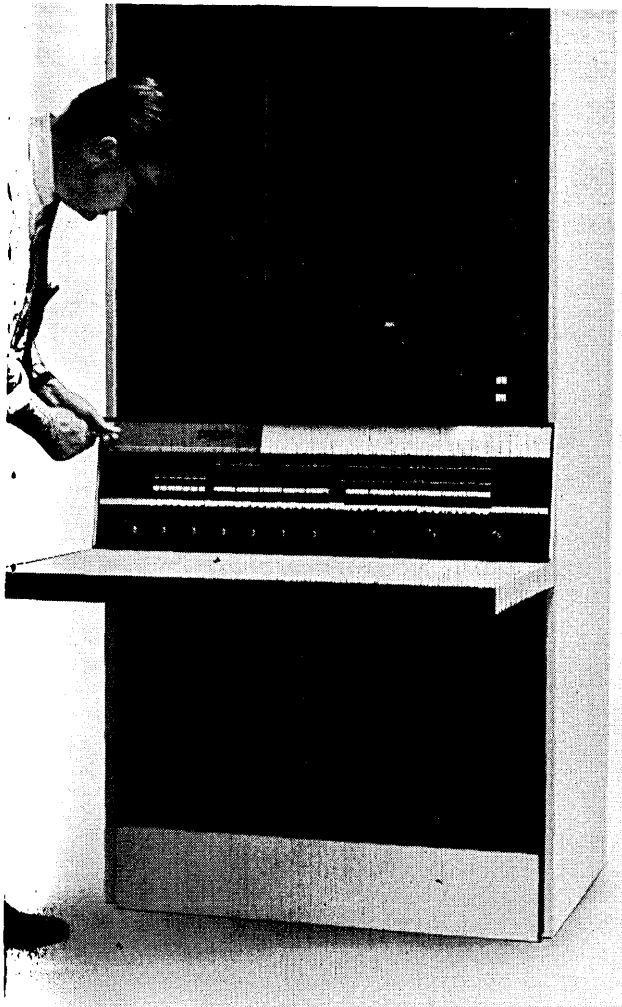

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Software includes real-time FORTRAN IV, a versatile macro assembler, a 6 and 9 digit floating point arithmetic package, an on-line editor, an on-line debugging system, a control monitor, and a modular I/O programming system. Basic software is fully compatible with the PDP-7. Extended software package expands to fully utilize all configurations.

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ADVANCED DATA SYSTEMS FOR PERSONNEL PLANNING AND PLACEMENT

W. J. Pedicord
Vice President of Personnel
International Business Machines Corporation
Armonk, New York

"While we seek to use all the computer's advantages, our primary objective from the first in developing the computerized personnel data processing system and recruiting program has been respect for the individual — his goals, his needs, his interests."

Personnel management today has a dual responsibility: to develop manpower plans which fulfill corporate objectives; and, within the framework of these plans, to locate most productively the capacities of both present employees and job applicants. Since short term corporate needs and available manpower are both continually changing, effective decision and action in personnel management depends critically on the accuracy and timeliness of its information on both need and manpower.

In a large corporation that is active in an expanding economy, the balancing of manpower need and supply requires a vast quantity of valid information from many points in the organization. Traditional manual methods of recording and retrieving personnel information are particularly inadequate in a corporation that is decentralized, is experiencing a rapid growth in total employment, and has a continual demand for a wide variety and depth of skills in many locations. Computer-based personnel data systems can significantly improve the effectiveness of personnel management — benefiting both the corporation and the individual — by providing at a single, accessible point, up-to-date career-oriented information on both present and potential employees.

An integrated PERSONNEL DATA SYSTEM (PDS) under development for some time in IBM encompasses 115,000 employees in the United States. The corporate PDS evolved from the more specialized personnel information systems which are operational in the various divisions. Similarly, a parallel corporate recruiting information system — IRIS (IBM Recruiting Information System) — has been designed to strengthen recruiting activities of all divisions. Both the PDS and IRIS programs have been built step by step to insure a smooth evolution from decentralized manual recording and retrieving methods to an integrated computer-based system spanning the entire corporation.

While we seek to use all the computer's advantages in its immense data handling capacity and speed, our primary objective from the first in developing both PDS and our recruiting programs has been respect for the individual — his goals, his needs, his interests. Through mechanized personnel data systems, all management levels of the corporation are then given the tools to do a better job in working with their employees. The individual's educational opportunities, career plans, and family needs can and should be considered in planning the systems.

The First Step: Matching

On a broad scale, the personnel specialist's job is to balance the internal corporate demand for people in numbers and in skills with the supply both within and outside the corporation. On an individual level, he must match a particular man with a particular job. In order to accomplish this, Personnel must have immediately at hand enough reliable information on each man in order to evaluate fully his qualifications against the position's specifications. For example, available data on an individual at IBM were formerly more than adequate but were widely distributed in 17 separate records — such as in personnel files at his own location, in the Medical Department, in Salary Administration, and in the Education Organization. A traditional manual system of this type for recording and retrieving personnel data can result in a large degree of overlap, accompanied by a good deal of harmless discrepancy and serious error. In one study of personnel records and reports, it was found, for example, that over 2,000 pieces of personnel information were being maintained but only 145 of these were unduplicated. In mechanizing a personnel data system, then, the first step clearly must be to place all data in a standard format and store all records in an easily accessible form.

Planning for Personnel, and Searching for Them

The PDS now underway at IBM is designed both for personnel planning and for searching personnel throughout the corporation for placement. In planning, the system provides an immediate picture of the corporate population as it is today and, combined with other information sources, indicates what must be done in the future. In placement, the system permits operating management to consider all logical candidates within the corporation as the first step in filling a position.

While special data files will continue to be added, there are presently three basic PDS information files on individual employees:

1. Basic Personnel Profile
2. Personnel Skills Inventory
3. Educational Objectives and Attainment Data

The Basic Personnel Profile contains 80 types of basic data on each of 115,000 employees. These data include: name, address, birth date, marital status, number of dependents, Military Reserve status, when first employed, where located in the corporation, salary, and highest educational level achieved. Besides maintaining the Basic Personnel Profile, each of the more than 200 branch offices, 17 laboratories, and 21 plants in the corporation may also maintain additional computerized personnel records of their own employees, as do the various division headquarters. In general, the amount of profile information increases at the division and location. For example, at the division level we might record a man's patent activity, while his participation in local professional societies may be important only at his particular location. Changes in the Basic Personnel Profile are now made on a monthly basis through our Integrated Teleprocessing System (ITPS). Changes are transmitted to Corporate Headquarters over wire from 24 major IBM locations. Ultimately, the Profile information on an employee will be updated on a real time basis.

The Personnel Skills Inventory records all the career-oriented skills of each employee. These skills are first separated under major groupings: (1) engineering, technical, scientific, (2) marketing, planning, and systems analyst, (3) administrative and staff, (4) manufacturing service and support. Language proficiency and experience with specialized instruments and machines are recorded. Another section is devoted to the specific IBM products that he is familiar with or has worked on. Of his various skills, a man is also asked which are his specialties and what are his preferences.

The Educational Objectives and Attainments file is concerned with the man's formal education, planned and in the past. Thus, is he working towards a Master's degree, Ph.D., or a trade school certificate, and in what area? What has he already achieved — what degrees has he received, when and at what schools?

Auditing and Validating Data

One of the major values of PDS has been in providing the capacity to audit data directly. For example, as happens in developing information systems for any management area, there were many errors in the original data. While most of these errors were caught before the original information was recorded in the Personnel Profile file, a great deal has been corrected since, either by being pinpointed on the computer (which can detect, for example, that Seattle is not in the Eastern Regional area), or by human review (is a man likely to have graduated from college at the age of eight?).

The overall PDS has been designed and the computer programs developed so that these files can be added to as the need arises. For example, accounting records have always maintained a 7-digit number code for each person. This code has now been added to the profile for each employee so that both Personnel and Accounting can perform the same types of analyses.

Maintaining Consistent Procedures

Although not concerned with individual employees, a computerized personnel policy file is now being constructed which will be extremely useful in maintaining consistent personnel procedures in all areas and in readily providing information for general personnel management. Presently, company policy documents are being stored on tape and can be retrieved according to a key word index on subject title. Thus, all policy documents related to a given subject can be retrieved and reviewed within minutes. While the key word index presently covers only the title and sub-title of the policy, statements within documents are now being indexed. In addition, letters and memoranda which interpret personnel policy are also being recorded and indexed for easy retrieval through computer equipment.

The Personnel Profile, Skills Inventory, and Education files in Corporate PDS can be drawn on for a wide variety of data needed in personnel planning. Personnel specialists are able to specify information format and content and receive hard copy print-outs at five IBM 1050 data terminals located at Corporate Headquarters. A terminal information handbook instructs the user on terminal operation and indicates how he can request a desired information format. In this manner, a terminal retrieval program permits the user to draw on any information in all files in the PDS, as long as his security code gives him free access to that information.

Planning that Uses the Information

The scope of planning projects that draw on PDS information, of course, varies widely. A corporate population study might be concerned specifically with employee exposure to draft and military reserve call. Therefore, the computer would be required to print out summaries of employees who are affected. Combined with other data, Personnel and top management are then able to make the necessary decisions on the basis of up-to-date information.

The loss of manpower due to retirement and other forms of attrition can also be observed. With this information, Personnel can indicate to the computer work load requirements in the future so that the number of positions that must be filled can be determined.

Other recent personnel planning projects which have drawn on both PDS and other sources of information include a five-year projection of the corporation's need for personnel in the areas of engineering, mathematics, and physical sciences for various rates of growth.

Reports that Use the Information

In addition to special planning projects, a number of scheduled reports are produced each month by the computer on such subjects as corporate strength (number and location of employees) and analysis of positions and salaries. One of the most important regular monthly reports used in planning is the "Monthly Manpower Transaction Report," which relates a divsion's current manpower status with its formal objectives. While such analyses are made by each division's own personnel staff and the necessary decisions are made at the divisional level, these reports are helpful in pinpointing possible interdivisional imbalances which may become corporate problems.

Searches for Placing People

Most searches of personnel data for placement purposes occur at the location and division levels. The corporation recognizes that promotional opportunities should be available to all employees; searches normally begin at the location level, then to the division, and finally to corporate. Whenever a qualified candidate can be found at the location or division level, there is usually no need to search the corporate-wide PDS file. For this reason, today much of placement searching at the corporate level is for unusual or highly specialized positions which cannot be filled within a division.

Since the three basic information files can be combined internally in the PDS, Corporate Personnel can specify very closely a wide variety of Profile, Skill Inventory, and Education qualifications. The search procedure is designed in general to pinpoint several candidates for each position (rather than the ideal one) so as to leave the final selection

to human judgment. When a location or division makes a request for search, printouts of appropriate data of the computer selected candidates are forwarded to the location.

The PDS terminals at Corporate Headquarters are available for the use of other staff functions than the Personnel Department. As a matter of fact, the parameters of the original PDS data base were first reviewed by all staffs. It is planned that Type 1050 terminals will also be available at 30 major locations in the corporation in 1967. These terminals will first be used for retrieval of information from PDS files and later, as the necessary computer programs are developed, personnel data can be updated on a real time basis. Security codes will be assigned both at Corporate Headquarters and for all other users of data terminals on a definite "need-to-know basis." Even today, without terminals outside Corporate Headquarters, firm agreements have been established among all Personnel Departments covering ground rules for searching position candidates in other plants and locations.

Searches Outside the Corporation

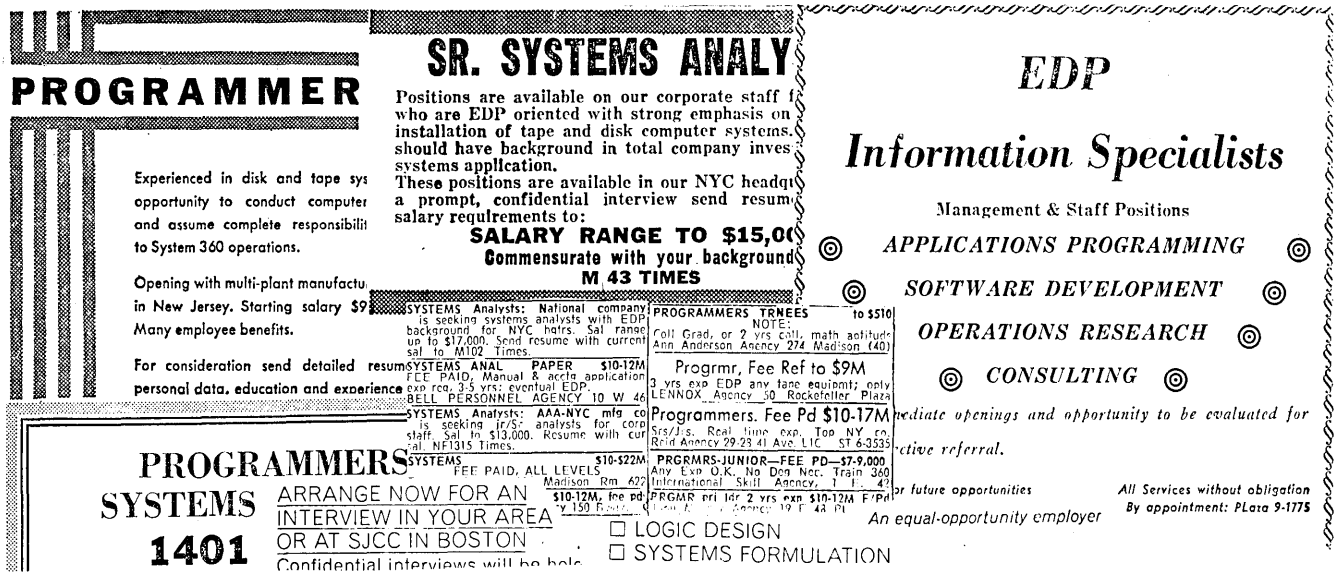
In addition to optimum placement of its present employees, a growing industrial organization by definition has a continuing need for additional manpower from those who are already in or who are just entering industry. An experienced professional, either on his own or in response to recruiting activity, may be expected to apply for a position at a particular location at a particular time. If he is not immediately hired at that location, it can happen that his application is filed and perhaps forgotten, going no further in the corporation. In addition to efforts to increase the number of well qualified professional applicants, it is Personnel's responsibility to see that each applicant's qualifications are available throughout the corporation at the time he applies and for some time afterwards.

IRIS — the IBM Recruitment Information System — is a computer program in which information on the job qualifications of applicants is stored and retrieved. The main component of IRIS is an application form, the IRIS Data-Pak, which is included in an explanatory brochure designed to assist in the recruitment of experienced professionals, the IRIS application form covers enough information on the applicant's qualifications for a particular job. In response to an ad explaining IRIS, the applicant fills out and sends the Data-Pak to Corporate Personnel. The information is key punched and stored in the disk files of a computer.

When a location must fill a position from outside the corporation, an IRIS job requisition is made out on a form designed for transmittal through the teleprocessing system to the Corporate Personnel Department. The IRIS file is searched by the computer and a list of applicants filling the indicated qualification — names and pertinent experience data —is printed out. The printout and copies of each person's original IRIS application form are then forwarded to the location for consideration.

As in searching within the corporation in the PDS, IRIS benefits both the corporation and the individual applicant. For a period of two years, the applicant knows that his qualifications will not be overlooked at any point in the corporation. To the corporation, an experienced applicant will not be lost because his qualifications are not known elsewhere in the organization at a time when an appropriate position opens up.

In summary, a personnel data system benefits the corporation to the degree that the mechanization of recording and retrieving information enhances management's recognition of its responsibility to the individual. Managers throughout the corporation are thus given better tools in personnel planning and placement, but the ultimate actions and decisions are theirs.



JOBS AND CAREERS IN DATA PROCESSING

Dick H. Brandon
Brandon Applied Systems, Inc.
New York, N.Y. 10017

An inventory of functions and positions in data processing installations and services.

"HELP WANTED" advertisements such as those shown here are typical of those to be found every day in the nation's major metropolitan newspapers. The same call is echoed loudly in the many professional, trade, and business publications. It's obvious that the bright young man who would pursue a career in data processing has just about everything going his way. Jobs and career opportunities abound.

Because the field is growing, because there is a shortage of qualified people to man data processing installations, and because employers want those they want *now,* there is a real scramble for available talent. Salaries are at premium levels. A data processing manager can ask and get $20,000 a year. Salaries of analysts vary from $12,000 to $15,000. Even programmers' salaries range from $9,000 to $12,000.

Between now and 1970 the number of electronic computers in use in the United States will nearly double, from some 28,000 to more than 55,000. By 1970 an additional 130,000 systems analysts, about 100,000 more programmers, and 55,000 managers and supervisors will be needed to provide the specialized sort of computer-based data processing systems required (See Table 1). And we have not yet mentioned such other jobs as console operators, unit record equipment operators, keypunch supervisors, librarians, and control clerks, to name but a few.

The Functional Point of View

Data processing is a technical operation. It requires highly trained, technically competent, and in some cases, creative people. Perhaps an appreciation of the extent and diversity of careers and jobs in data processing can best be gained by looking first at this complex new management tool from the functional views of planning, operations, and management, and then relating these three basic functions to the jobs to be performed.

Planning

Planning is a major part of the activities of a new data processing organization and of many established ones. It covers those functions concerned with establishing a data processing capability and selecting, designing, and preparing programs for new data processing applications.

Installation Planning — Organizing and scheduling personnel and mechanical resources into an effective plan for establishing or changing a data processing activity requires all tasks to be carefully scheduled. Installation planning covers budgeting, developing performance standards, and planning for recruiting, selection, and training of personnel.

Application Selection — Selecting and defining those data processing applications which will fulfill the objectives of

Table I

Estimated Personnel Requirements for
U. S. Data Processing Technicians *

	Managers and Supervisors	Systems Analysts	Programmers	Machine Operators
1. July 1966 Requirement (28,000 Digital GP Computers)	40,000	95,000	175,000	80,000
2. 1966 Availability of Qualified Personnel	30,000	60,000	120,000	80,000
3. 1966 Shortage	10,000	35,000	55,000	0
4. 1970 Requirement (55,000 Digital GP Computers)	85,000	190,000	220,000	150,000
5. 1970 Training Needs, (4)-(2)	55,000	130,000	100,000	70,000

*This excludes peripheral functions such as software development, hardware and software research, software maintenance, consulting and independent service companies, and the like.

Source: Brandon Applied Systems, Inc.

the company and of the data processing activity requires that the needs and the objectives of the company be reviewed and analyzed in detail.

Systems Analysis and Design — This function produces the optimum solution to application needs: the most economical solution consistent with management and operating objectives, equipment capabilities, and personnel resources.

Programming — Programming is translating defined systems requirements and procedures into a logical process and then into a set of instructions for its operation on data processing equipment.

Testing — Testing determines the success of the program in meeting the defined systems requirements and procedures and of the total system in meeting the objectives of the application. Testing methods must be designed that will thoroughly try the new system.

Documentation — It is essential to reduce the system and programs to standardized written form for use in system and program modification, training, and machine operation.

Conversion — The controlled transition from an old system to a new one involves extremely careful planning of the conversion steps and equally careful supervision of their execution.

Operations

The "operations" group of data processing functions includes the activities of day-to-day operation of established systems: machine operation, input preparation, input/output control, maintenance of record libraries, and program maintenance.

Machine Operation — The actual loading, unloading, setup and control of the equipment that makes up a data processing installation may involve one or more computers, a variety of data file equipment, a variety of unit record equipment, and teleprocessing equipment.

Input Preparation — The objectives here are to prepare accurate, properly coded input data as prescribed by the system, and according to schedules.

Input/Output Control — This involves keeping records of documents received and transmitted, working with operating departments to assure that information to be processed is timely, routing work according to procedures, and controlling data processing supplies and inventories.

Maintenance of Record Libraries — The library contains all data files, programs, documentation, and operating records and reports. These records must be controlled on an item basis, and detailed control records maintained throughout.

Program Maintenance — This requires making relatively minor changes in operating programs, solving program operating problems, adapting to scheduling changes, and correcting errors in programs found after they go into operations.

Management

Data processing includes the many management functions of an operating organization; supervision and administration, reporting, long-range planning and project control, maintenance of standards, and liaison. In data processing, however, these functions have some rather unusual features.

Supervision and Administration — Administrative functions in a data processing organization are ordinarily much lower than is indicated by the budget being administered. Supervision, however, usually is quite complex and highly technical. A combination of rigid, detailed operations and creative development work must often be simultaneously supervised. Also, supervision of data processing is no easy task without thorough knowledge of the technical details and skills.

Reporting — The reporting function is an important part of any manager's job. In data processing, however, there are two special problems: (1) translating technical measures of progress and performance into commonly understood standards; and (2) continual reporting on planning and on project performance.

Long-Range Planning and Project Control — In the early stages of a data processing organization, planning, project organization, and project control are the almost exclusive occupation of management. And it is the unusual data processing unit in which such planning does not continue to occupy an important part of the manager's time. Long-range plans are typically subject to periodic, often major, revisions. Data processing management must keep continuously abreast of new developments in equipment and techniques, to see how these may alter planning.

Maintenance of Standards — The establishment of stan-

dards and the maintenance of high quality require constant attention to: recruiting qualified personnel, training new employees and updating the old, developing quantity and quality evaluation systems, developing job descriptions, and constantly reviewing individual and group performance.

Liaison — The unusual position of the data processing activity within the larger organization — half service, half operating — greatly heightens the importance of the liaison function at the management level. The data processing manager is faced with particularly difficult relationships — he is often in the position of sharing in decisions that do not relate directly to his own department.

The Critical Functions

In a situation that will extend into the 1970s, by far the most intensive searches for qualified personnel in data processing are concentrated in the technical areas of planning and management, as defined earlier (See Table I). Within these areas, the greatest number of position vacancies are for data processing managers, systems analysts, and programmers. Recruiting and training operating personnel offers no real problem.

Why is this? There are several reasons; the most obvious is simply that the growth of data processing has been so rapid that it has outpaced personnel supplies and capabilities. Contributing to the problem is the fact that these particular positions demand persons possessing special prerequisite skills and such traits as imagination, initiative, and motivation. They must undergo specific long-term (more than six months) training as well (See Table II). By contrast, an operator requires but five weeks of training and no great educational or environmental prerequisites.

Recruiting and Training

One of the significant problems in recruitment is determining who has the prerequisites. How does one measure imagination, initiative, motivation? The answer is that one cannot. So recruiters tend to recruit from among those limited numbers of persons who have already proven records as systems analysts and programmers. The effect of much competition has been to raise salaries to their present high level. And there are no signs of stabilization.

In training, a problem of great significance exists in the long lead time required for systems analysts and the fact that there are no true systems analysis training courses. This means that most analysts currently practicing in industry have actually been given training only as programmers. (See Throughput, September 1966) It is not uncommon to find an organization promoting its most qualified programmers to systems analysts without regard for their capabilities as such. This may have the result of creating poor systems analysts and eliminating good programmers. Since, however, no definitive systems analysis training is available, it is fairly difficult to use any other approach at this time.

Managers

A number of data processing management positions must be filled with people skilled in the techniques of management as well as the techniques of data processing. A major deficiency in this area to date has been the practice of creating supervisors and managers by taking the most competent technician and making him the manager of his skill group. Unfortunately, a good technician is not always a good manager. The manager requires significant training in the management skills: administration, planning, control, supervision. It is probably better to take a skilled manager and teach him the basic techniques of data processing than to take a skilled technician and teach him the techniques of management.

Positions and Duties

Exact job titles and duties are closely related to the size of the data processing activity, the class of installation, the kind of company, and other factors. It is possible, however, to translate from the functions defined earlier to five groups of jobs: (1) clerical and administrative, (2) machine operation, (3) programming, (4) systems analysis, and (5) management.

In the order listed, an employee in a position in one level need not be qualified to perform the duties of a position in one of the higher levels. Conversely, a person holding a job in one of the higher levels may be assumed to be qualified to perform any of the lower-ranked jobs, or to know thoroughly what goes on in any of those jobs.

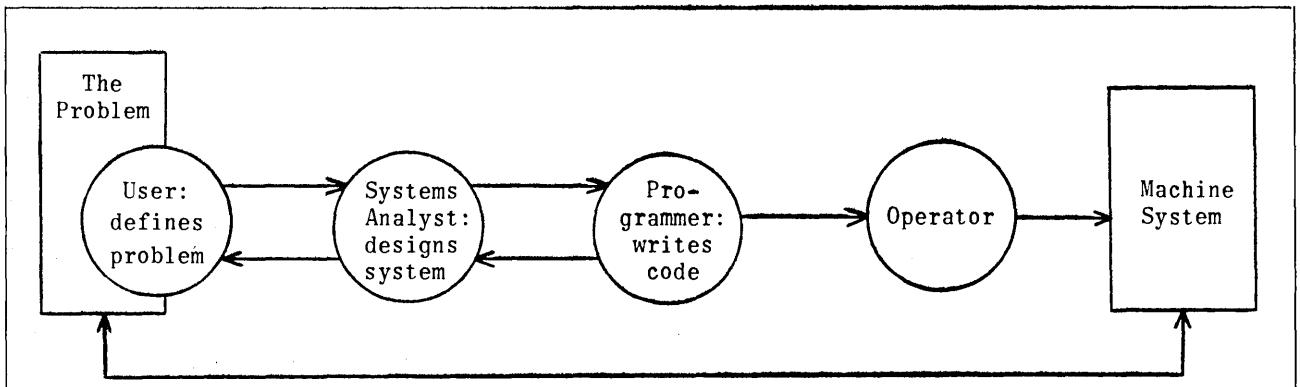
Clerical and Administrative

These positions are generally concerned with input and control and record maintenance; operating functions in data processing.

Librarian — Issues and stores data files and other records of the installation.

Control Clerks — Responsible for the integrity of all data received, processed, and dispatched from the data processing department. He performs such activities as batch reconciliation, checking the validity of data, zero balancing, and other control activities specified by the application.

Scheduler and Dispatcher — Coordinates the input requirements of production programs, the output requirements of the user department, and the processing capabilities of the data processing equipment; dispatches output to its ultimate users. This is one of the few clerical positions requiring technical operations experience.



Flow of The System Development Process

Table II

Data Processing Personnel Prerequisites

	Systems Analyst	Programmer	Operator
1. Educational Requirements:	• Bachelor's degree in any applied or analytical science, or the euivalent	• High school diploma, or equivalent. (Scientific programmer will require 2 years of college math.)	• High school diploma, or equivalent.
2. Prerequisite Characteristics:	• Imagination; • Some understanding of logic; • Organizational ability; • High degree of initiative; • Communication skills	• Logical aptitude (as indictated by various aptitude tests.) • Reasonable motivation or initiative • Limited writing ability	• Average intelligence • Manual dexterity
3. Eligibility:	Possibly 1 in 25 working individuals	1 in 12 (1 in 10 pass test) working individuals	1 of every 2 working individuals
4. Desirable Formal Training:	20 weeks	8-10 weeks	1 week
5. Desirable On-The-Job Training:	12-15 months	6-12 months	4 weeks
6. Available Formal Training:	2 weeks	5-6 weeks	1 week
7. Desirable Training Concepts:	• Basic business skills • Data gathering techniques • Documentation analysis • File management concepts • Data analysis • Hardware • Basic programming • Computer applications • Advanced concepts of systems technology (PERT, Decision Logic Tables, Data Communications, Operations Research)	• Logical analysis • Language coding • Testing techniques • Documentation skills and requirements • Installation standards • Controls and checking	• Normal operating procedures • Exception procedures • Emergency procedures • Data file protection

Clerk — Performs miscellaneous document and data handling tasks required for a smooth work flow between machine processing steps.

Burster Operator — Deletes carbons, strips margins, and separates continuous forms as part of final processing of output reports.

Machine Operations

Jobs in this category are concerned with the operation of data processing equipment. (Keypunch operators are included here, but they are, in some cases, considered as clerical employees.)

Keypunch Operator — Converts source documents into machine acceptable form, typically key punching from handwritten or typed forms. Occasionally operates a paper tape-to-card converter.

Console Operator — Operates the computer system, including entry of variable data through the console keyboard; initializes and loads programs, monitors programs during execution, and records equipment use.

Peripheral Equipment Operator — Operates equipment in support of the main processing configuration for such purposes as converting card to tape, loading and editing, tape-to-printer report preparation, and paper-tape conversion.

Punched Card Equipment Operator — Operates unit record equipment.

File Handler — Obtains and returns tape reels, discs and data cells; mounts and dismounts files on the proper drives assigned by program specifications and directed by console operator; maintains work and master files.

Programming

Programming positions occur both in the planning and operating functions. Positions are described in ascending order of difficulty and qualifications required.

Wiring Technician — Wires and tests control panels; defines external control switches and selectors for unit record equipment.

Coder — Converts detailed logical descriptions into program instructions as specified by the program specifications.

Maintenance Programmer — Codes and tests revisions to production programs, needed to maintain operations.

Programmer — Designs and tests program logic, selects subroutines and other software aids for use in the program.

Utility Programmer — Develops subroutines and special software. Develops programming techniques and trains the programming staff in use of these programming aids.

Systems Analysis

Positions in this group are primarily concerned with the planning of new applications. While the general title "systems analyst" or "systems designer" is normally used for most levels, job titles occasionally become specific.

Research Analyst — Investigates and reviews operations identified as suitable for data processing.

Forms Designer — Designs, coordinates, and controls the use and circulation of all company forms.

Procedures Analyst — Develops improved clerical and manual office procedures.

Methods Analyst — Designs systems and their implementation; plans, controls and coordinates conversion to new systems.

Systems Consultant — Supplies technical assistance and direction with specific emphasis on problem identification, organization analysis, conversion planning, forms control and analysis, and reports control.

(Please turn page)

CALENDAR

OF COMING

EVENTS

Aug. 30-Sept. 1, 1966: National ACM Conference, Ambassador Hotel, Los Angeles, Calif.; contact S. F. Needham, Exhibits Chairman, National ACM Conference, P.O. Box 90698, Airport Station, Los Angeles, Calif. 90009

Sept. 6, 1966: South African Council for Automation and Computation, Johannesburg, South Africa; contact Dr. A. Lutsch, C.S.I.R., Pretoria, South Africa

Sept. 7-9, 1966: The Computer Society of South Africa Limited, Johannesburg, South Africa; contact E. S. Russell, P.O. Box 7018, Johannesburg, South Africa

Sept. 26-28, 1966: International Systems Meeting, Systems and Procedures Association, Queen Elizabeth Hotel, Montreal, Canada; contact Richard B. McCaffrey, Systems and Procedures Association, 7890 Brookside Drive, Cleveland, Ohio 44138

Oct. 3-7, 1966: American Documentation Institute Annual Meeting, Santa Monica, Calif.; contact Jules Mersel, Informatics, Inc., 5430 Van Nuys Blvd., Sherman Oaks, Calif. 91401

Oct. 5-7, 1966: Allerton Conference on Circuit and System Theory, Conference Center, University of Illinois, Monticello, Ill.; contact Prof. W. R. Perkins, Dept. of Elec. Engrg., Univ. of Ill., Urbana, Ill.

Oct. 17-21, 1966: Business Equipment Exposition/Conference, Business Equipment Manufacturers Assoc., McCormick Place, Chicago, Ill.; contact George L. Fischer, Jr., BEMA, 235 East 42 St., New York 17, N.Y.

Oct. 18-20, 1966: Seventh National Symposium of the Society for Information Display, "Information Display as an Emerging Discipline," Hotel Bradford, Boston, Mass.; contact Glenn E. Whitham, General Chairman, Box 413, Wayland, Mass. 01778

Oct. 19-21, 1966: CUBE (Cooperating Users of Burroughs Equipment) Fall Meeting, Prom Town House Motor Inn, Omaha, Nebr.; contact William Macomber, Boston Insurance Group, 87 Kilby St., Boston, Mass.

Oct. 24-26, 1966: International Symposium on Microelectronics, Munich Fair and Exhibition Grounds, Munich, Germany; contact INEA — Internationaler Elektronik-Arbeitskreis e. V., 8000 Munchen 12, Theresienhohe 15, Germany.

Oct. 24-27, 1966: Annual Instrument Society of America (ISA) Conference & Exhibit, New York Coliseum, New York, N.Y.; contact Daniel R. Stearn, Public Relations Mgr., Instrument Society of America, 530 William Penn Place, Pittsburgh, Pa. 15219

Oct. 25-28, 1966: Data Processing Management Association Fall International Conference, Los Angeles Biltmore Hotel, Los Angeles, Calif.; contact Mrs. M. Rafferty, DPMA, 505 Busse Highway, Park Ridge, Ill. 60068

Oct. 31-Nov. 1-3, 1966: Annual Meeting of UAIDE (Users of Automatic Information Display Equipment), Vacation Village Hotel, West Mission Bay, San Diego, Calif.; contact Marvin J. Kaitz, Dept. 200-312, Space and Information Systems Div., North American Aviation, 12214 Lakewood Blvd., Downey, Calif. 90241

Nov. 8-10, 1966: Fall Joint Computer Conference, Brooks Hall, Civic Center, San Francisco, Calif.; contact R. George Glaser, General Chairman, Suite 1060, 100 California St., San Francisco, Calif. 94111.

Nov. 15-18, 1966: GUIDE International, Americana Hotel, Miami Beach, Fla.; contact Lois E. Mechan, Secretary, GUIDE International, c/o United Services Automobile Assoc., 4119 Broadway, San Antonio, Texas 78215

Nov. 17-18, 1966: Southwest Conference on Computers in Humanistic Research, Texas A&M Univ., College Station, Tex.; contact Milton A. Huggett, Center for Computer Research in the Humanities, College Station, Tex.

Nov. 28-30, 1966: COMMON User Group (formerly 1620 User Group), Jung Hotel, New Orleans, La.; contact Wiltz P. Champagne, c/o Computing Center, University of Southwestern Louisiana, Lafayette, La.

Mar., 1967: Fifth Annual Symposium on Biomathematics and Computer Science in the Life Sciences, Shamrock Hilton Hotel, Houston, Texas; contact Office of the Dean, Division of Continuing Education, the University of Texas Graduate School of Biomedical Sciences, 102 Jesse Jones Library Bldg., Texas Medical Center, Houston, Texas 77025

April 18-20, 1967: Spring Joint Computer Conference, Chalfonte-Haddon Hall, Atlantic City, N.J.; contact AFIPS Hdqs., 211 East 43 St., New York, N.Y. 10017

May 9-11, 1967: Spring Joint Computer Conference, Convention Center, Philadelphia, Pa.; contact AFIPS Headquarters, 211 E. 43rd St., New York, N.Y. 10017

May 18-19, 1967: 10th Midwest Symposium on Circuit Theory, Purdue University, Lafayette, Ind.

June 28-30, 1967: 1967 Joint Automatic Control Conference, University of Pennsylvania, Philadelphia, Pa.; contact Lewis Winner, 152 W. 42nd St., New York, N.Y. 10036

Aug. 29-31, 1967: 1967 ACM (Association for Computing Machinery) National Conference, Twentieth Anniversary, Sheraton Park Hotel, Washington, D.C.; contact Thomas Willette, P.O. Box 6, Annandale, Va. 22003

Sept. 11-15, 1967: 1967 International Symposium on Information Theory, Athens, Greece; contact A. V. Balakrishnan, Dept. of Engineering, U.C.L.A., Los Angeles, Calif. 90024

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

Brandon — Jobs

Management

Manager of Data Processing — Responsible for planning, development, and operation of applications and programs to meet needs.

Manager of Operations — Responsible for the operation and scheduled use of data processing equipment.

Programming Manager — Responsible for planning, scheduling, and supervising program development and maintenance work.

Control Supervisor — Responsible for input preparation, job scheduling, data control, and output control.

Unit Record Supervisor — Responsible for the operation and scheduled use of unit record equipment.

Computer Supervisor — Responsible for the operation and scheduled use of computer and peripheral devices.

Manager of Systems Analysis — Responsible for planning, scheduling, and supervising systems analysis and design activities.

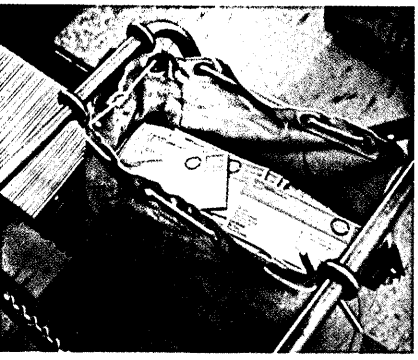
Keypunch Supervisor — Responsible for input preparation using keypunch and key verification equipment.

Certain management functions are sometimes delegated to "staff" job titles.

Standards Controller — Develops and audits the use of standards in programming, data control, systems analysis, and operating procedures.

Training Specialist — Develops and conducts educational programs dealing in data processing, and guides the technical training of new and promoted employees.

Advanced Planner — Reviews and evaluates new development in the data processing field and coordinates the forward planning of the data processing department with the corporate forward planning effort.

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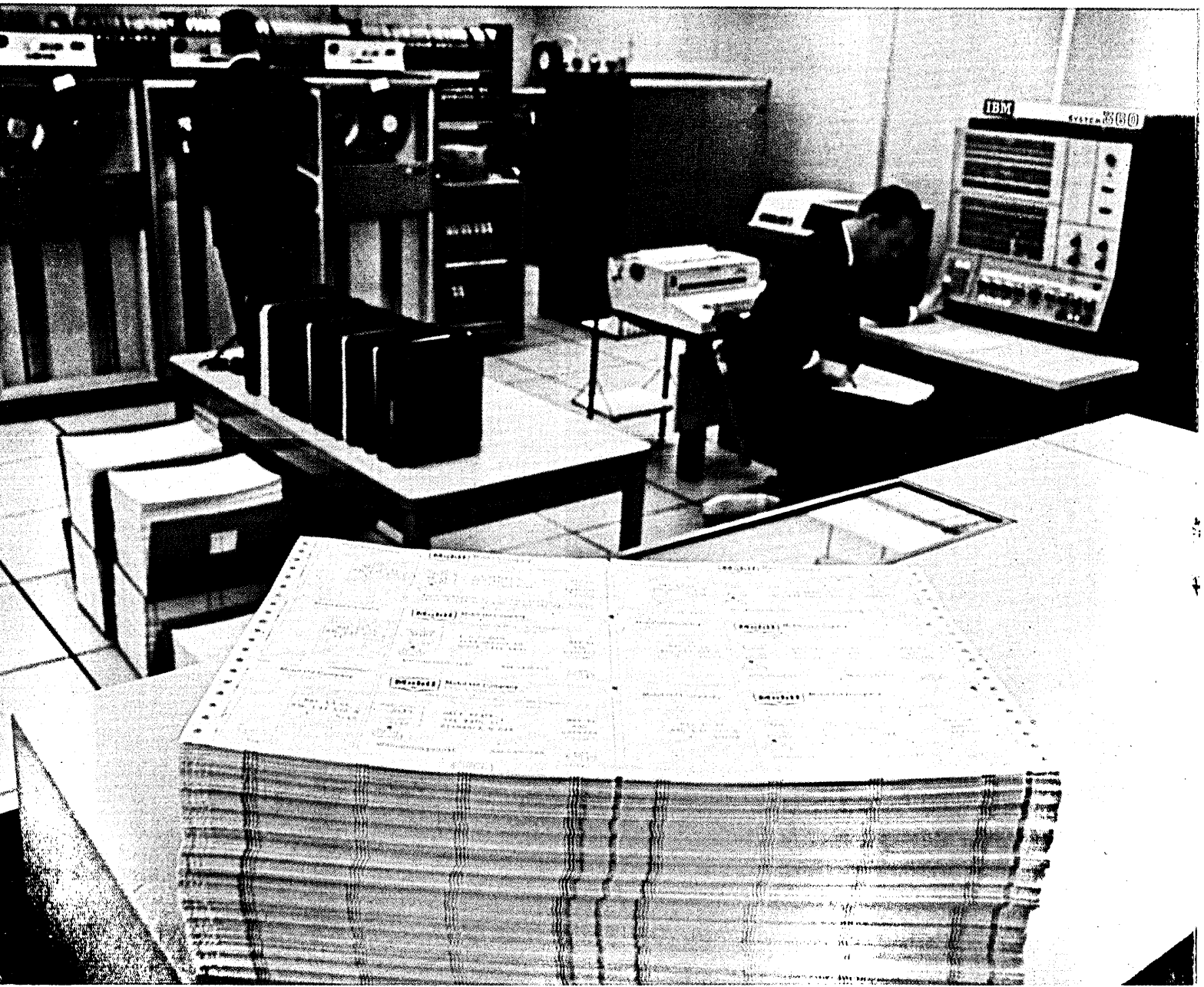
IBM
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SYSTEM/360 passed Mobil's computer economy run...

Twelve IBM SYSTEM/360's are saving money for Mobil Oil Corporation...and helping them improve customer service, too.

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It is a Model 30 that went in last March at the regional credit card center in Kansas City. In just two weeks it was out-performing a more expensive IBM 1460.

What the 1460 did in 20 hours, the SYSTEM/360 was doing in 17—using the same programs. With the time saved, Mobil can do more jobs. Like the two daily reports for the traffic department. They help get more productive mileage from 3,400 tank cars—and help save $100,000 a year in the process.

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It processes a variety of new programs as well. In its spare time, it's being used to test programs for a much larger SYSTEM/360.

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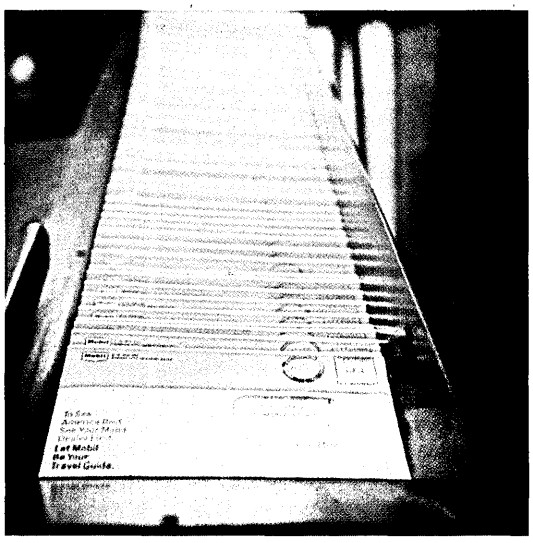

TRAINING PERSONS FOR MARKETING DATA PROCESSING EQUIPMENT AND SERVICES

Paul F. Smith
Manager
Marketing Development Program
Information Systems Marketing Operation
General Electric Company
Phoenix, Arizona

"Your customer may call you a salesman — an applications engineer — a problem-solver — or a profit-maker — but the important thing is, that he calls you."

Education and training of people to market data processing equipment is like much other training in marketing. But the big and exasperating difference is that trainees who already have specialized knowledge of the data processing field are extremely scarce.

Training in most other fields can draw on experience gained by previous generations of experts in the more common professions. The data processing or computer field is however relatively new to the educational fraternity; and persons who can teach it are very busy in pursuing their pressing tasks in this highly competitive industry. Therefore few experts with an intimate knowledge of the data processing business are available to teach newcomers.

The training of persons to market data processing equipment, techniques and services, therefore, has a tendency to fall upon some dedicated senior computer administrators who work in league with some marketing specialists who have a knack for intelligent and farsighted planning.

A marketing development program for EDP should include these three principal goals:

1. To develop loyal field representatives with a strong feeling for the company and its computers, who know how to apply the resources of the company to benefit customers and to get the customer's jobs done properly;
2. To develop professional, versatile, marketing-oriented representatives who possess a keen insight into customers' needs and can help design adequate systems to meet those needs now and later on;
3. To develop a reasonably homogeneous field organization, which is able to adapt readily to new products, and is motivated toward self-development in the information-processing business.

The time to accomplish these goals is at present considered to be from 20 to 30 months. This appears to be the period required to assure that objectives have been realized so completely as to offer the fullest benefits for the trainee, the customer, and the company. No program of education is successful without a balance of benefits to all these three.

The "People Business"

In establishing these long-term goals, our approach is that we are in the "people business." The first consideration is selection of the right people.

To select and recruit suitable people for training in marketing, a number of criteria have been established by field managers and aligned with the program's aims. The best sources of manpower for the program appear to be persons newly hired directly from college campuses, and recent college graduates with one or two years of non-computer business experience.

Field managers interview, recruit, and select candidates for the program according to the planned manpower needs of their area of supervision. By this method, the program member acquires his on-the-job training under the guidance of the manager who first hired him. His permanent position on completion of the program is also established by the same manager.

The program for the development of marketing personnel has six distinct phases:

1. Initial education and training (orientation);
2. Field-training assignment;
3. First evaluation;
4. Advanced programming training;
5. Programmer-analyst field-training assignment; and
6. Second evaluation.

1. Orientation

The first phase, orientation, is a formal course of about eight weeks. In general, it helps the individual become familiar with the company, the information processing business, customer needs, and his personal opportunities.

Included in this initial phase is teaching of the following:

1. *Company* — Organization, history, products, services, opportunities, employee benefits, etc.
2. *Basic Data Processing* — Introduction to, and hands-on experience with, the 80-column card punch; terminology; general requirements of the basic industry data processing applications.
3. *Introduction to Computers* — Fundamentals about small- and medium-size computer systems.
4. *Selected Industry Applications* — Terminology; data processing operations; needs and trends of various types of businesses, from banking to manufacturing to marketing and distribution.
5. *Computer Programming* — Hands-on programming of a small-scale computer system.
6. *Computer Applications and Operations* — Programming and running specific applications.
7. *Communication Skills* — Writing; listening; speaking.
8. *Conference Leadership Workshop* — With aid of standard and also specially prepared texts, learning how to participate in and run conferences, formal meetings, etc.

2. Field Training Assignment

During this phase of the program, attitudes and aptitudes of individual program members are continually checked and measured. Program objectives can only be realized if these are satisfactory.

Upon completion of this orientation phase, the individual returns for a six- to eight-months training assignment to the field district where he was selected. There he is assigned to pre-sale and post-sale situations involving the computer system used during the orientation course. These situations are referred to as "work assignments." They are specific in nature, issued by the marketing development program and supervised by the field manager or key man designated by him.

During this second period, the program member completes self-study courses, and other special assignments, such as technical presentations and application studies. The program member's performance on each work assignment is evaluated and recorded by the field manager upon completion. The marketing development program manager checks on the completion of all assignments. Through this checking, the program manager can discover deficiencies in the individual's record and assign work which will provide opportunities to remove the deficiencies.

3. First Evaluation

As the second phase draws to a close, the individual is evaluated in order to determine whether:

1. He is to proceed to the next phase of the marketing development program;
2. He should be given another work assignment using the initial computer system; or
3. He should be certified as a junior application engineer on this particular computer system, with a recommendation that no further training be initiated at this time.

It is recognized, of course, that not all the members of the program will aspire equally to completion of the full program. Some will realize that because their aptitudes or unconscious wishes leave them satisfied with certain lesser attainments. Some may wish to follow a path of technical assignments, and thus be employed immediately at the work in which they feel most comfortable and where they can best serve the customer and company.

Alternative No. 3 thus enables such individuals to take their places in work that is most satisfying to them, thereby avoiding the frustrations, pressures and unhappiness which often beset the more ambitious who are not satisfied to recognize early signs of their limitations.

4. Advanced Programming Training

In the fourth phase of the program, the program member is assigned to a formal course of training in:

1. Advanced programming concepts of more complex computers;
2. Introductory systems concepts of intermediate computers;
3. Additional training in communication skills.

This fourth phase may be carried out either at a field training center or at the company headquarters programming facility.

5. Programmer Analyst Field Assignment

In the fifth phase, the individual is assigned as programmer-analyst in the field. He can become a junior member of an on-site team, working with an advanced computer system in a customer location, or he may become a site leader for a customer's less complex system.

Again, the work assignments are specific in nature and are evaluated by the field manager upon completion of the assignment. Additional self-development programs and self-training assignments will be designated by the marketing development program manager during this phase. This field assignment is of nine- to twelve-months duration, because of the more complex nature of computers, systems and customer requirements.

Since every person learns at a different rate, and the attitudes and aptitudes of individuals vary, field assignments vary in length.

6. Second Evaluation

Phase six, the second evaluation, determines whether the program member:

1. Should be given an additional programming analyst assignment; or
2. Should be awarded a certificate of completion from the marketing development program, and;
   a. Recommended for advanced training as a sales representative; or
   b. Recommended for advanced training as an application engineer.

The monitoring and measurement of the progress of program members is handled by a computer system; and the degree of progress may be determined at any time. This system also helps establish a "profile" of the type of individual most likely to succeed in a marketing career.

The program manager must remain continually aware of the assimilation rate of each individual, his needs, and his desires. Every program member needs to be aware that he is receiving "tools" which he may employ in his effort at success, and that his success depends on how effectively he uses these "tools."

A parting word to the graduate of the marketing development program might be like this:

"Your customer may call you a salesman — an applications engineer — a problem-solver — or a profit-maker. The important thing is that he calls *you*."

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CAPITAL REPORT

A Special Report from C&A's Washington Correspondent

The Library of Congress, which easily qualifies as the world's largest collection of literature, has begun an automation program that undoubtedly will be felt in coming years by every major library in this country.

The Library recently installed an IBM 360 Model 30 in its Capitol Hill building and is applying this computer to two major phases of its work — bibliographic processing and catalog searching. In addition, it will begin a pilot test this fall with 16 cooperating libraries in which cataloging data will be sent out to the libraries on magnetic tape for use on their own EDP systems. Since the Library of Congress cataloging system has long been a standard in this country, results of this pilot test could have far-reaching effects in library science.

The first big automation push in the Library of Congress is in the Manuscript Division, estimated to contain 27.9 million items, including the original manuscripts of hundreds of major American writers. The computer is being used to consolidate on magnetic tape all the reference and descriptive information about each collection, the records of each collection's source and accession, information on the status of work in organizing and describing it, shelf location, and statistics on its use.

From this master record of manuscripts, the staff has produced punch card call slips for 1,600 collections (the largest and most frequently used of the 3,000 collections). More will be represented as the program advances. At the moment, their titles — the names of 1,600 famous men, women and organizations from the 15th century to 1966 — appear on the cards used by the readers. The Library reported that scholars working in the Manuscript Reading Room made the switch from the old 3 by 5 inch call slip to the punch card "with interest and approval."

Each card is preprinted with a name, the exact shelf location of the collection, and a numeric code symbol for the collection. Multiple copies of each name card provide for repeated use in calling for materials from the same collection, and the cards are arranged alphabetically at the reader-service desk.

For the staff, the effects of computer use are numerous. Most important, printouts from the master record of manuscripts, whose contents can be approached in 93 ways, are already providing staff specialists in particular periods of history or other fields of study with unified data describing all the 3,000-odd collections, permitting them to help readers more quickly and in broader scope with materials in their fields.

The punch card also provides a central record of materials sent outside the Manuscript Division for binding, repair, photocopying, exhibition, or, in the case of transcripts and photocopies, for inter-library loan. At the end of the day, the used cards turned in by readers are punched with the number of manuscript containers served and with the date, so that the computer can compile statistics on use.

A related, experimental program in this Division is aimed at a unified index of all the registers (or guides) for 500 collections of manuscripts. These collections contain more than half the division's individual manuscripts. This master index record on magnetic tape will permit analysis of the contents of these collections by subjects and by the names of persons to whom the manuscripts refer.

The two tapes for the master record and the master index record will then be run in tandem on the computer to provide both descriptive and subject analysis of the collections. Computer programs have already been written for this program.

In the future, the Library may turn to the big problem of document retrieval. Back in 1964, an industry survey team headed by Gilbert S. King, former research director of IBM and then vice president of Itek Corporation, concluded in an 88-page report that it was technically and economically feasible for the Library to begin the automation of documents, as well as cataloging and bibliographic data.

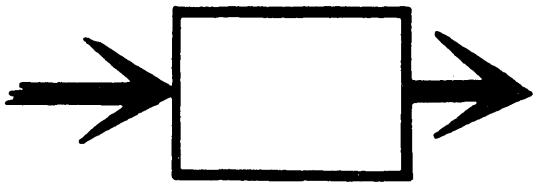
Since 1964, the Library's Data Processing Office has been chiefly concerned with business operations, but it recently has become involved in such projects as microfilming and indexing the manuscripts of 23 American presidents and compiling a 124-page index to nearly 2,000 pages of testimony from congressional hearings on copyright revision.

The latter project was done for the Copyright Office, part of the Library of Congress, and included the indexing of testimony on what to do about copyrighting computer programs and using copyrighted material in computers.

During these hearings, the Association for Computing Machinery's committee on copyrighting and patenting of computer programs wrote to the House Judiciary Committee expressing concern that the latest version of the copyright bill is unduly restrictive of the use of computers in information retrieval.

The ACM group has asked the Committee to permit use of copyrighted material in applications where a computer essentially replaces a human research worker in literature searching. It also said the bill seems to allow copyrighting of computer programs.

JAMES TITUS



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THROUGHPUT

Systems Analysis Training

The best estimates that can be made today indicate that somewhere in the neighborhood of 130,000 systems analysts must be trained by 1970 to meet the requirements of an ever-expanding computer industry. This is roughly double the number of qualified analysts practicing in the industry today. This need represents a great problem which virtually nobody is really facing.

The major problem stems from two factors:

- an appalling lack of agreed definition of what the systems analysis function is and does, and
- the failure so far of any one group or organization to assume adequately the responsibility for the requisite training.

This is coupled with the fact based on much evidence that effective systems analysis training requires at least a six-month formal training program, followed by a nine-month on-the-job program.

Since systems analysis training is not easy to define, and not easy to do, it is almost impossible to accomplish.

In the broadest sense, the systems function encompasses a number of varied disciplines:

Computer systems investigation
Computer systems analysis
Computer systems design
and
Systems, methods and procedures
Industrial engineering
Operations research
Management analysis,

and a number of subsidiary functions such as forms design and control, process analysis, and the like. Training in all these disciplines is in practice impossible unless some functional specialization is retained.

As to the responsibility for teaching systems analysis, the manufacturer appropriately feels that it is his responsibility to teach only *machine-dependent* skills; and systems analysis clearly is independent of machines. Although there are some efforts in this area, by-and-large the responsibility for systems training appears left to the user, who can ill afford the costs of six-month training programs.

What is available in the industry?

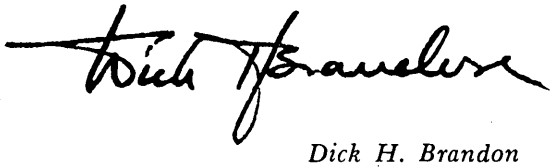
For Government users, three programs stand out, although none satisfies the total need, and none is wholly satisfactory.

1. The Army Management Engineering Training Agency (AMETA): Rock Island Arsenal, Ill.: a 6-week systems course, covering computer systems analysis and systems and procedures.
2. The ADP Management Training Center (United States Civil Service Commission): Washington, D.C.: a five-day program — Computer Systems Analysis for Programmers.
3. The ADP Management Training Center also conducts a workshop in systems analysis.

Commercial ventures in systems analysis training are few, and generally of limited benefit:

1. IBM has a 2-week course in "Systems Planning"; it presents only a summary of techniques.
2. NCR is planning to develop a 6-week systems course.
3. Systemation (Ross-Martin Co.) in Tulsa, Oklahoma, has a fairly extensive correspondence course in basic systems, emphasizing manual systems.
4. The American Management Association presents some basic seminars in computer systems analysis.
5. The most comprehensive course is undoubtedly IBM's 3-month Systems Research Institute. It has only been open to users since July, on an experimental basis.
6. Brandon Applied Systems, Inc. has 2-day, 5-day, and 10-week courses, which currently are limited.
7. A number of universities are now offering degree programs in Computer Sciences, which include systems analysis and other elements. These include Rutgers, Texas A and M, Stanford, Chicago, and a number of others. (See "Computers and Automation," June 1966.)

In order to obtain the 130,000 additional systems analysts, what we can actually do is limited. Self training, or no training, reliance on universities, or waiting for manufacturers to develop programs, are currently the only feasible alternatives.



Dick H. Brandon
Contributing Editor

"ACROSS THE EDITOR'S DESK"

Computing and Data Processing Newsletter

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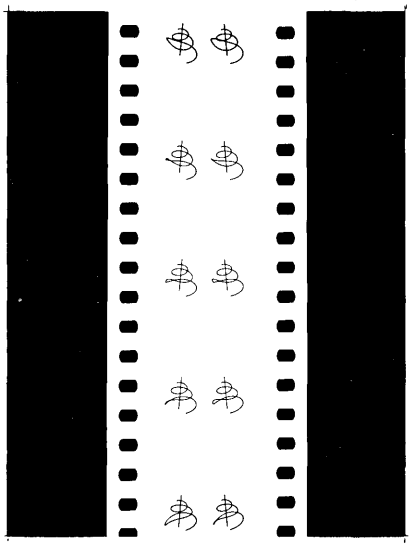
APPLICATIONS

COMPUTER MAKES 3-D MOVIES OF INNER EAR

A computer has been used to make three-dimensional animated movies depicting the part of the inner ear that translates sound waves into audible sensations. The movies, produced at Bell Telephone Laboratories, were made by a computer which was programmed with a mathematical description of how the basilar membrane moves under certain conditions.

The basilar membrane is the primary transducer in the hearing process; that is, it converts sound waves to audible sensations. This delicate, spiral structure has a diameter of about 1/4-inch. It is extraordinarily difficult to observe because it is within the cochlea — a part of the ear deeply embedded in the temporal bone of the skull. Georg von Bekesy, a Nobel laureate now at Harvard, was the first to measure basilar membrane movements.

Using data obtained from Bekesy, James L. Flanagan of Bell Laboratories devised a mathematical model of the basilar membrane. With this model, Robert C. Lummis, A. Michael Noll, and Man Mohan Sondhi programmed a computer to generate a magnetic tape containing data describing a sequence of drawings depicting the movements of the basilar membrane. The tape was fed to a microfilm plotter which converted the digital data into line drawings on the face of a special cathode-ray tube. A motion picture camera, also controlled by the computer, photographed the drawings, thus producing a movie. The three dimensional effect is created by presenting a different picture to each eye. The two pictures show what the object looks like from two slightly different positions. When a person



— Frames from a three-dimensional animated motion picture that may help significantly in understanding how we hear.

views the movie with stereoscopic glasses, both pictures appear to fuse and the minute difference in perspective is translated into a realistic depth effect.

One of the most significant advantages of this computer-generated motion picture is that the complicated motions of the basilar membrane can be seen clearly and studied in detail. This is because small rapid changes can be slowed down and movements greatly exaggerated. For example, even the loudest sounds move the basilar membrane by an amount measured in microscopic dimensions. Yet there may be thousands of movements in the basilar membrane each second. Without a computer, it would be impossible to calculate, let alone plot, the movements of the basilar membrane in response to even ordinary speech sounds. The movements are so fast that to show clearly what happens when the spoken word "to" is heard takes two minutes of film time.

Using these movies, movements of the membrane can be related to frequencies and intensities of sound. By studying these movements, scientists are able to understand the correspondence of physical motions to psychological phenomena.

GRAND COULEE DAM NOW MONITORED BY COMPUTER

Engineers at Grand Coulee dam (Wash.) now have a "watchdog" computer system that is expected to save more than $600,000 a year in operating the largest hydroelectric power facility in the United States. The automated system (built by the Control Systems Department of Honeywell's Computer Control Division, Framingham, Mass.) will monitor and record important performance data

of huge generators, switchyards and pumps, including giant 65,000-horsepower pumps that lift water up into a reservoir feeding canals that irrigate 500,000 acres of land.

Power supervisor R. K. Seeley said the system, believed to be the first ever applied to an all-hydro power plant, will become fully operational by the end of this month, following a series of tests. The Interior Department's Bureau of Reclamation built and operates the dam on the Columbia river. Grand Coulee, with 18 Generators in two power plants at opposite ends of the dam's spillway, now has a rated capacity of almost 2 million kilowatts that is fed into the northwest power pool. It is to be enlarged to 5.6 million kilowatts by the addition of a third power plant authorized last June by Congress.

The Honeywell system, located in the dam's left power plant, is programmed to sequence-monitor 420 relay and circuit breaker contacts 1000 times every second and to scan and alarm 200 bearing temperatures and 30 oil pressures of generators and pumps every 15 seconds. Prior to installation of the computer system, highly trained clipboard-carrying operators had to carefully watch the operation of each of the 108,000-kilowatt-capacity generators to insure that they were operating properly. Surveillance still will be necessary, it was pointed out, but operational data will be logged automatically on electric typewriters. Audio and visual alarms alert operators if any of the hundreds of operating conditions exceed preset limits.

The computer system also includes electronic recorders, which monitor and control the power output assigned to each generator, and microswitches of special design that enable operators to manually control the on-off operation of generators, pumps and transmission lines.

WATER FILTRATION PLANT CONTROLLED BY COMPUTER

A 960 million gallon-per-day water filtration plant (the world's largest such facility) is now controlled by a single computer — an IBM 1710. The $105 million Central District Filter Plant, located on 61 acres reclaimed from Lake Michigan, was dedicated in June by Mayor Richard J. Daley. It will serve nearly three million persons in Chicago and 36 suburbs.

James Jardine, commissioner of water and sewers, said the IBM computer takes more than 300 readings throughout the plant every six minutes and automatically prints out-of-normal condition reports. Plant personnel instantly spots any unusual conditions and can take appropriate corrective action. In addition, the 1710 prints hourly water and chemical process logs and produces daily master compilations of water and chemical conditions.

Commissioner Jardine said the plant operates in four separate areas, all controlled by the 1710. This "quadrant" approach permits experimentation with differing formulas to obtain desired purification levels from the same untreated water. "Since water purification becomes a new problem virtually every half-hour," he said, "we must treat entirely new kinds of problems every few minutes."

"The 1710 permits us a luxury never known in water treatment before: we can try four distinct purification procedures at the same time, learning from them the one best solution should the same problem arise again."

BRITISH COMPUTER DESIGNS WORLD FAIR CENTER PIECE

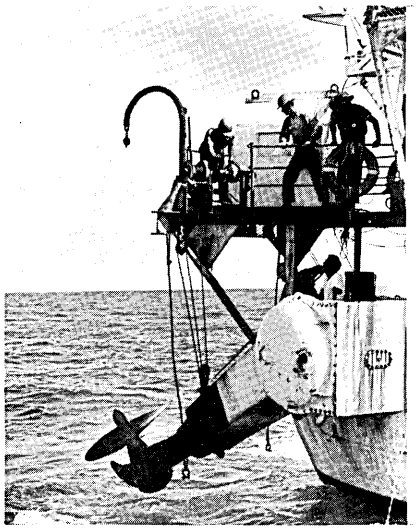
The center piece of the 1967 Montreal World Fair is to be a 200 foot high "Gyrotron". It is being constructed using a "space-frame" technique and when completed will be the first completely space-frame building in the world. The design analysis for this revolutionary building was carried out on an I.C.T. Atlas computer. The computer analysis of the structure, which took two hours to run on the Atlas computer, would have taken one man, working an 8 hour day and 5 days a week, 30,000 years to complete.

The structure, designed by Mr. Boyd Auger, the British Architect and Engineer, will use some 9000 16-foot long aluminum tubes, 27 miles of them. They will be joined into a massive three-dimensional cobweb or honeycomb structure — technically a "multi-layer octet truss" arrangement. The computer analysis of Boyd Auger's design was carried out by Engineering Computations, who developed a specail program which was run on an I.C.T. Atlas computer.

OUTBOARD PROPELLERS CONTROLLED BY COMPUTER IN DRILLING OPERATION

Humble Oil & Refining Company and Standard Oil Company of California are drilling in water up to 4354 feet deep, about 80 miles off the Texas coast, as part of a joint exploration and research program. The tests have set a new deep-water drilling record for the Gulf of Mexico. The two companies are drilling a series of core holes from a converted navy ship in order to study the geology of the Continental Slope from Texas to Florida.

In the deep waters of the Continental Slope, conventional anchors would not be economically practical to hold the ship steady over the hole during each coring operation. On Caldrill I (the contract drilling vessel Humble and Socal are using) four outboard propellers are controlled by a computer, and this automatic position equipment (called APE) keeps the ship in position in any depth of water without use of anchors.



— A shipboard computer is linked to this outboard propeller and three others like it on the oil-exploration ship Caldrill I.

Each of the vessel's four outboard propellers is powered by an electric motor. Two propellers are mounted in the stern and two in the bow. All four are linked to an analog computer on board the ship. Signals from the computer start and stop each motor automatically to maintain the ship's position directly over the core hole, and also control the speed of the propellers and the direction in which the force of each is exerted. With APE, drill-

ing can continue and pipe can be handled from the deck of the ship in 20-foot waves and 40-mile-per-hour winds.

NEW YORK TRAFFIC SUMMONSES TO BE CHECKED BY COMPUTER

An IBM System/360 Model 30 will be used to check the 20,000 traffic summonses issued daily in New York City against a file of 7,000,000 vehicle registrations in New York State. The registrations are recorded on magnetic tape. Copies of these tapes are being made available by the state and new tapes will be made from them, listing registrations by license number. A file of New Jersey registrations, listed by license plate number, also is being created as information is received from the State of New Jersey on individual cases.

The computer (which is equipped with a 1100 line-per-minute printer) will take only a few hours to check a week's list of summonses against all the registrations and print out citations and warrants against these cases if no payment is received in a specified period.

There are about 35 reels of tape for the 1964-65 registrations and these are now being matched against a magnetic tape file of 3,500,000 open violations of all types — parking, jaywalking and moving for this period. About 80 per cent of open violations are for parking.

Under the new system, the computer also will produce a number of other lists, or registers, using the same basic information. One that will be produced daily will be a docket register for the courts, which record cases by docket number. At the end of each week other registers will be produced. For one of these, the computer will check that week's list of summonses against a master file of open violations and produce a list of violators with all the summonses still outstanding against them. It has been estimated that with the help of the computer, the time required to notify a violator that his summons has not been settled will be reduced from as long as two years in some cases to about 45 days.

NEW CONTRACTS

FROM	TO	FOR	AMOUNT
National Aeronautics and Space Administration	IBM Corporation	Addition to existing contract for design, development, implementation and maintenance, and operation of computer facilities for the Apollo program	$107 million
National Aeronautics and Space Administration, Manned Spacecraft Center	Philco Corporation, WDL Div., Philco Houston Operations	Implementation, programming and operating a computer system used in connection with Apollo space flight simulations	$1.6 million
National Aeronautics and Space Administration	Computer Sciences Corp., El Segundo, Calif.	Heading a team of companies to develop a general-purpose computer program for analyzing complex three-dimensional structures — a cost-plus-award-fee contract	about $1 million
Department of Transport, Government of Canada, Ottawa	IBM Company Ltd., Ottawa	Installation and operation of IBM 1800 system at Gander International Airport, Newfoundland, to be used principally for the control of North Atlantic air traffic operating through the area	—
U. S. Bureau of Public Roads	System Development Corp., Santa Monica, Calif.	The design of a simulated freeway diamond interchange, in order to study vehicular flow	$509,262 cost-sharing contract
American Stock Exchange, N.Y.	General Electric Co.	A computer complex that will drive the Exchange's sales and quotation tickers and monitor trade data — will include two GE-415 computers and related equipment	leasing at $35,000/month
The Lake Superior & Ishpeming Railroad Company, Michigan	Sylvania Electric Products Inc., Commercial Electronics Div., Bedford, Mass.	Installation of two Sylvania KarTrak® automatic car identification systems	—
Electrologica, Rijswijk, The Netherlands	Informatics Inc., Sherman Oaks, Calif.	Designing and managing the implementation of a COBOL compiler for the Electrologica ELX8 computer	$200,000
U. S. Navy	System Development Corp., Falls Church, Va.	Studying electronic data processing methods as a means of correlating fleet antisubmarine warfare surveillance data	$184,000
Defense Documentation Center (DDC) of the Defense Supply Agency	System Development Corp., Falls Church, Va.	Assistance in the development of a five-year plan to improve computer-based data system services and techniques	$73,500
Jet Propulsion Laboratory	Informatics Inc., Sherman Oaks, Calif.	Providing general-purpose programming and analysis in support of engineering and scientific work being done by JPL for the National Aeronautics and Space Administration	—
Air New Zealand, Auckland, New Zealand	IBM Corporation	An IBM 360/30 computer for delivery in 1967 — will be used to process all flight planning, general accounts, payroll, inventory control and crew assignments; also inspection, personnel and engineering records	—

FROM	TO	FOR	AMOUNT
Educational Facilities Laboratories, New York	Duke University, Durham, N.C.	Development of the first phase of a "computer aided master planning system for colleges and universities"	$133,700
The Chicago Board of Trade, Chicago, Ill.	Data Trends, Inc., Parsippany, N.J.	Installation of a $750,000 Price and Reporting System	—
Office of Administrative Services of Nassau County, N.Y.	Auerbach Corporation, Philadelphia, Pa.	Review of county's existing electronic data processing facilities and aid in establishing guidelines for future development of these services	—
U. S. Department of Defense	Northwestern University, Technological Institute, Evanston, Ill.	Expanded program of basic research in computer sciences, control systems and solid state electronics	$100,000

NEW INSTALLATIONS

AT	OF	FOR
U. S. Naval Research Laboratory, Washington, D.C.	ADVANCE Series 6050 computer system	Use on-line for acquiring and processing data during progress of low-energy nuclear-physics experiments conducted at the Naval Research Laboratory's 75 MEV sector-focusing cyclotron
Clark-O'Neill, Inc., Fairview, N.J.	IBM System/360 Model 40	Improved and expanded market research capabilities in company's pharmaceutical marketing services; drug control services; also in conjunction with mailing services, medical and non-medical
Chemical Engineering Department, Villanova University, Villanova, Pa.	Hitachi 505-60 Analog Computer	Student instruction in chemical process simulation and process control as well as for research
Puget Sound National Bank, Tacoma, Wash.	IBM System/360 Model 30	Development of a computerized information network with all departments and branches of the bank eventually having direct access via remote terminals
Itek Corporation, Lexington, Mass.	Control Data 3300 Computer System	Solving problems in field of precision optical lens design. Computer enables scientists and engineers to mathematically simulate the performance of various types of lenses used in complex aerial camera systems
Taylor Instrument Companies, Rochester, N.Y.	IBM System/360 Model 30	Inventory control of parts, accounting, sales analysis and production control
Disabled American Veterans National Headquarters, Cincinnati, Ohio	Honeywell 200 EDP System	Automatic processing of labels for solicitation mailings, maintenance of membership list; general accounting, inventory control, payroll, Women's Auxiliary record keeping and subscription mailings
Aerospace Corporation, El Segundo, Calif.	Control Data 6600 and 6400 Computer Systems	Wide variety of applications including data reduction, analysis, and general scientific computation
Le Soleil, Quebec, Canada	NCR 315 System	Processing a daily mailing list of about 35,000 in addition to handling a variety of other applications' for the French language newspaper's advertising and circulation departments
Iowa State University Computation Center	EAI 8800 Analog/Hybrid Computing System	Hybrid computing capabilities for general research; system is being linked to an IBM system and will be available to all departments
American Radiator and Standard Sanitary Corp., Industrial Div., Detroit, Mich.	NCR 315 System	Engineering and payroll applications, labor and expense distribution, inventory control. Such applications as parts explosion and routing will be added in about a year
Univ. of Minnesota, Numerical Analysis Center, Minneapolis, Minn.	Control Data 6600 System valued at nearly $3½ million (on lease basis with option to purchase)	Use by both students and faculty members in education and in research (such fields as mathematics, physical sciences and engineering, medicine and life sciences, humanities, agriculture, and others)
Reaction Motors Division of Thiokol Chemical Corporation, Denville, N.J.	IBM System/360 Model 50	Analysis rocket engine test data, exploring advanced propulsion concepts for missiles and space vehicles; monitor project costs, process payrolls and personnel records; also provide data processing services to other companies in area
Ryan Aeronautical Co., San Diego, Calif.	EAI 8400 Digital Computing System including EAI 3500 DATA-PLOTTER	Use in flight simulation studies of Ryan Firebee jet target drones; control system design and stability studies of drone and V/STOL aircraft; and as an educational tool to teach operators how to handle the remote drone control systems
Bell Telephone Laboratories, Holmdel, N.J. and Andover, Mass.	Two EAI 8800 Scientific Computing systems valued at over $200,000 each	Use as part of large hybrid computing systems, in combination with CDC 3100's, to be applied to studies of transmission networks — used primarily to analyze, design and optimize circuits for trans-development projects

AT	OF	FOR
AVCO Corporation, Missile Systems Division, Wilmington, Mass.	Two IBM System/360 computers, costing $3.7 million — on a lease basis from Randolph Computer Corp., NYC	Use in Division's missile activities and also in company's Service Bureau operation throughout the New England Scientific Community
U. S. Atomic Energy Commission, Theoretical Physics Division of Los Alamos Scientific Laboratory	Control Data 6600 Computer System	Use primarily by various divisions within the Laboratory for rapid solutions to complex scientific problems in the field of nuclear energy research and development
Wright Line Division, Barry-Wright Corp., Worcester, Mass.	IBM System/360 Model 20	Basic accounting and management control operations

COMPUTING CENTERS

SBC ANNOUNCES NATIONWIDE DATA PROCESSING NETWORK

Plans for a nationwide network of interconnecting data processing service centers, each equipped with IBM System/360s (ranging in size from the basic Model 30 to a powerful Model 75), have been announced by The Service Bureau Corporation (SBC), New York, N.Y. As outlined by SBC, the inter-center 360 network will be composed of 12 Central Processing Bureaus, each linked directly by data communication lines to local SBC computer centers. Over 70 SBC offices will tie into the national computer network.

Unlike most real-time processing systems, where a customer merely purchases computer time on a shared basis, the SBC Network will provide a full range of customer services, from the initial study of the problem through systems design, programming, processing and final results. With strategically-located processing centers linked together across the country, SBC will offer its services to any customer regardless of his location or the nature of his data processing requirements, whether scientific or commercially oriented.

SBC president Herbert R. Keith said the firm already has installed 25 IBM System/360s. In eight months, each of the 12 Central Processing Bureaus will have two Model 30s and one Model 20 System/360 installed and all 12 Bureaus will be tied together by data transmission lines. Also at that time the remaining local SBC offices will be integrated into the Network as equipment availability permits. During 1967 one Model 30 in each Central Bureau will be available for real-time applications providing SBC customers with direct access to SBC's computers via remote terminals installed on their premises. The entire Network, he said, will be fully operational in 1969, at which time over 125 IBM System/360s will have been installed and more than 181,000 miles of leased private lines, with speeds ranging from 300 to 5100 characters per second, will span the intra-company Network.

INSTANT COMPUTER NETWORK SERVES SAVINGS INSTITUTIONS IN BOSTON

An electronic banking network, which gives tellers instantaneous access to a computer, recently began servicing the first of almost 700,000 savings accounts in the Boston (Mass.) area. The "on-line" system, developed and operated by the National Cash Register Company, initially will serve six savings banks and six savings and loan associations with some 400,000 savings accounts and 40,000 mortgage accounts. NCR president R. Stanley Laing said that eventually, the center will be equipped to handle approximately 1.2 million accounts in New England. The new center will tie in such diverse locations as Cambridge, Waltham, New Bedford, Worcester and Manchester, N.Y., with a central computer in downtown Boston.

Linked to the network but functioning independently is a second on-line system operated by the Savings Bank Service Corporation, formed by the Suffolk Franklin Savings Bank and Boston Five Cent Savings Bank. (The two savings banks are handling only their own accounts and are not in competition with the data processing center services.) The two systems will include 85 teller consoles at 30 different banking locations. Under a unique operating arrangement, both on-line systems will share a combined computer facility at Park Square, Boston, with two sets of virtually identical equipment. This arrangement permits each system to back up the other if required. The heart of each is an NCR 315-100 computer. The on-line data processing center has seven CRAM (Card Random Access Memory) units.

The new on-line service now makes available to New England banking institutions instantaneous computer service on a "public utility" basis — with the subscriber buying only as much service as he needs, said Mr. Laing.

COM-SHARE, INC. OPENING SECOND CENTER IN MIDWEST

The second time-shared computer utility service center in the Midwest, part of a network extending from Buffalo to Kansas City, will open in Chicago in December, it was announced by COM-SHARE, INC., Ann Arbor, Mich. An SDS 940 computer, manufactured by Scientific Data Systems, Santa Monica, Calif., will be the key element of the computer system.

COM-SHARE will provide full scale computer services to business, engineering, industrial and educational subscribers by linking individual users to the SDS 940, located in northside Chicago, via telephone and telegraph lines. Most of the customers will be located within a 15-mile radius of central Chicago. Capacity for the Chicago installation will be about 350 subscribers.

Cost of the service per subscriber is as low as $10 per hour. Walter Manning, Vice President of COM-SHARE, and director of its computer service division, estimated the typical subscriber will pay under $1000 per month for the service, including line charges. Subscribers can pay as little as $40 a month for COM-SHARE's computer service, he said.

The first COM-SHARE computer installation (see Computers and Automation, May 1966, p. 41), Ann Arbor, serves Southern Michigan.

EDUCATION NEWS

UPGRADING AND RETRAINING CENTER FOR SEAMEN

A new school for retraining and upgrading unlicensed members of the National Maritime Union, directed by Captain P. R. Becker, is designed to qualify seamen for higher ratings and for those new ratings established as a result of changes in operating procedures aboard ship caused by automation. Trainees at the new Upgrading and Retraining center of the NMU (New York City) have equipment available to them on land which will make them feel at home in the most automated ships at sea.

Equipment at the school includes a training version of a General Electric centralized engine room console, called a Central Operation System (COS), as well as a G-E bridge control unit. The new G-E consoles, like much of the training equipment at the school, will familiarize NMU members with centralized push buttons, dials and meters, which, on the newest automated ships, replace scattered valves, switches and gages.

— Unlicensed members of the National Maritime Union (NMU) learn how to operate an automated ship. Left to right are William Laird, William H. West, William O. Dickey (seamanship instructor)

The G-E engine room control equipment provides remote control of engines, boilers and auxiliary equipment. The bridge console (shown in the picture) provides control by a single man on the bridge of propeller speed and direction from full ahead to full astern operating conditions. Training with this control equipment familiarizes NMU members with the latest equipment in the most advanced seagoing vessels.

STATE-SUPPORTED PROGRAM TO TRAIN COMPUTER PERSONNEL

The first state-supported program set up exclusively to train computer programmers and systems analysts through the use of an elaborate data communications network has been announced by the Oklahoma State Board for Vocational Education. Dr. Oliver Hodge, State Superintendent of Public Instruction, said the unique system, designed to alleviate the critical need for trained data processing personnel, initially will include nine computers — an RCA Spectra 70/35 third generation computer, eight RCA 301 systems and peripheral equipment.

When the two-year training program begins this month, it will be offered at four Oklahoma Area Vocational-Technical schools, three junior colleges and a technical institute. The training course to be offered will include basic and advanced programming, computer operation and systems analysis, and is expected to be well-attended by students from the Texas-Oklahoma area, as well as from other states.

The Spectra 70/35 (which will be installed in April, 1967 in the Oklahoma City data center) will be the heart of the advanced training system. As students are trained in the fundamentals of programming, they will prepare their own punched-card programs which will be read into the 301 computer at their school. The student's program then will be transmitted to the Spectra 70 at the data center, where the program will be checked out by the advanced computer and returned to the student either in printed or punched-card form.

J. B. Perky, Oklahoma Director of Vocational Education said that Oklahoma, in pioneering this unique educational program, "is providing the impetus for other states to establish similar advanced training methods that can help to meet the serious need for programmers and other specialists in the growing data processing field." By 1970 personnel requirements in the computer field, particularly for business use, are estimated at more than 500,000, with trained programmers accounting for nearly one half of the total. "Job placement for students who complete any level of the program should pose no problems,", Mr. Perky said, "and this is particularly true for those who complete the two-year course. We already have received inquiries from companies who want to know when the first graduate programmers will be available and the training program hasn't even begun yet."

MORE IN-TOWN COURSES FOR OUT-OF-TOUCH GRADS

The Cambridge (Mass.) research and consulting firm of Bolt Beranek and Newman Inc. has announced that a total of 12 college-level courses in new scientific and engineering subjects will be offered in cities throughout the country during the fall and winter semester of the Program for Advanced Study. The Program for Advanced Study (which was first introduced in 1964 to update technical graduates of 5 to 10 years ago) differs from the usual undergraduate or graduate program in that the courses are specialized and often unavailable locally. They are given in full-day, monthly sessions from October to June and all are taught by nationally recognized university professors and technical leaders.

The new courses were developed to provide technical and managerial personnel with advanced information in the following scientific areas: Semiconductor Electronics, Systems Engineering, R & D Management, Modern Optics, Modern Control Theory, Ocean Engineering, Underwater Acoustics, Random Processes, Heat Transfer, Decision Analysis in Large Systems, Aerospace Noise and Vibration, and Design and Analysis of Experiments. An additional course on Oceanography will be made available on request. Requirements for admission are a college degree in science or engineering.

Course cities are Los Angeles, San Diego, Seattle, Dallas, Houston, Chicago, New York, Washington, Cambridge (Mass.), and Huntsville (Ala.), although not all courses will be given in all cities. Special in-house courses also will be given in Murray Hill (N.J.) and San Diego. (For more information, designate #41 on the Readers Service Card.)

IBM COMPUTER SIMULATORS SPEED SYSTEM/360 SERVICE TRAINING AND DELIVERIES

Simulators which serve as "stand-ins" for System/360 computers are reducing the training time for IBM customer engineers who install and service the company's information handling systems. These training aids were developed by IBM

Corporation's Field Engineering Division, White Plains, N.Y. By using this electronic device which simulates actual equipment, the company has cut in half its need for System/360s used for customer engineer training purposes, thus freeing machines for shipment to customers.

The simulator shown below duplicates the computer console operation of a System/360, Model 30. As many as five customer engineers can receive simultaneous and independent console training while tying up only a single computer system. Five console simulators like this one can be linked to the single System/360 in the back or a 1400 series computer programmed to act like five System/360s at the same time.

"In addition, as useful as these simulators are today in providing effective hands-on training and allowing more efficient use of current data processing systems," said O. M. Scott, IBM vice president and president of the Field Engineering Division, "we see real possibilities for them in training customers".

NEW PRODUCTS

Digital

G-E EXPANDS GE/PAC LINE OF PROCESS CONTROL COMPUTERS

The General Electric Company, Phoenix, Ariz., has announced expansion of its GE/PAC® line of Industrial Process Control Computers. Newest addition to the computer family — GE/PAC 4050-II — has been developed for applications which can benefit from increased programming flexibility coupled with a faster core memory cycle time.

With the new equipment, computer memory addressing instructions operate 57 percent faster than was previously possible with similar size machines. GE/PAC 4050-II has a core cycle time of 3.4 microseconds. By strengthening the product line between the 5.1 microsecond 4050 machine and the larger GE/PAC 4060, which has a 1.7 microsecond core cycle time, the new computer extends the time it would normally take to progress to a larger computer.

GE/PAC 4050-II includes an arithmetic and control unit, 24-bit word magnetic core memory, peripheral buffer, eight levels of automatic priority interrupt and a stall alarm. Core memory is expandable to 64,000 words with overlap. The new computer is program compatible with other members of the GE/PAC family and retains such features as circular list processing, hardware assisted floating-point subroutines, masked-memory search capability and a full line of system equipments.

R. C. Berendsen, Manager of the Company's Process Computer Business Section, describing 4050-II as a capable computer from both the scientific and process control standpoint, pointed out that it is ideally suited for petrochemical installation, nuclear or thermal power plants or for any applications which requires numerous calculations, both off and on-line. (For more information, designate #42 on the Readers Service Card.)

COLLINS INTRODUCES NEW COMPUTER SYSTEM

Collins Radio Company, Dallas, Texas, has introduced an integrated communication/computation/control system designed to implement the multiprocessing approach for diversified and geographically separated operations. The new system, designated the C-8500, combines multispeed communication and business/scientific data computation for control of on-line real-time operations.

The heart of the system is the C-8560 Computer Group, using micro-miniature integrated circuit components, designed in modular packages similar to those defined by Air Transport Association specifications. This modular package has been proven through continued use in aircraft, marine, military and ground transportable applications under the severest environmental conditions. The user now can customize his system. Expansion or change is accomplished by adding or replacing modules. (For more information, designate #43 on the Readers Service Card.)

Data Transmitters and A/D Converters

COMPATIBLE DATA LINE TERMINAL ANNOUNCED BY UNIVAC

A new compatible communications adaptor that permits UNIVAC 1004 and 1005 Systems to be used as a high-speed data communications terminal for non-UNIVAC computers has been announced by Sperry Rand Corporation's UNIVAC Division.

The new DLT-9 uses the 4 out of 8 code and format at synchronous data transmission rates of 2000 and 2400 bits per second. A higher speed model of the DLT-9 operates up to 40,800 bits per second using a TELPAK service. Complete flexibility of timing allows for internal or external clocking modes so that total compatibility can be achieved.

The DLT-9 operates with equal efficiency over lease or dial circuits. Delivery is scheduled for approximately nine months after receipt of order. (For more information, designate #45 on the Readers Service Card.)

NCR BANK TRANSMISSION SYSTEM

Members attending a panel discussion at the annual automation conference of the American Bankers Association, held in Chicago in June, heard Peter N. Cumming, director of financial systems planning, National Cash Register Company, describe a system for correspondent or branch banking in which the computer is located centrally and "items" are sent back and forth by telephone wire.

The system, outlined in a paper entitled, "Correspondent Bank Demand Deposit Accounting Via Data Transmission" is the result of a year-

long survey of correspondent and branch bank networks made by NCR. "The cost figures in our survey," Cumming said, "have led us to believe that it is possible to design a more efficient and more economical system that will also alleviate the delivery headaches of conventionally transporting checks and deposits physically."

The system would include a low-cost document handler, a magnetic tape unit, a printer and associated communications equipment. Basically, Cumming explained, items would be "read" by the document handler and filed on the magnetic tape at the remote location. When the central computing room was ready for the remote accounting job, a telephone signal would start the magnetic tape sending the data. Finished reports would be sent back over the wire before the next morning.
(For more information, designate #44 on the Readers Service Card.)

Software

HONEYWELL, CONSULTING FIRM TO DEVELOP SYSTEM

Honeywell Inc. and Bowles and Tillinghast, a nationally-known insurance actuarial and consulting firm, have entered into an agreement to develop a total information system for the life insurance industry. The project will use advanced systems concepts including on-line storage of policyholder records, direct access inquiry to random access memory files, and communications capabilities between home and field offices.

This new system, called LIMIS (Life Insurance Management Information System), will start where TIP ends. It will make use of the COBOL compiler language, and is being designed to permit users to add increments of systems design and programming aids to allow gradual adoption of the total system. In addition to handling normal production processing and file maintenance tasks, LIMIS also will prepare various advanced management reports in areas such as policy issue, agent production, and profitability accounting. (Initial deliveries of the LIMIS system are expected in the second half of '67.)
(For more information, designate #46 on the Readers Service Card.)

NEW MONITOR SYSTEM FOR SEL 800 SERIES COMPUTERS

Systems Engineering Laboratories, Inc., Fort Lauderdale, Fla., has announced a major expansion of its software capability, according to the President, A. G. Randolph. This expansion is due to the development of a monitor (combined operating and programming) system for its 810A and 840A computers.

The components of the monitor system include: Resident Executive, designed to increase machine efficiency in both real-time and data processing environments; Compiler and Library; Assembler; Loader; and Debug and Utility Routines.

While the SEL Monitor System will operate in computers with only 12K of core memory, the individual programs will operate in smaller configurations. For example, the assembler requires only 4K and the compiler 8K of memory (only paper tape input and output plus a typewriter are required). Also, I/O handlers are supplied to take full advantage of card, magnetic tape, disc and line printer units if present in a system.

The complete monitor system will be available to all SEL 810A and 840A computer customers the first quarter of 1967 at no additional cost, and will be furnished with all necessary documentation.
(For more information, designate #49 on the Readers Service Card.)

NEW SYSTEM SPEEDS PROGRAMMING OF TAPE-CONTROLLED MACHINE TOOLS

A new method of programming tape-controlled machine tools has been developed by AEI Electronics. The system utilizes an electronic data processing machine and the Pencil Follower (available from Edwin Industries Corp., Syracuse, N.Y.).

During a demonstration, visitors were able to mark out any pattern of crosses on a card. These were traced by an operator using the Pencil Follower, which noted the co-ordinates of the selected points, converted this information into digital form and fed it into a tape punch. The resulting tape was then fed directly to a drilling machine which reproduced the original pattern on a sheet of plastic material.

Use of the Pencil Follower in "reading" drawings for numerically-controlled tools effects savings in the time required to prepare tapes. In certain applications it is possible to produce in 30 minutes a tape which could take five hours to prepare by conventional means. In addition, use of the Pencil Follower reduces the risk of human error since there is no need to record plots manually and the punching of tape as a separate stage also is eliminated.

In its present form, the system is suitable for boring, drilling and line milling. Other applications are under development.
(For more information, designate #48 on the Readers Service Card.)

OPTIMUM BOND BIDDING PROGRAM

IBM Corporation, New York, N.Y., now has available the Optimum Bond Bidding Program, a computer program designed to assure the lowest possible interest cost to a bond-issuing municipality consistent with marketability. The program was developed to be used by bond underwriters. An IBM System/360, under control of the program, can turn out a variety of bids in minutes, freeing an underwriter from tedious and time-consuming manual calculations.

In addition to quickly establishing the most desirable bid price and coupon schedule (varying rates of interest for bonds of different maturities within a single issue), the program calculates selling prices, interest cost, cash flow and other items of essential information. According to A. H. Pfanschmidt, industry manager - finance for IBM's Data Processing Division, the Optimum Bond Bidding Program provides maximum precision for underwriters.

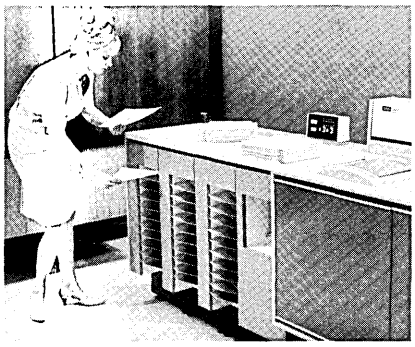
Although the program is oriented toward municipal bond bidding, it also may be used successfully in computing bids on other types of bond issues which are based on a 360-day year. The program is available without charge to IBM customers and can be used with a number of models of System/360, starting with Model 30, if they are equipped with the necessary storage capacity.
(For more information, designate #47 on the Readers Service Card.)

Input-Output

XEROX OFFERS NEW COLLATING DEVICE

A new automatic sorter that does away with hand-collating of multi-page reports soon will be available as an accessory to Xerox Corporation's 2400 copier/duplicator. The automatic sorter, when coupled with the 2400, will make it possible to reproduce and sort 40 copies a minute directly from an original. It will be available on a rental basis to customers this fall.

The sorter, modular in construction, plugs directly into the 2400 and may contain from 10 to 50 bins, depending on the number of



10-bin modules used. The arrangement shown in the picture provides 30 bins. Each bin holds up to 150 copies. A Xerox-designed transport system automatically carries each copy from the 2400 into the sorter. A selector control on the device sets the machine for the number of bins into which copies should be sorted.

The operator need only remove the completed copies of the report from each of the bins and fasten the pages together to complete the reproduction job. Work space is provided at the top of the unit for binding and distributing the finished reports.
(For more information, designate #52 on the Readers Service Card.)

MAGNETIC TAPE TERMINAL BY DIGITRONICS

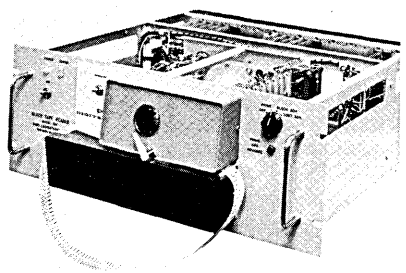
A new multi-purpose EDP input/output terminal with third generation capabilities has been made known by Digitronics Corp., Albertson, L.I., N.Y. The self-contained D524 Magnetic Tape Terminal is fully compatible with most types and makes of EDP equipment in use today. Its modular, solid-state construction permits easy modification in the field to meet a wide range of functional requirements without costly engineering changes or excessive down-time. The D524 also is fully compatible with Dial-o-verter data acquisition/transmission systems produced by Digitronics, and adds to the variety of terminal options available from the company.

Principal components of the D524 are a magnetic tape handler as the primary input/output device, a 1024 character, core memory to permit an efficient match between high-speed magnetic tape and telephone lines, and a coupler for telephone line interface. Data is transmitted via dial or leased telephone lines.

The D524 has a number of features including automatic vertical and longitudinal parity checks, detection of memory overflow or errors, and provision for interruped operation until errors are corrected. The new terminal has the ability to receive from or transmit to other magnetic tape terminals, paper tape terminals, printers, and also can operate on-line with certain other manufacturers' equipment.
(For more information, designate #51 on the Readers Service Card.)

NEW PROGRAMMABLE BLOCK TAPE READERS BY WANG LABORATORIES

Wang Laboratories, Inc., Tewksbury, Mass., have introduced new programmable block tape readers which combine all the advantages of conventional readers with the high speed and reliability of solid-state photoelectric readout and greater current switching capacity.



The new Series TRP Readers, with solid-state circuitry throughout, are available for fixed or variable block lengths from 4 lines up, with from 20 to 320 or more bits per block. Configurations are possible which accomodate 40 character blocks in one 7" high chassis.

The TRP can be used for any fixed block size from 4 to 40 or more characters, or any variable block length using a stop code. Each output bit switches up to 100 ma at voltages up to 30 volts, with a variety of output options. The maximum block stepping rate is 50 blocks/second for a 4 line block and 7 blocks/second for a 40 line block.

The new reader uses a single character optical unit and has its own buffer storage. Its parallel readout feature makes it particularly suitable for any tape programmed operation. Applications have been in programmed systems for numerical control, circuit testing, process control, and similar areas handling a large amount of unique or repetitive information automatically.
(For more information, designate #50 on the Readers Service Card.)

NCR OPTICAL SCANNER 420-2

National Cash Register Company optical scanners, such as the new 420-2 shown here, now are processing from more than 20,000 cash reg-

isters, adding machines and accounting machines equipped with optical typefonts, the company reports. The 420-2 reader scans 52 lines of print per second at up to 32 characters per line for a maximum of 1664 characters per second. This reader is internally programmable and has fast (10-second) tape change, automatic editing and variable output formats.

Optical scanners can be used for input of data either on-line to a computer or off-line for automatic preparation of punched tape or cards.
(For more information, designate #54 on the Readers Service Card.)

Newsletter

'METAL-LESS' TYPESETTER LINKS COMPUTER AND VIDEO CAPABILITIES

An electronic type composition system, capable of setting the entire text for a newspaper page in two minutes through the use of video and computer techniques, has been announced by the Radio Corporation of America, New York, N.Y. Called Videocomp Model 70/320, it is the first commercially available typewetter to employ all electronic character generation, and marks a "potential second revolution in the printing industry," according to Stanley W. Cochran, Division Vice President and General Manager, RCA Graphic Systems Division.

Videocomp is one of two new automatic systems for the printing industry introduced by RCA. The second product, Colorscan II, is an electronic color separation device, which can scan color transparencies and break them down into the four color separations required for full color reproduction. These two systems, which will be marketed by RCA, are produced by Firma Dr. -Ing. Rudolf Hell, of Kiel, West Germany.

Videocomp, a "metal-less" typesetter, utilizes a computer memory to store up to four type fonts ranging in size from 5 to 24 points. Under program control, it generates text at rates up to 600 characters a second, and writes it with an electron beam on the face of a high resolution cathode ray tube. The characters on the tube are exposed through a precision lens directly onto sensitized film or paper for subsequent printing by offset, letterpress or gravure processes.

Original copy is fed into a computer, which hyphenates and justifies the text and produces an output tape. This is read electronically by Videocomp, which calls from its memory the proper characters in desired type font and size.

"No metal fonts, matrices or photomasters are used," Mr. Cochran said. "The technique is so flexible that Videocomp can extract from its electronic storage any specified type face or symbol — Cheltenham, Gothic, even Chinese ideographs — in thousandths of a second.

"Videocomp's electronic technique makes it possible to expand, enlarge, compress or italicize characters; change fonts within a line; have underwriting and overwriting for foreign language accent marks, and vary line lengths for 'run-around' photographs. All such variations are made electronically and can be pre-programmed."
(For more information, designate #55 on the Readers Service Card.)

ADVANCED GEOPHYSICAL MAGNETIC RECORDING SYSTEM

Potter Instrument Company, Inc., Plainview, N.Y., has introduced a new digital magnetic tape recording system designed for geophysical, mobile, and shipboard field recording applications. The new system, packaged to withstand adverse environmental conditions encountered in field seismic exploration operations, operates directly from a 12-volt battery, with very conservative power consumption.

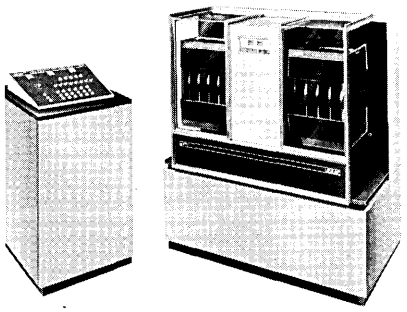
The system, FT-151, is fully compatible with IBM and Texas Instruments tape formats. It features versatile operation, modular construction, front access to all components for ease of maintenance, and minimum depth behind the front panel for mounting in confined areas. The standard transport provides three selectable tape speeds with any combination from 15 ips to 150 ips.
(For more information, designate #53 on the Readers Service Card.)

Components

MEMORY CONTROL UNIT INTRODUCED BY POTTER

A memory control device to provide the logic and electronics necessary to adapt the firm's RAM®, magnetic tape random access memory system to a standard computer interface, has been announced by Potter Instrument Company, Plainview, N.Y. The new control device, Model CTM-4550, provides error detection and address location to enable the RAM to be used for data storage by any data processing system.

The CTM-4550 accepts a 15-bit RAM address from the data processor interface, in conjunction with a "read" or "write" command. The control unit properly positions the RAM and locates the correct one of up to 16 sectors on the specified track. In a "read" operation, after sector addressing has been accomplished, the control unit reads the entire sector from the RAM and sends it word-parallel to the data processor interface. Error-checking through both word-parity and sum check character, and a record-length check are performed. In a "write" operation, after sector addressing has been accomplished, the control unit obtains the entire sector word-parallel from the data processor interface and stores it in the RAM. Parity bits and sum check character are affixed while writing. An immediate read-after-write check is performed on the complete sector, and is completed 300 microseconds after completion of the write operation.



— Potter RAM® with Model CTM-4550 Control Unit

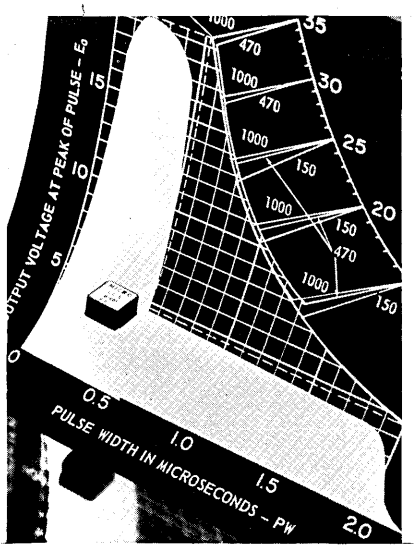
Among the several accessories available with the control unit are a sectorization control unit to relieve the DP System from programming the addresses and a multiple-RAM unit which allows a group of RAMs to be treated as a single data storage unit.
(For more information, designate #58 on the Readers Service Card.)

SHORT TAPE REELS AVAILABLE FROM COMPUTRON

New convenience for computer users is provided by special, short tape reels now available from Computron Inc., Waltham, Mass. The new "COM-PAC" reels contain precision, certified Computape digital magnetic recording tape in the relatively short lengths of 300 and 600 feet. COM-PAC, in its convenient, self-mailing boxes, can be mailed anywhere in the country for a few pennies. An inner, polyethylene bag with a convenient zip fastener seals each reel against dust and dirt. COM-PAC reels are available for immediate delivery, with a minimum order quantity of 10.
(For more information, designate # 61 on the Readers Service Card.)

MICROSECOND ONE-SHOT PULSE CIRCUIT OFFERED

An encapsulated electronic pulse circuit that can be attached directly to printed circuit boards has been announced by Micro Switch, a division of Honeywell Inc. The circuit gives a single pulse whose duration is inversely proportional to the output voltage: depending on the voltage, pulse duration varies from 0.1 to 2.5 microseconds. While the circuits are manually actuated, pulse duration is entirely independent of how long the actuating switch is held down, the company said.



— New Microsecond Pulse Circuit. Background graph shows minimum and maximum pulse widths, which vary inversely with supply voltage and load impedance.

Because the new circuits give a one-shot pulse far faster than is possible manually, they are especially suitable for computer registry control, electronic test equipment, data links, keyboard strobes, checking-ring counters, radar systems and other unitary-bit inputs, Honeywell said.

The circuits are available for DC inputs ranging from 6 to 35 volts, and impedances from 47 to 2200 ohms. Output pulses can be either positive or negative, depending on external circuit grounding. The device measures about 7/8-inch square and 1/2-inch high and is available in quantity for immediate delivery.
(For more information, designate #59 on the Readers Service Card.)

PLOTTER CONTROL UNIT ADDED TO SERIES 200 LINE

Honeywell's electronic data processing division (Wellesley Hills, Mass.) has added a plotter control unit, Model 234, to its Series 200 computer line. The plotter control permits four different Calcomp Series 500 plotters to be used on-line with any Series 200 computer system. Plotting is controlled by either of two instructions which automatically raise, lower or move the plotting pen in one of eight directions. Curves and symbols of any shape can be produced, Honeywell said. Maximum plotting speeds are 300 increments per second.

The plotter control employs an interrupt capacity available on all Series 200 processors, which allows simple termination or interruption of plotting as systems demand requires.
(For more information, designate #57 on the Readers Service Card.)

COMPUTER TENSILE TESTING SYSTEM

A computer system for tensile testing has been developed by Control Corporation, a subsidiary of Control Data Corporation, Minneapolis, Minn. The new system consists of a small electronic computer, devices for acquiring stress and strain data from the test equipment, control keyboards and output printers, and special computer programming. Each testing machine, which may be located a considerable distance from the computer, is equipped with its own control keyboard and printer. The system can be installed at any existing tensile testing facility.

Stress and strain data is obtained by the system directly from up to 16 simultaneously operating tensile testers. In seconds, the results are automatically processed and printed as initial modulus, breaking strength, percent of elongation at specific loads, tenacity, work-to-break, toughness, etc. Average and standard deviation of a sample group are also immediately available.

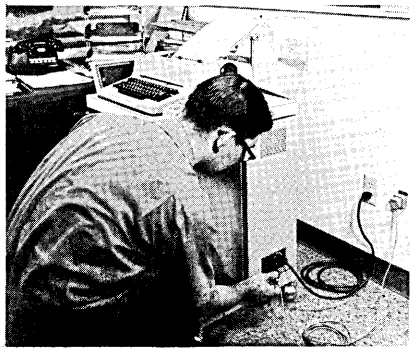
Among the benefits offered by the new system are greater accuracy, consistent results, instantaneous print out and lower cost per test.
(For more information, designate #56 on the Readers Service Card.)

RESEARCH FRONTIER

RAND BUILDING WIRED FOR "COMPUTER POWER"

What the computing industry has predicted will be the way of the future — computer power distributed through wall outlets similar to ordinary electric outlets — is now a reality at The RAND Corporation, Santa Monica, Calif. The installation is believed to be the first of its kind in the world.

Special outlets have been installed in 200 offices throughout the RAND headquarters building. The scientist requiring access to the computer simply wheels one of the system's special typewriter consoles to his office and plugs it in. An automatic switching central, such as is used by telephone companies, immediately senses his request for service and connects him to a powerful central computer.



— Charles L. Baker, member of RAND's Computer Sciences Department connects mobile JOSS console to a computer through one of wall outlets

Heart of the system is a specail computer language developed at RAND which makes it possible for the scientist, with less than an hour's training, to communicate directly with the computer through a conventional electric typewriter slightly modified for the purpose. The RAND system is known as JOSS.

At present, 30 scientists at RAND can plug into the system at one time, since the high speed of the computer conveys the impression that each commands the machine's full resources. When he has finished, the researcher can store his operating programs and data in the computer's memory. Unplugging the JOSS console does not erase

this material. To retrieve it at a later date, the researcher need only plug in again (on any JOSS outlet) and ask for it.

Computer specialists expect that such large extensions of computer flexibility and accessibility will eventually help to make computing power inexpensively and widely available to homes, schools, businesses, and industrial organizations.

IBM LASER COLOR SELECTOR MAY PACK MORE DATA IN LESS SPACE

An experimental device which changes the color of a laser beam at electronic speeds has been developed by IBM Corporation, Poughkeepsie, N.Y. IBM scientists believe it could lead to the development of color-coded computer memories with up to a hundred million bits of information stored on one square inch of photographic film.

The wavelength (or color) selector, as the device is called, consists of a series of special crystals and prisms placed within a laser which generates a multicolor light beam. By applying proper voltages to certain of the crystals, all colors are blocked except the one selected. Laboratory tests indicate the feasibility of 125,000 color selections per second. Previous color selection techniques proved too slow for use in computers.

Photographic memories in which tiny spots on film represent the "ones" and "zeros" of computer language have previously been described by computer scientists. The high density storage using the laser color selector would be attainable in a system where the "ones" and "zeros" are stored in layers, according to color, in the film's emulsion.

With a reversible photosensitive medium, such as photochromic glass, the selector could be used as the key element in a high-speed, high-density memory in which one color would record information in the medium, a second color would read the information, and a third color would erase it.

The color selector also shows promise for optical communications. Color-coded light beams could carry information, in place of wire or cable, either within a computer or between remote points.

MEETING NEWS

COMPUTER CONTROL OF PROCESSES TO BE ANALYZED AT A.I.Ch.E. MEET

Means of controlling chemical manufacturing processes by computer will be described in a full day of reports and discussion workshop at the fall national meeting of the American Institute of Chemical Engineers in Atlantic City, N.J. The symposium will be held on Tuesday, September 21, in the Viking Theater of the Haddon Hall Hotel. It is open to members of the society and others interested in process control by computers.

In the morning session, three speakers will report on recent original research. After each paper is delivered, prepared comments also will be made by an experienced person in industry and discussion will then follow. A fourth presentation will describe the role of universities in providing education in computer control. Graduate training programs at Purdue University will be used to illustrate recent progress in the educational field.

During an afternoon workshop session, discussion will focus on problems associated with making computer systems work in industry.

Chairman for the day-long meeting is M. T. Tayyabkhan, Manager Systems Analysis, Research Division, Mobile Oil Corporation. Vice chairman is R. I. Gray, Union Carbide Corporation. Readers wishing further information may contact Raymond C. Mayer & Associates, 9 Depot Drive, White Plains, N.Y. 10606.

19th INTERNATIONAL SYSTEMS MEETING

Over 2000 Systems and Data Processing Managers, Analysts, Programmers, Trainees and Educators will gather at the Queen Elizabeth and Sheraton-Mount Royal Hotels in Montreal for the 19th International Systems Meeting September 25-28, sponsored by the Systems and Procedures Association. Manufacturers of computers, office equipment and supplies will exhibit their products during the three-day conference.

The program has been designed to serve all elements of the systems profession. For the first time at an ISM, there will be five seminars given solely in French. Simultaneous translation of five English topics also will be made. There will be 18 management seminars ranging from Systems organization and profit to numerical control of machine tools. For the intermediate and junior Systems man, there are 15 seminars on the Basic Techniques from which to choose.

In addition, the program will feature nine case studies aimed at helping management make the decision on how to approach certain problems. Topics range from company recruitment and training to planning and implementing a world-wide EDP network. Finally, seven workshop sessions will be offered, restricted to 25 participants so that individual problems in specific areas can be discussed by all.

People in all areas of systems and data processing are invited to attend.

INFORMATION SCIENCE PROGRESS HIGHLIGHTS '66 ADI CONCLAVE

The American Documentation Institute will hold its 1966 national convention in Santa Monica, Calif. October 3-7. Theme of the five-day meeting is "Progress in Information Science and Technology" with authorities in the field of information science and technology participating in progress review panels, author forums, discussion groups and informal information exchanges.

The sessions will be designed to assess developments in recent years in the theoretical and practical aspects of information which has been defined as "the science dealing with the properties, behavior and flow of information." This encompasses the environmental aspects of information and communication, information and language analysis, and organization of information and man-system relationships.

Technical Program Chairman Dr. Carlos Cuadra (Systems Development Corp.) extended an invitation to persons from all communication fields to attend any of the conference's sessions including author forums and special interest group meetings, as well as the special tutorials for those wishing to develop a general understanding of information problems. Preliminary programs are available from Sister Mary Lucille of the School of Library Science at Immaculate Heart College, Los Angeles, Calif.

BUSINESS NEWS

IBM'S SIX MONTHS EARNINGS UP 8.6%

IBM Corp., reports net earnings of $253,626,545 after taxes for the six months ended June 30, 1966. Net earnings for the same 1965 period were $233,094,878, up 8.6% from the corresponding period last year. Gross income for the six months amounted to $1,992,980,775, up from the $1,720,160,733 in the first half of 1965.

BURROUGHS HAS RECORD SALES, EARNINGS

Burroughs Corp. reports record sales and earnings for the six months ending June 30, 1966. The company had net earnings of $11,743,000 on sales of $236,608,000. In the same period, Burroughs earned $5,889,000 on sales of $209,145,000. For the quarter ending June 30, 1966, earnings totaled $6,434,000 on sales of $122,216,000, compared with earnings of $3,111,000 on sales of $108,300,000 in the same period in 1965.

RCA SALES TOP $1 BILLION IN HALF

RCA topped the $1 billion sales mark for a six month period for the first time with sales of $1,152,600,000 for the half-year ending June 30, 1966. Sales during the same 1965 period were $977,900,000. Net profit for the first 6 months of this year was $56 million, compared with $44 million for the first half of 1965. Records also were set for the 2nd quarter, with sales of $566,900,000, and net earnings of $24,100,000, compared with sales of $495,300,000, and earnings of $19 million for the same quarter in 1965.

SPERRY RAND REPORTS UNIVAC "IN THE BLACK"

Sperry Rand Corporation earned $31,859,232 on sales of $1.279 million for the fiscal year ended March 31, 1966, contrasted with $22,016,961 on sales of $1.247 million for 1965. For the first time the Univac Division was "solidly profitable" for the year. A profit was realized in each of the last five months of the fiscal year, the firm reports.

Earnings for the first quarter ending June 30, 1966 are reported as $13,678,000 on sales of $356,348,000. During the same 1965 period, earnings were $4,450,000 on sales of $271,792,000. (Sales for the first quarter 1965 were depressed because of a 38 day strike at one of the plants).

CALCOMP HITS NEW SALES MARK

California Computer Products traces a rising sales and earnings curve out of the plotter business. The Anaheim, Calif., firm reports record sales of $2,300,000 during the three months ending June 30, 1966. $3,500,000 in new orders were received during the quarter bringing the backlog as of the end of June to $3 million compared with $1 million a year ago.

Sales and other income for the fiscal year ended June 30 amounted to $6,160,000, an increase of 49% over the previous year. Earnings reached $552,000, a 23% increase over last year. The sale of proprietary digital plotting equipment accounted for 88% of CalComp's total revenue during fiscal '66, up from 77% in the previous fiscal year.

RECOGNITION EQUIPMENT, UNIVERSITY COMPUTING FILE FOR PUBLIC OFFERINGS

Recognition Equipment, Inc., Dallas, Tex., has filed a statement with the SEC to register $8.5 million of 5 3/4% convertible subordinated debentures for sale through underwriters headed by White, Weld & Co., New York. The firm will use the proceeds to finance the cost of leased optical character recognition systems, and for research & development, product marketing and manufacturing.

University Computing Company, Dallas, Tex., has filed a statement with the SEC to register 100,000 shares of common stock and $2.5 million of debentures through underwriters headed by A. G. Edwards & Sons, St. Louis, Mo. The firm will use the proceeds to expand its EDP equipment and profession services.

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 and maintains a data bank describing current 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 AUGUST 10, 1966

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	$3850	4/62	25	0
	ASI 2100	Y	$4200	12/63	7	0
	ADVANCE 6020	Y	$4400	4/65	11	5
	ADVANCE 6040	Y	$5600	7/65	6	4
	ADVANCE 6050	Y	$9000	2/66	2	6
	ADVANCE 6070	Y	$15,000	10/65	4	5
	ADVANCE 6130	Y	$1000	11/66	0	4
Autonetics	RECOMP II	Y	$2495	11/58	40	X
	RECOMP III	Y	$1495	6/61	8	X
Bunker-Ramo Corp.	BR-130	Y	$2000	10/61	162	2
	BR-133	Y	$2400	5/64	22	2
	BR-230	Y	$2680	8/63	15	X
	BR-300	Y	$3000	3/59	36	X
	BR-330	Y	$4000	12/60	34	X
	BR-340	Y	$7000	12/63	20	X
Burroughs	205	N	$4600	1/54	46	X
	220	N	$14,000	10/58	36	X
	E101-103	N	$875	1/56	135	X
	B100	Y	$2800	8/64	150	20
	B250	Y	$4200	11/61	85	1
	B260	Y	$3750	11/62	225	5
	B270	Y	$7000	7/62	155	12
	B280	Y	$6500	7/62	128	10
	B300	Y	$10,000	7/65	100	90
	B2500	Y	$5000	1/67	0	30
	B3500	Y	$14,000	5/67	0	21
	B5500	Y	$22,000	3/63	55	14
	B6500	Y	$33,000	2/68	0	3
	B8500	Y	$200,000	2/67	0	1
Computer Control Co.	DDP-24	Y	$2500	5/63	80	5
	DDP-116	Y	$900	4/65	100	35
	DDP-124	Y	$2050	3/66	12	40
	DDP-224	Y	$3300	3/65	35	5
Control Data Corporation	G-15	N	$1600	7/55	310	X
	G-20	Y	$15,500	4/61	23	X
	LGP-21	Y	$725	12/62	118	X
	LGP-30	semi	$1300	9/56	124	X
	RPC-4000	Y	$1875	1/61	55	X
	160*/160A/160G	Y	$2100/$4000/$12,000	5/60;7/61;3/64	453	2
	924/924A	Y	$11,000	8/61	26	X
	1604/1604A	Y	$45,000	1/60	59	X
	1700	Y	$4000	5/66	10	85
	3100	Y	$11,000	12/64	84	30
	3200	Y	$14,000	5/64	90	X
	3300	Y	$15,000	9/65	20	40
	3400	Y	$25,000	11/64	19	X
	3500	Y	$30,000	9/66	0	10
	3600	Y	$58,000	6/63	50	X
	3800	Y	$60,000	2/66	4	12
	6400	Y	$50,000	5/66	4	14
	6600	Y	$85,000	8/64	16	10
	6800	Y	$130,000	4/67	0	4
Data Machines, Inc.	620	Y	$900	11/65	18	30
Digital Equipment Corp.	PDP-1	Y	$3400	11/60	60	X
	PDP-4	Y	$1700	8/62	57	X
	PDP-5	Y	$900	9/63	114	1
	PDP-6	Y	$10,000	10/64	19	4
	PDP-7	Y	$1300	11/64	70	50
	PDP-8	Y	$525	4/65	350	250
El-tronics, Inc.	ALWAC IIIE	N	$1820	2/54	18	X
Electronic Associates, Inc.	8400	Y	$10,000	6/65	6	7
Friden	6010	Y	$600	6/63	440	80
General Electric	115	Y	$2200	12/65	110	500
	205	Y	$2900	6/64	44	X
	210	Y	$16,000	7/59	50	X
	215	Y	$6000	9/63	54	X
	225	Y	$8000	4/61	205	X
	235	Y	$10,900	4/64	64	4
	415	Y	$7600	5/64	175	65
	425	Y	$9600	6/64	65	40
	435	Y	$14,000	9/65	25	18
	625/635	Y	$55,800	5/65	28	30
	645	Y	$150,000	7/66	0	10
Honeywell Electronic Data Processing	H-120	Y	$3500	1/66	150	280
	H-200	Y	$5700	3/64	820	140
	H-400	Y	$8500	12/61	119	X
	H-800	Y	$26,000	12/60	88	3

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	$7300	2/66	12	65
	H-1400	Y	$14,000	1/64	12	1
	H-1800	Y	$35,000	1/64	17	2
	H-2200	Y	$13,000	1/66	10	50
	H-4200	Y	$20,500	6/66	0	6
	H-8200	Y	$35,000	3/67	0	2
	DATAmatic 1000	N	$40,000	12/57	3	X
IBM	305	N	$3600	12/57	150	X
	360/20	Y	$2000	12/65	350	6400
	360/30	Y	$7500	5/65	1600	4500
	360/40	Y	$15,000	4/65	790	1500
	360/44	Y	$10,000	7/66	1	120
	360/50	Y	$26,000	8/65	100	560
	360/52	Y	$55,000	11/65	1	X
	360/65	Y	$50,000	11/65	14	200
	360/67	Y	$75,000	9/66	0	60
	360/75	Y	$78,000	2/66	6	30
	360/90 Series	Y	$140,000	6/67	0	9
	650	N	$4800	11/54	180	X
	1130	Y	$1200	11/65	325	3600
	1401	Y	$6600	9/60	6700	250
	1401-G	Y	$2300	5/64	1575	50
	1410	Y	$14,200	11/61	780	100
	1440	Y	$4800	4/63	3100	300
	1460	Y	$11,500	10/63	1800	100
	1620 I, II	Y	$4000	9/60	1700	30
	1800	Y	$7600	1/66	25	275
	701	N	$5000	4/53	1	X
	7010	Y	$22,600	10/63	205	5
	702	N	$6900	2/55	6	X
	7030	Y	$160,000	5/61	6	X
	704	N	$32,000	12/55	33	X
	7040	Y	$22,000	6/63	120	4
	7044	Y	$32,000	6/63	120	5
	705	N	$38,000	11/55	54	X
	7070, 2, 4	Y	$27,000	3/60	330	X
	7080	Y	$55,000	8/61	85	X
	709	N	$40,000	8/58	9	X
	7090	Y	$63,500	11/59	46	X
	7094	Y	$72,500	9/62	124	2
	7094 II	Y	$78,500	4/64	120	8
Monroe Calculating Machine Co.	Monrobot XI	Y	$700	12/60	480	100
National Cash Register Co.	NCR - 304	Y	$14,000	1/60	26	X
	NCR - 310	Y	$2500	5/61	20	X
	NCR - 315	Y	$8500	5/62	340	30
	NCR - 315-RMC	Y	$12,000	9/65	42	70
	NCR - 390	Y	$1850	5/61	1000	70
	NCR - 500	Y	$1500	10/65	400	800
Philco	1000	Y	$7010	6/63	20	X
	2000-210, 211	Y	$40,000	10/58	18	X
	2000-212	Y	$52,000	1/63	11	X
Radio Corporation of America	RCA 301	Y	$7000	2/61	647	4
	RCA 3301	Y	$17,000	7/64	54	12
	RCA 501	Y	$14,000	6/59	99	X
	RCA 601	Y	$35,000	11/62	5	X
	Spectra 70/15	Y	$3500	9/65	50	110
	Spectra 70/25	Y	$5700	9/65	28	60
	Spectra 70/35	Y	$9000	11/66	0	75
	Spectra 70/45	Y	$15,000	11/65	10	120
	Spectra 70/55	Y	$30,000	7/66	0	12
Raytheon	250	Y	$1200	12/60	175	X
	440	Y	$3500	3/64	15	3
	520	Y	$3200	10/65	14	6
Scientific Control Systems	650	Y	$500	5/66	1	8
	655	Y	$1800	10/66	0	2
	660	Y	$2000	10/65	3	3
	670	Y	$2600	5/66	1	2
Scientific Data Systems Inc.	SDS-92	Y	$1500	4/65	53	35
	SDS-910	Y	$2000	8/62	180	5
	SDS-920	Y	$2900	9/62	126	11
	SDS-925	Y	$3000	12/64	24	17
	SDS-930	Y	$3400	6/64	120	25
	SDS-940	Y	$10,000	4/66	4	13
	SDS-9300	Y	$7000	11/64	27	7
	Sigma 2	Y	$1000	2/67	0	9
	Sigma 7	Y	$12,000	12/66	0	20
Systems Engineering Labs	SEL-810/810A	Y	$1000	9/65	23	8
	SEL-840/840A	Y	$1400	11/65	3	5
UNIVAC	I & II	N	$25,000	3/51 & 11/57	28	X
	III	Y	$20,000	8/62	80	X
	File Computers	N	$15,000	8/56	18	X
	Solid-State 80 I,II, 90 I, II & Step	Y	$8000	8/58	265	X
	418	Y	$11,000	6/63	85	38
	490 Series	Y	$35,000	12/61	102	60
	1004	Y	$1900	2/63	3300	100
	1005	Y	$2400	4/66	80	200
	1050	Y	$8000	9/63	280	50
	1100 Series (except 1107)	N	$35,000	12/50	11	X
	1107	Y	$55,000	10/62	29	X
	1108	Y	$65,000	9/65	16	40
	9200	Y	$1500	6/67	0	100
	9300	Y	$3400	6/67	0	40
	LARC	Y	$135,000	5/60	2	X
				TOTALS	35,173	22,543

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.

NEW PATENTS

RAYMOND R. SKOLNICK
Reg. Patent Agent
Ford Inst. Co., Div. of Sperry Rand Corp., Long Island City 1, New York

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

January 25, 1966

3,231,864 / Robert L. McIntyre, Elmsford, N.Y. and Charles F. Saunders, Sunland, and Dale V. Schmidt, Pacoima, Calif. / General Precision Inc. / Digital Computer.

3,231,867 / William F. Bartlett, Rochester and Barrie Brightman, Webster, N.Y. / General Dynamics Corporation / Dynamic Data Storage Circuit.

3,231,868 / Leon Bloom, Morris Cohen, and Sigmund N. Porter, Los Angeles, Calif. / The National Cash Register Company / Memory Arrangement for Electronic Data Processing System.

3,231,869 / Frank A. Hill, Van Nuys, A. J. Pankratz, La Canada, Alfred W. Sanborn, North Hollywood, and Ben T. Sato, Los Angeles, Calif. / General Precision, Inc. / Information Storage and Search System.

3,231,871 / Albert W. Vinal, Owego, N.Y. / International Business Machines Corporation / Magnetic Memory System.

3,231,872 / Oleg Avsan, Huddinge, Gote Back, Bandhagen, Kurt Alvar Olsson, Tullinge, and Ake Bertil Fredrik Svensson, Hagersten, Sweden / Telefonaktiebolaget L M Ericsson, Stockholm, Sweden / Magnetic Memory.

3,231,873 / Joseph P. Sweeney and John C. Mallinson, Harrisburg, Pa., and William K. English, Menlo Park, Calif. / AMP Incorporated / Bi-Directional Magnetic Core Shift Register.

February 1, 1966

3,232,533 / Willis A. Boothe, Scotia, N.Y. / assignor to General Electric Company / Fluid-operated Logic Circuit.

3,233,085 / Reed C. Lawlor, San Marino, Calif. (412 W. 6th St., Los Angeles, Calif.) / no assignee listed / Logic System.

3,233,117 / Eugene J. Rymaszewski, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / High Speed Logical Circuits Employing A Negative Resistance Device.

3,233,224 / Jerry Flickwir Foster, Arcadia, Lawrence Le Roy Bewley, Covina, and James Russell Bennett, Glendora, Calif., and Edward L. Glaser, Newton Square, Pa. / assignors Burroughs Corporation / Data Processing System.

3,233,227 / Richard J. Petschauer, Minneapolis, Minn. / assignor Fabri-Tek Inc. / Permanent Memory Data Storage Device.

3,233,229 / George Angus Gibson, Stevenage, and David Charles Tyler, Hitchin, England / assignors General Electric Company Limited, London, England / Apparatus for the Reproduction of Digital Data Recorded on a Plurality of Parallel Tracks on a Recording Medium.

February 8, 1966

3,234,399 / Thomas M. Lo Casale, Warminster, Pa. / assignor Sperry Rand Corp. / Logic Circuit.

3,234,517 / Henry L. Herold, Palo Alto, and Robert B. Wright, Saratoga, Calif. / assignors General Electric Company / Data Processing System.

3,234,518 / Laszlo L. Rakoczi, Merchantville, and Eli Gloates, Haddonfield, N.J. / assignors to Radio Corporation of America / Data Processing System.

3,234,524 / Robert I. Roth, Briarcliff Manor, N.Y. / assignors International Business Machines Corporation / Push-Down Memory.

3,234,526 / Shintaro Oshima, Musashinoshi, Hajime Enomoto, Ichikawa-shi, and Shiyoji Watanabe, Tokyo-to, Japan / assignor Kokusai Denshin Denwa Kabushiki Kaisha, Tokyo-to, Japan, a company of Japan / Analogue Memory Circuit.

3,234,527 / Vincent J. Korkowski, Richfield, Minn. / assignor Sperry Rand Corporation / Transfluxor Reading and Writing.

February 15, 1966

3,235,714 / Louis G. Oliari, Brockton, and Richard D. Pasciuto, Randolph, Mass. / assignors Honeywell, Inc. / Information Handling Apparatus.

3,235,717 / Gunter Martens, Schliersee, Upper Bavaria, Germany / assignors to Kienzle Apparate G.m.b.H, Villingen, Black Forest, Germany / Matrix Information Transforming Device.

3,235,718 / Eugene T. Walendziewicz, Philadelphia, Pa. / assignor Burroughs Corp. / Magnetic Device for Performing Complex Logic Functions.

3,235,845 / Adin D. Falkoff, Croton-on-Hudson, N.Y. / assignor to International Business Machines Corp. / associative Memory System.

3,235,846 / Bunzi Okazaki, Tokyo, Japan / assignor to Nippon Electric Company Limited, Tokyo, Japan / Data Processing System.

3,235,854 / Patrick R. Nugent, Wellesley, Mass. / assignor to Honeywell, Inc. / Information Handling Apparatus.

3,235,855 / Way Dong Woo, Newton Center, Mass. / assignor to Honeywell Inc. / Binary Magnetic Recording Apparatus.

February 22, 1966

3,237,024 / William C. Mavity, Van Nuys, Calif. / assignor to Radio Corporation of America / Logic Circuit.

3,237,166 / Joseph Weizenbaum, Palo Alto, and Robert B. Wright, Saratoga, Calif. / assignors General Electric Company / Data Transfer Apparatus in a Data Processing System.

3,237,167 / Melvin P. Xylander, Apalachin, N.Y. / assignor International Business Machines Corp. / Shift Register Utilizing Magnetic Cores and Transistor Latch Circuits.

3,237,168 / Theodore M. Hertz, Whittier, Calif. / assignor North American Aviation, Inc. / Instruction Sequence Control for a Digital Computer.

3,237,172 / Karlheniz Gosslau, Hans Joachim Harloff, Friedrich Ohmann, and Gerd Schneider, Munich, Germany / assignors to Siemens & Halske Aktiengesellschaft, Berlin and Munich, Germany / Impulse Storage Matrix Comprising Magnet Cores Having Rectangular Hysteresis Loops.

March 1, 1966

3,238,505 / David Shapiro, Watertown, and William G. Daly, Jr., Belmont, Mass., and Harry G. Williams, Tampa, Fla. / assignors to Honeywell Inc. / Information Handling Apparatus.

3,238,507 / Joseph Weizenbaum, Palo Alto, Calif. / assignor to General Electric Company / Apparatus for Transferring Data Between non-contiguous Memory Locations and a Data Handling Means.

3,238,508 / Donald M. Kelley, Lake Katrine, N.Y. / assignor to International Business Machines Corporation / Logical Manipulator.

3,238,509 / Joerg E. Schnoor, Rolling Hills, Richard G. Fisher, Torrance, and Arthur M. Angel, Rolling Hills, Calif. / assignors to The National Cash Register Company / Control Means for a Random Access Storage System.

3,238,510 / Harold L. Ergott, Jr., Apalachin, N.Y. / assignor to International Business Machines Corporation, / Memory Organization for Data Processors.

3,238,511 / Harold C. Anderson, Silver Spring, and Kenneth E. Peltzer, College Park, Md. / assignors to Litton Systems, Inc. / Subatomic Resonance Storage and Recording Process and Article.

3,238,512 / Gerard A. Alphonse, New York, N.Y. / assignor to Radio Corporation of America / Dual Element Superconductive Memory.

3,238,516 / Terence Hore, Reigate, Surrey, England, / assignor to North American Philips Company, Inc., New York / Reduction of Delta Noise in Coincidentcurrent Magnetic Matrix Storage Systems.

March 8, 1966

3,239,655 / Paul E. Goldsberry, Lexington, Ky. / assignor to International Business Machines Corporation / Single Cycle Binary Divider.

3,239,689 / Robert O. Winder, Trenton, N.J. / assignor to Radio Corporation of America / Logic Circuits.

3,239,816 / Mary A. Breslin, Philadelphia, Pa., Mary Louise Moore, Livermore, Calif. and William F. Schmitt, Wayne, Albert Tonik, Philadelphia, and William J. Turanski, deceased, late of Philadelphia, by Margaret K. Turanski, administratrix, Narberth, Pa. / assignors to Sperry Rand Corporation, / Computer Indexing System.

3,239,818 / Harold E. Petersen, Chappaqua, and Michael Teig, Yonkers, N.Y. / assignor to International Business Machines Corporation / Memory System.

3,239,821 / Thomas E. Baker, Framingham, and Ronald I. Day, Wakefield, Mass. / assignor to Sylvania Electric Products Inc. / Tunnel Diode Data Storage.

3,239,822 / John S. Davis, Glendale, and Paul E. Wells, Los Angeles, Calif. / assignor to Thompson Ramo Wooldridge Inc. / Permanent Storage Wire Screen Memory Apparatus.

March 15, 1966

3,240,114 / Frederick Jonker, Washington, D.C. and William P. Gingras, Rockville, and William L. Parks III, Silver Spring, Md. / assignor to Jonker Business Machines Inc. / Information Storage and Retrieval Copy Apparatus.

3,240,119 / Arthur W. Tyler, Weston, Mass. / assignor to Itek Corporation / Data Retrieving Apparatus.

3,240,880 / Manfred R. Kuehnle, Lexington, Mass. / assignor to Itek Corporation / Data Processing Apparatus.

3,240,920 / Charles J. Barbagallo, Needham, and Richard D. Pasciuto, Randolph, Mass. / assignor to Honeywell Inc. / Data Transmission Verifier.

3,240,921 / Gunnar E. Sundblad, Bromma, Sweden / assignor to Svenska Data-Register AB, Stockholm, Sweden, / Data Handling System.

3,241,126 / Richard L. Snyder, Malibu, Calif. / Assignor to Hughes Aircraft Company / Magnetic Shift Register.

3,241,127 / Richard L. Snyder, Malibu, Calif. / Assignor to Hughes Aircraft Company / Magnetic Domain Shifting Memory.

March 22, 1966

3,242,326 / William H. Cox, Beaumont, Texas / assignor to Sun Oil Company / Method and Apparatus for the analysis to Seismic Records.

3,242,349 / Laszlo Leslie Rakoczi, Phoenix, Ariz., and John W. Figueroa, Arcadia, Calif. / assignors to Radio Corporation of America / Data Processing.

3,242,350 / Frank A. Smalto, Endicott, N.Y. / assignor to International Business Machines Corporation / Shift Register.

3,242,467 / Richard C. Lamy, San Jose, Calif. / assignor to International Business Machines Corporation / Temporary Storage Register.

March 29, 1966

3,243,603 / Jack Saul Cubert, Willow Grove, and Thomas M. LoCasale, Warminster, Pa. / assignor to Sperry Rand Corporation / Logic Circuit.

3,243,693 / Toshio Kinoshita, Ichige, Katsuta-shi, and Akira Kurabayashi, Kodaira-shi, Japan / assignors to Kabushika Kaisha Hitachi Seisakusho, Tokyo-to Japan, a jointstock company of Japan / Programmer.

3,243,778 / Harry R. Shillington, Glen Ellyn, Ill. / Assignor to Western Electric Company / Data Processing Circuit.

3,243,779 / Harry R. Shillington, Glen Ellyn, Ill. / Assignor to Western Electric Company / Data Processing Circuit.

3,243,780 / Marc Bendick, Pacific Palisades, Vincent J. Galati, Granada Hills, and Donald B. Manning, Manhattan Beach, Calif. / assignors to Systems Development Corporation / Random Access Storage and Delivery Device.

3,243,782 / Francis O. Underwood, Endwell, N.Y. / assignor to International Business Machines Corporation / Data Handling System.

3,243,783 / Edward J. Rabenda, Poughkeepsie, Wayne D. Brodd, Wappingers Falls, and Eugene E. Marquardt, Poughkeepsie, N.Y. / assignors to International Business Machines Corporation / File Search Data Selector.

3,243,785 / Milton W. Green, Menlo Park, Calif. / assignor to Radio Corporation of America / Superconductive Associative Memory Systems.

3,243,786 / Paul M. Davies, Manhattan Beach, Calif. / assignor, by mesne assignments to Thompson Ramo Wooldridge Inc. / Associative Memory Cell Selecting Means.

April 5, 1966

3,244,864 / Glyn H. Jones, Hacienda Heights, Calif. / assignor to Burroughs Corporation / Subtraction Unit for a Digital Computer.

3,244,902 / Kenneth O. King, Rolling Hills, Calif., and George F. Minka, Sydney, New South Wales, Australia, / assignors to The National Cash Register Company / Inhibit Logic Circuit.

3,244,903 / Brian Elliott Sear, Oreland, Pa. / assignor to Sperry Rand Corporation / Logic Circuit.

3,244,905 / Arnold S. Farber, Yorktown Heights, N.Y. / assignor to International Business Machines Corporation / Tunnel Diode Logical Circuit.

3,244,908 / Thomas M. Lo Casale, Warminster, Woo F. Chow, Horsham Township, Montgomery County and Jack S. Cubert, Willow Grove, Pa. / assignor to Sperry Rand Corporation / Logic Circuit Utilizing Tunnel and Enhancement Diodes.

3,245,058 / George D. Bruce, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / Semi-Permanent Memory.

April 12, 1966

3,246,298 / Franz Josef Schramel and Hans Kok, Hilversum, Netherlands / assignors to North American Philips Company, Inc. / Apparatus for Receiving Messages and Transmitting them in certain of a number of Directions.

3,246,302 / Thomas B. Martin, Collingswood, and James E. Saultz, Oaklyn, N.J. / assignor to Radio Corporation of America / Coupling of Logic Neurons.

3,246,303 / Lowell D. Amdahl, Northridge, Calif., Gene M. Amdahl, Chappaqua, N.Y., Howard L. Engel, Woodland Hills, and Edward J. Schneberger, Canoga Park, Calif., and John V. Blankenbaker, Lawrenceville, N.J. / assignors to Thompson Ramo Wooldridge Inc. / Stored Logic Computer.

April 19, 1966

3,247,488 / Herbert Frazer Welsh, Philadelphia, John Presper Eckert, Jr., Gladwyne, William F. Schmitt, Wayne, and Lawrence F. Harrison, Norristown, Pa. / assignors to Sperry Rand Corporation / Digital Computing System.

3,247,489 / Edward H. Sussenguth, Jr., Arlington, Mass. / assignor to International Business Machines Corporation / Memory Device Including Function Performing Means.

3,247,490 / Glen R. Kregness, Hopkins, and Charles J. Pence, Minneapolis, Minn. / assignors to Sperry Rand Corporation / Computer Memory System.

3,247,492 / Robert J. Furlong, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / Automatic Memory Start Circuit for Asynchronous Data Processing System.

April 26, 1966

3,248,522 / Byron F. Burch, Jr., Phoenix, Arizona, and Myles E. Wood, Norristown, Pa., / assignors to General Electric Company / Information Reading System.

3,248,523 / Edgar O. Morgenson, Jr., Norristown, and Walter C. Fresch, Phoenixville, Pa., / assignors to Burroughs Corporation / Information Handling Device.

3,248,560 / Robert R. Leonard, Boston, Mass. / assignors to Honeywell Inc. / Information Handling Apparatus.

3,248,561 / James L. Walsh, Hyde Park, N.Y. / assignor to International Business Machines Corporation / Logic Circuit.

3,248,563 / Hung Chang Lin, Monroeville, Pa. / assignor to Westinghouse Electric Corporation / Low Power Semiconductor Logic Circuit.

3,248,564 / Frederick Henry Rees, London, England / assignor to International Standard Electric Corporation, New York / Logical Circuitry for Digital Systems.

3,248,565 / Michael John Lanigan, Chorlton-cum-Hardy, Manchester, and David Beverly George Edwards, Gatley, Cheadle, England / assignors to National Research Development Corporation, London, England / Digital Information Storage Apparatus.

3,248,571 / Jack S. Cubert, Willow Grove, Pa. / assignor to Sperry Rand Corporation / Logic Circuit.

3,248,696 / Richard M. Bloch, Framingham, Mass. / assignor to Honeywell Inc., / Information Handling Apparatus.

3,248,700 / Robert S. Sinn, Seaside Park, N.J. / assignor to Ultronic Systems Corp., Pennsauken, N.J. / Data Selection System.

3,248,706 / Donald D. Christensen, Sun Valley, and Thomas W. Kampe, Covina, Calif. / assignors to General Precision, Inc. / Computer.

3,248,708 / Munro K. Haynes, Chappaqua, N.Y. / assignor to International Business Machines Corporation / Memory Organization for Fast Read Storage.

3,248,711 / Morton H. Lewin, Princeton, N.J. / assignor to Radio Corporation of America / Permanent Storage Type Memory.

May 3, 1966

3,249,746 / Walter A. Helbig, Woodland Hills, and William E. Woods, Northridge, Calif. / assignors to Radio Corporation of America / Data Processing Apparatus.

3,249,765 / Henry S. Miller, Yardley, Pa. / assignors to Radio Corporation of America / Logic Circuit.

3,249,920 / Ralph W. Pulver, Jr., Saugerties, N.Y. / assignor to International Business Machines Corporation / Program Control Element.

3,249,921 / Robert R. Seeber, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / Associative Memory Ordered Retrieval.

3,249,924 / Robert J. Furlong, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / Asynchronous Data Processing System.

3,249,925 / Charles H. Single, Pleasant Hill, John A. Brussolo, El Cerrito, and Edward M. Billinghurst, Concord, Calif. / assignors to Beckman Instruments, Inc. / Sample and Hold System.

May 10, 1966

3,250,917 / Steven R. Hofstein, Princeton, N.J. / assignor to Radio Corporation of America / Logic Circuits.

3,251,041 / Yaohan Chu, Chevy Chase, Md. / assignor to Melpar, Inc. / Computer Memory System.

3,251,042 / Paul D. King, Pasadena, Calif. / assignor to Burroughs Corporation / Digital Computer.

May 17, 1966

3,252,004 / Allan L. Scherr, Boston, Mass. / assignor to International Busi-

ness Machines Corporation / Multistate Memory Circuit.

3,252,143 / Gunnar E. Sundblad, Bromma, Sweden, / assignor to Svenska Dataregister AB, Stockholm, Sweden / Data Handling System.

3,252,144 / Thomas E. Digan, Needham, Mass. and Richard F. Murray, Rhinebeck, N.Y. / assignors to International Business Machines Corp. / Data Processing Device.

3,252,145 / Samuel John Marshall Denison, Stafford, and Reginald Hugh Allmark and Wilfred James Jones, both of Kidsgrove, Stoke-on-Trent, England / assignors to the English Electric Company Limited / Electric Data Storage Apparatus.

3,252,146 / Wolfgang Handler, Geisslautern, and Fritz Rudolf Guntsch, Konstanz, Germany / assignors to Telefunken Patentverwertungs - G.m.b.H., Ulm (Danube), Germany / Computer.

3,252,149 / Robert L. Weida, Whitestone, Edward M. Richards, East Northport, Evelyn Berezin, New York, Jack Knoll, Plainview, and Philip Rosenblatt, Mount Vernon, N.Y. / assignors to Digitronics Corp. / Data Processing System.

3,252,151 / Edward Michael Bradley and John Bernard James, Stevenage, England, / assignors to International Computers and Tabulators Limited / Data Storage Apparatus.

May 24, 1966

3,253,134 / Thomas G. North, Jr., Burlington, N.C. / assignors to Western Electric Company / Digit by Digit Series High-Low Limit Comparator having means for Completing an Electrical Path through a Logic Circuit.

3,253,257 / William E. Goetz, Endicott, N.Y. and Philip H. Howard, Rochester, Minn., / assignors to International Business Machines Corporation. / Character Recognition Employing Partial Superposition of Images.

3,253,262 / Evelyn Berezin Wilenitz, New York, N.Y., and Frank C. Marino, South Norwalk, and Donald W. Russell, Norwalk, Conn. / assignors to the Bunker-Ramo Corporation / Data Processing System.

3,253,264 / Robert R. Seeber and Arwin B. Lindquist, Poughkeepsie, N.Y. / assignors to International Business Machines Corporation / Associative Memory Ordered Retrieval.

3,253,265 / Arwin B. Lindquist, Poughkeepsie, N.Y. / assignor to International Business Machines Corporation / Associative Memory Ordered Retrieval.

May 31, 1966

3,253,497 / John F. Dreyer, Cincinnati, Ohio / assignor to Polacoat Inc. / Information Storage Device.

3,253,605 / Harold R. Grubb, Owego, N.Y. / assignor to International Business Machines Corporation / Fluid Logic Trigger.

June 7, 1966

3,255,361 / Woo F. Chow, Horsham Township, Montgomery County, Pa. / assignor to Sperry Rand Corporation / Transformer trigger tunnel diode nor logic circuit.

3,255,362 / Philip A. Stowell, Paoli, Pa. / assignor to Burroughs Corporation, / Cryotron Logic Circuits having at least two interacting central elements and one path always superconducting.

3,255,438 / Eugene Leonard, Sands Point, Marvin Shapiro, Huntington, and Robert F. Shaw, Locust Valley, New York, and Bruce B. Weber, Cleveland Heights and Robert V. Zaman, Euclid, Ohio, / assignors to Addressograph-Multigraph Corp. / Data Processing System.

June 14, 1966

3,256,425 / Wyman L. Deeg, Glenview, Ill. / assignor to C. P. Clare & Company / Logic Module using Magnetic Switches.

3,256,445 / Francois Henri Raymond, St.-Germain-en-Laye, Andre Michel Richard, Paris, Alice Maria Recoque, Sartrouville, and Claude Marie Edmond Masson, Paris, France / assignors to Societe d'Electronique et d'Automatisme, Courbevoie, Seine, France / Magnetic Core Switching Devices.

Burroughs sets the pace for the computer industry

The new B 2500 and B 3500 are the latest Burroughs 500 Systems to be developed for business, scientific, and data communication tasks. In every measure of hardware and software performance, they far outpace other computer systems in the low- to medium-price range.

Two major factors are responsible for the exceptionally high performance-to-price ratio of the B 2500 and B 3500. The first is a design principle common to all Burroughs 500 Systems. In 1960, Burroughs Corporation determined that, in the future, computer performance would depend as much on software as on hardware. Events have proved this to be true. For this reason, *every* Burroughs 500 System has been *designed from the beginning* by *teams* of engineers and software experts.

Many economies result for the user. For example, the Master Control Program for the B 2500 and B 3500 not only performs many more useful functions than other automatic operating systems, but also reduces by a factor of 10 the amount of main memory that must be set aside for its exclusive use. Other gains are made in compiling times, programing ease, and speed and efficiency of operation. In short, the teamwork approach to computer design has allowed Burroughs to build a better bridge of communication between the B 2500 and B 3500 and their human users.

A second major factor is the use of monolithic integrated circuitry in construction of virtually all logic and the two control memories. The Burroughs B 2500 and B 3500 make use of complementary transistor logic, plus some use of array monolithics—two proven design concepts at the forefront of this newest logic technology. The results are smaller, faster, more reliable circuits at lower costs—and operating speeds measured in billionths of a second.

Like the other Burroughs 500 Systems—the larger B 5500 and the very large B 8500—the two newest systems can handle a variety of input/output activities simultaneously—as many as 20 at a time with the B 3500—while the processor continues its work. They multiprocess many unrelated jobs at one time, keeping the whole system fully utilized and greatly speeding the turn-around time for jobs. *And, since no human being could manage and schedule their multiple split-second operations, they are self-managing through their control programs.* All this, in the low- to medium-price range.

No wonder Burroughs is regarded as the pacesetter for the computer industry.

Burroughs Corporation

Designate No. 22 on Readers Service Card

Detroit, Michigan 48232

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

IBM announces direct-access files for SYSTEM/360 Model 20

Now, the lowest-priced IBM SYSTEM/360 gives you a level of performance never before possible in a low-cost system.

IBM's Model 20 provides direct-access capabilities with the simple addition of the 2311 Disk Storage Drive... in two models similar to the high-performance drives previously available only with larger models of SYSTEM/360.

The 2311 features on-line storage of up to 10.8 million bytes; access times as fast as 60 milliseconds; a data transfer rate of 156,000 bytes per second; and interchangeable disk packs.

If you are a Model 20 user, the 2311 means you can handle a much broader range of business applications.

You can use systems approaches that let you reach into the system and select any record vital to the control of your company. You can call for on-the-spot management information... and get it in seconds.

Moving up to a Model 20 disk system is made easier with IBM's Report Program Generator, a proven programming language that will be expanded to support disk and disk-tape systems.

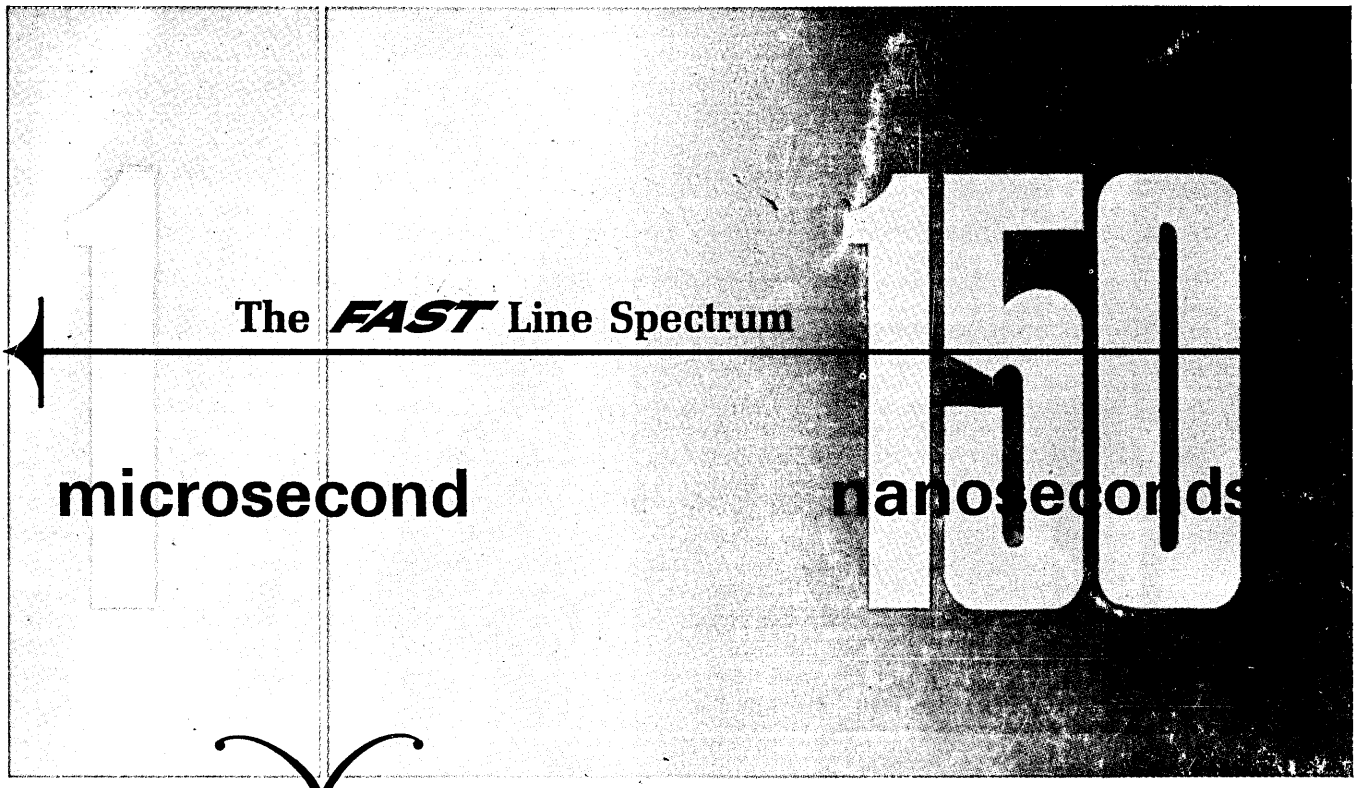
And you can add this dimension of direct access to your Model 20 for as little as $575 a month.

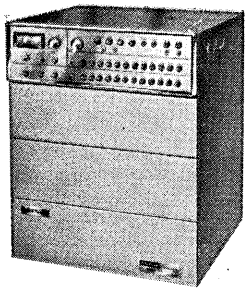
What better way to have a computer system keep pace with your company's growth?

SYSTEM/360 was designed that way.

IBM

Fabri-Tek's FAST Line* 500 core memories...





FAST Line 500 core memories:
Operation Summary

Cycle Time: Choose any cycle speed between 500 and 1000 nanoseconds.

Access Time: 250 to 400 nanoseconds, depending upon cycle time and control logic.

Access Modes Available: Random, Sequential or Random Sequential.

Capacity: To meet your requirements.

Optional Operating Modes: Read-restore, clear-write, read-modify-write.

Input/Output Levels: Typical −0.5 volts and +2.5 volts.

Control Panel Options: Address and data register indicators, self-testing controls, flag signals, marginal voltage check, manual load and data retention "Data Saver".

Power Required: 115 or 220 volts, ac, single phase, 50—60 CPS. Optional power supply available.

Packaging: Relay-rack modules or free-standing cabinet.

Available soon . . .
FAST Line 500 core memories bulletin
WRITE TODAY

The Leader in Memory Technology

Meeting your core memory requirements in the 500-1000 nanosecond range

If your next computer requires a core memory in the 500-1000 nanosecond speed range, the Fabri-Tek FAST Line 500 is the answer.

This family of core memories gives you a free choice of speed and capacity in this particular speed band of the spectrum.

From initial engineering to final assembly and test, the Fabri-Tek FAST Line concept means "pre-customizing" of design for the best combination of speed, capacity and price.

FAST Line 500 core memories use all-silicon integrated circuits in the logic, decoding and timing sections as well as all-silicon discrete components to insure high MTBF.

FAST Line 500 stacks take maximum advantage of 20-mil cores to provide wide operational margins at sub-microsecond speeds.

Take advantage of Fabri-Tek's technology and "pre-customized" design. Ask about FAST Line!

Call: 612-935-8811—TWX: 910-576-2913 or

Write: Fabri-Tek Incorporated, 5901 So. County Rd. 18, Minneapolis, Minnesota 55436.

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