

Special Eastern Joint Computer Conference Issue

Research & Engineering

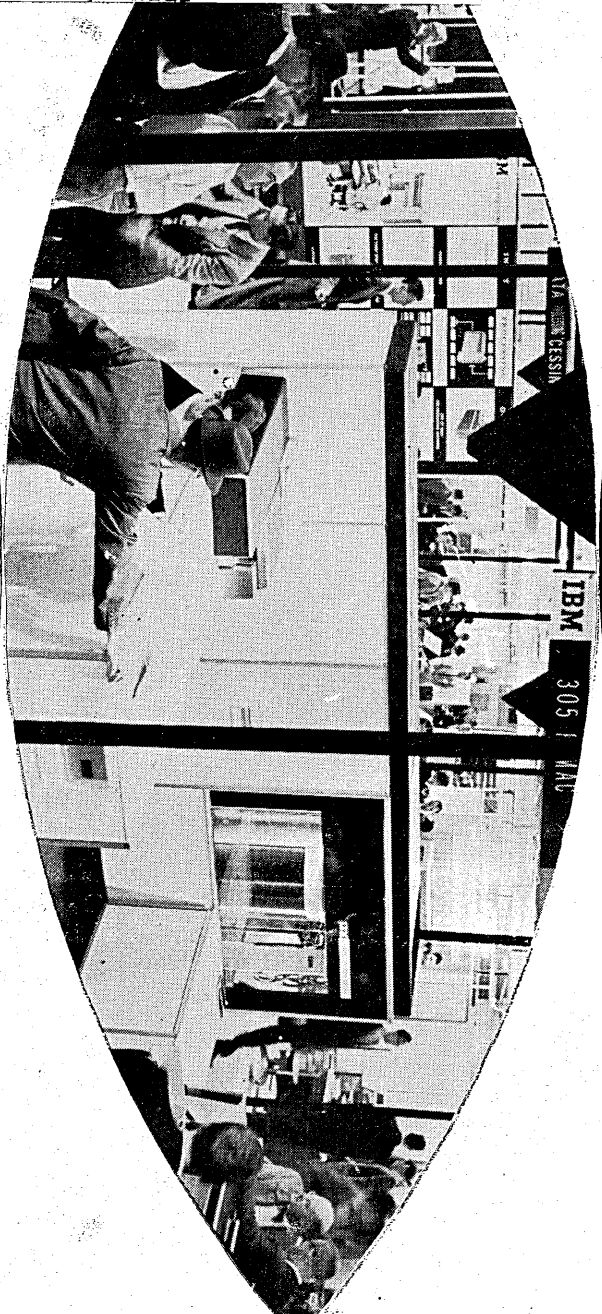
NOVEMBER/DECEMBER 1965

DATAmation

The Magazine of

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Natl Cash Reg
Electronics Div
1401 E El Segundo
Hawthorne, Calif



The automatic handling of information

LOADING OR UNLOADING SPEED:
14 μ SEC/CHARACTER

144-BQ8 CORE MEMORY

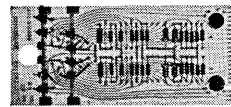
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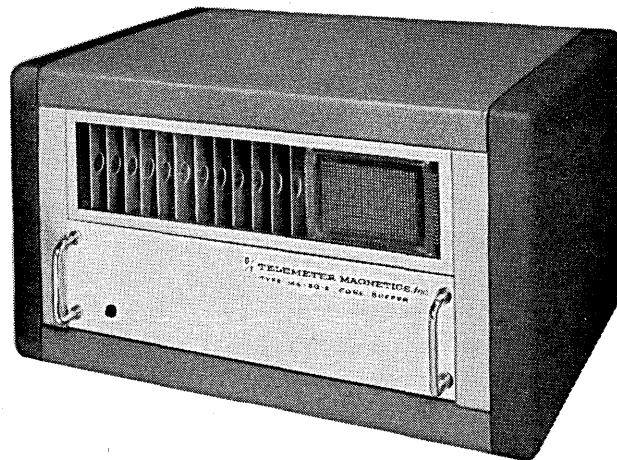
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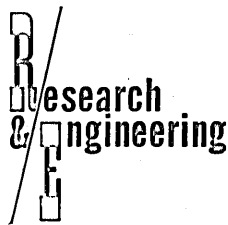
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November/December 1957

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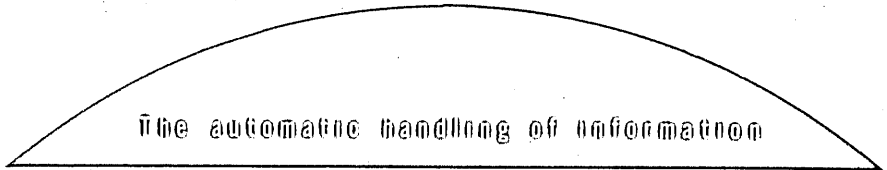
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A Publisher's Vision . . .

THERE IS A NEW RIVER OF ENERGY flowing through American business and industry. You've called it automation. Quite broadly, automation breaks into two main categories: the automatic handling of materials, and the automatic handling of information. It is to the latter that we wish to devote this publication.

All of automation is young . . . and the field of handling information automatically, even younger. Because this field of endeavor is presently pioneering, it needs a voice—a voice which is responsible, intelligent, and which will assist its people by reporting and interpreting the industry's developments. *DATAmation* intends to be that voice.

All of you involved in data processing know this field is only in the headwater stage. As well as further developing the equipment, the state of the art can only be improved by more imaginative application of the equipment to business and scientific problems. *DATAmation* intends to assist you in finding these solutions.

DATAmation will not be a news magazine. It will be a *news report* magazine—reportage in its broadest, deepest, and most complete sense.

DATAmation will publish thoughtful articles by leading men in the data processing field. It will publish abstracts from technical journals. It will report the latest technical achievements, theory developments, and even "blue-sky" experiments made at universities and laboratories.

DATAmation will make a monthly study of work being done abroad . . . of recent developments in Germany, France, England, Sweden, and Russia.

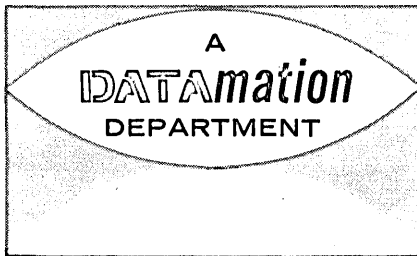
Special issues of *DATAmation* will be devoted to the Eastern and Western Joint Computer Conferences. These issues will report the conference themes, present abstracts of the papers read, and interpret conference developments. In addition, *DATAmation* will also report on other information-handling conferences, such as the National Telemetering Conference, the International Conference on Scientific Information, and the National Business Show.

With all of the foregoing, we believe *DATAmation* will fill a present void. Rather than being "just another technical publication," we feel *DATAmation* will inspire and provide you with something you've been wanting and needing.

We invite the confidence of engineers, mathematicians, scientists . . . all men concerned with the automatic gathering, storage, retrieval, processing, reducing, computation, and presenting of information . . . this will be *your* publication. We've told you how we think it should be; you tell us how you *want* it to be.

Frank D. Thompson

Publisher



NEWS OF THE INDUSTRY

Audio Devices '57 Tape Sales Top '56

"Forecasts concerning the future of the magnetic tape business become more and more difficult each quarter," states William Speed, president of Audio Devices, Inc. of New York. "Our own sales of recording tape for the third quarter were 59% ahead of the similar period last year, and were the largest for any quarter in the history of the company.

"This sharp increase is against seasonal trends, and compares with our 40% sales gain in the first half of 1957 over the like period in 1956. Our plant is running on a 24-hour schedule through a period which in the past used to be slow. It appears that new uses for tape breed still additional new uses. It's better than guinea pigs."

RCA Introduces Advanced-Type Transistor

A junction transistor of the germanium p-n-p alloy type (RCA-2N404) has been introduced by the RCA Semiconductor Div., F. F. Neuner, marketing manager, has announced. "The 2N404 was designed for use in switching circuits of compact, medium-speed military and industrial electronic computers.

"It will also find wide application in other low-level medium-speed 'on-off' control circuits. Characteristics of the device permit the design of electronic computers having exceptional stability over wide variations in temperature.

"In addition, careful control of the characteristics of the 2N404 with respect to saturation current, leakage current, breakdown voltage, and switching time—achieved by controlling the stored charge in the base region, contribute to the dependable performance of the device in critical military and industrial applications."

New System to Simplify Computer Operation

Science is making it possible for the man-on-the-street to operate an electronic computer. A big step in this direction was made recently with the unveiling of a new system for translating coded information into the data "language" of a medium-size, general purpose computer.

Developed and disclosed by Dr. Harry D. Huskey, assistant professor of mathematics at the University of California, Berkeley, the system will permit relatively inexperienced personnel to obtain maximum results from a computer. Until now, Dr. Huskey said, systems similar to the one he is introducing were available only for large, high-cost data processing machines and computers.

Attractive to industry because of its inherent man-hour economy and higher rate of productivity, the system was perfected through the combined efforts of Dr. Huskey and Bendix Computer Div. staff engineers and users who pooled their research findings. The system will become available at the end of the year as part of the Bendix computer, and will be supplied to all existing installations, ranging from research in synthetic fibers to calculation of highway earthwork.

Marquardt Awards Contract to CDC Control

CDC Control Services, Inc. of Hatboro, Pa., has been awarded a \$150,000 contract by Marquardt Aircraft, Van Nuys, Calif., to design and build a dynamic control system for a jet engine test facility. The work will involve the design, analog study, and construction of a complete closed-loop system including a dynamic flight simulation programmer.

Marquardt will use the control system to simulate widely-varying flight conditions in testing jet engine accessories such as fuel pumps and turbine drives. Accessories will be tested under varying air and fuel temperatures and pressures to determine performance characteristics under various flight climb, dive, and altitude conditions as simulated by the CDC CompuDyne Control System.

EECo Delivers "Quick Look" System to DACo

Delivery of a "Quick Look" magnetic tape data reduction system to the Douglas Aircraft Co. Missile Test Facility at Sacramento has been announced by Burgess Dempster, president of the Electronic Engineering Co. of Calif. (Santa Ana). The system, comprising 16 large cabinets of complex electronic equipment, permits Douglas engineers to obtain chart records of the performance of rocket engines.

The chart records produced by the EECo equipment permit study of the data prior to further processing of the test results by digital computers at the Douglas Aircraft Santa Monica Plant. Provision for editing and selection of data to be processed is made in the "Quick Look" system by automatic magnetic tape search equipment which uses one of the 14 channels on the tape for a time address code.

Consolidated Equipment Ordered by Cook

The DataTape Div. of Consolidated Electrodynamics Corp., Pasadena, Calif., has received an order in excess of \$150,000 from Cook Electric Co., Skokie, Ill., for magnetic-tape equipment that will become

part of a missile-range instrumentation system which Cook is designing and building for the Navy.

Magnetic-tape recorder/reproducers and associated equipment supplied by Consolidated will record telemetered data from missiles in flight for play-back and evaluation by test engineers.

GE Opens New Computer Applications Lab

Another new section of General Electric's rapidly-expanding Computer Dept. (Phoenix, Ariz.) has recently begun operation. Named the Computer Applications Laboratory, this latest facility has been formed to render business, industry, education, and government a complete range of computational services capable of providing an effective and economical approach to the solution of an entire problem—regardless of size.

The laboratory, under the direction of Dr. Herbert R. J. Grosch, is engaged in problem analysis, mathematical analysis, programming, coding, reporting functions, computer techniques, personnel training, commercial and applied science applications. It is staffed by more than 70 specialists, and is equipped with an IBM 704 computer.

With the Computer Center located on the campus of Arizona State College at Tempe, an invaluable relationship with faculty and students exists which provides a mutually beneficial interchange of professional services. In addition, GE maintains regular classes in computer theory and maintenance which are available for credit to the college engineering students.

Radiation Counter to Double Plant Size

Radiation Counter Laboratories, Inc., Skokie, Ill., has started an exchange program which will double the size of its present plant, Dr. Ernest H. Wakefield, president, has announced.

"The present trend toward nuclear data processing using instrumentation typified by RCL's 256-Channel Analyzer, and the augmented demands for radiation-sensing elements, has forced us to expand to meet the present and also the expected future needs for our equipment," Wakefield said.

Fairchild Camera Backs New Transistor Co.

Fairchild Semi-Conductors Corp. has been formed in Palo Alto, Calif., for the development and production of silicon diffused transistors and other semi-conductors, it was announced recently by Fairchild Camera & Instrument Corp., the sponsoring organization.

The new company was organized around a group of senior scientists and engineers who have been working together in the development of transistors and other semi-conductor devices. "Moving into the semi-conductor field is a logical step for us," commented John Carter, president of Fairchild Camera. "With four of our divisions already associated with missile and satellite instrumentation, these new components will enhance the advances we have made during the last six years."

The research group of the new company will be headed by Dr. Robert Noyce, formerly of the Research Div. of Philco Corp. President of the new corporation will be H. E. Hale, a vice-president of Fairchild Controls Corp. and general manager of the Components Div.; Richard Hodgson, executive vice-president of Fairchild Camera, will be chairman of the board.

First products to be offered will be a high-speed computer transistor to be followed by transistors which will serve the applications of vhf power oscillators, vhf amplifiers, and very-high-power applications at lower frequencies.

New Cathode Ray Tube by Westinghouse

Development and production of the first 16" all-glass radar picture tube for military use has been announced by B. W. Sauter, general manager of the Westinghouse electronic tube div. The new cathode ray tube is intended for new display equipment used with radar, missiles, and computers, or for replacement of 16" metal cone tubes in existing military equipment.

"Development of this tube," Sauter said, "is especially significant in view of the national need today for increasingly-reliable radar sets that can discern faster-flying objects at ever-greater distances. The new tube, with a 75% greater screen area than the previous 12" all-glass tube, enables radar systems to fill this need.

Marquette U to Install IBM Computer in '58

Marquette University's application for a "650" digital computer has been approved by the International Business Machines Corp., and the \$200,000 machine will be installed on a rental basis next August. With installation of the "650," Marquette will open its computing center in the college of engineering. Arthur Moeller, assistant professor of electrical engineering, is chairman of the computing center committee.

Aeronutronic Acquires Site in S. Calif.

The acquisition of a large permanent building site in Southern Calif. by Aeronutronic Systems, Inc., Ford Motor Company's new west coast subsidiary, has been announced by Gerald J. Lynch, president of Aeronutronic. Organized by Ford in mid-1956 to develop and manufacture systems and products for military and commercial application, Aeronutronic's major emphasis is placed on aeronautics, electronics, materials, computers, physics, and nucleonics.

For the past year, the company has had its central offices in Glendale, Calif., where the Far Side rocket vehicle announced last month was developed and built. That rocket vehicle currently is awaiting test at Eniwetok. Aeronutronic will continue to maintain the Glendale facilities as well as its computer development laboratory in Van Nuys, California.

Fly missile designs off board

A new "electronic brain" computer, which virtually can "fly" missile designs right off the drawing board, today is speeding early development of the Navy's Polaris ballistic missile.

The device, called a PACE analog computer, is being used by Lockheed Missile Systems div. scientists to weed out unworkable designs quickly by accurately simulating the flight characteristics a bird would have if it were actually built; also to find out how well a missile will respond to guidance commands and follow a flight path.

"Thus, we can eliminate the so-called bugs in missile design, and swiftly come up with a workable article without wasting valuable months of development and untold defense dollars in building and flying proposed missile shapes," said Richard P. Castanias, head of the mathematics and computer services department.

Now well along in development under technical direction of Lockheed as the missile system manager, Polaris is the Navy's ballistic missile which can be launched from submarines.

"The new \$100,000 computing machine installed at the division's Sunnyvale plant," Castanias said, "brings to nearly \$2.5 million the value of computing equipment employed by the Lockheed missile division. The division's computing facilities are among the most extensive on the west coast, and include the giant UNIVAC Scientific 1103A, alone worth \$1.5 million, and a battery of analog computers."

Because of its extensive installation of electronic brains and the increasing need for rapid solution of industry problems, the missile division makes the equipment available to other firms on a commercial basis, Castanias said.

Circle 101 on Reader Service Card

New giant brain has boston debut

The first Datamatic 1000, a new \$2½-million giant "brain," successfully completed its first public demonstration recently.

A critical audience of over 100 businessmen, government and municipal officials, and executives watched the large-scale computer system built by Datamatic Corp., Newton Highlands, Mass., whiz through a full day of demonstrations on sample business problems.

It exhibited an elephantine memory, and showed it could "read" and "write" at eye-blinking speeds. The new computer system, which occupies 5,000 square feet is the latest development in the explosive evolution of electronic brains since World War II's Mark I scientific model.

It is said to be the first designed exclusively for business use. Its builder, the two-year-old Datamatic Corp., is a firm originally formed by Minneapolis-Honeywell and Raytheon. Honeywell, senior partner, subsequently bought out Raytheon for \$4½ million and is now sole owner.

The system will be installed at the (Detroit) Michigan Hospital Service, the nation's second largest Blue Cross/Blue Shield service. There it will watch over the personal statistics of 3½ million residents, processing an average of 25,000 record changes per day in less than two hours.

Walter W. Finke, president of Datamatic, announced that the firm has more than doubled its production capacity, moving into an additional 75,000 square feet of floor space. This move is the

third physical expansion for the young company. He reported that Datamatic has seven other orders and that they would be shipped in 1958.

Finke cited some of the "brain's" vital statistics: It can "read" and "write" simultaneously at the rate of 60,000 digits a second, at the same time handling 4,000 additions, 1,000 multiplications, or 5,000 comparisons. Its central brain can search through the equivalent of 7,500 punched cards a second, or 4 million punched cards in less than ten minutes.

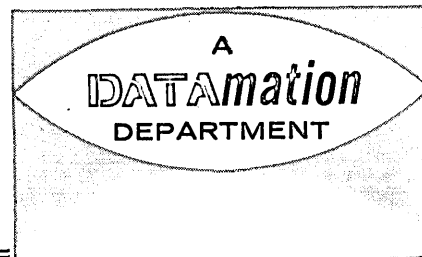
Each reel of its magnetic tape (3" wide, 31 channels of information) can hold data equal to that found on 465,000 punched cards. A full system, incorporating 100 magnetic tape units, can absorb 46½ million punched cards worth of information.

Answers, or reports, are turned out at the rate of 900 printed lines a minute or 60,000 punched cards an hour. Finke said that this ability to handle a tremendous amount of data quickly overcomes what has been an inherent weakness in the early giant brains.

These brains, he explained, were designed by scientists to handle a limited amount of data, do a lot of complicated calculation, and get a concise answer. "But business has huge amounts of paperwork which it wants to feed into a computer quickly and get all the answers as fast as possible. Involved is only a minimum amount of computation. That is what this new computer system has been expressly designed to do."

Circle 102 on Reader Service Card

GUEST EDITORIAL



Electronics to free human intelligence from tedious routine*

THE NATION'S industries, arts, and sciences are on the threshold of an exciting era of systematized electronics in which human intelligence will enjoy unprecedented freedom for growth, planning, and creativity.

It is becoming increasingly possible with electronics to free human intelligence from the strain and tedium of minute-by-minute direction of each play, and to elevate it to the exclusive role of coach or strategy maker. Electronics, too, is engendering the growth of human intelligence . . .

The intelligence which is required to design and to direct today's complex electronic systems is broader and more embracing than at any time in the past. As the science of electronics becomes broader and more encompassing, it will require a higher level of human intelligence for both design and application of new developments.

So vast and promising is this magical field of electronics that no one can visualize its full portent. Within the past decade electronics has developed almost unlimited power to duplicate and amplify man's senses and to match, and sometimes outdo, many of his abilities and capabilities.

We have seen, and are progressing in, the development and application of electronic devices and systems which can see, hear, feel,

measure, control, sort, count, compute, and calculate. Advances are being made in electronic systems which memorize and recall information, which respond to the spoken word, which can schedule and control manufacturing and commercial processes.

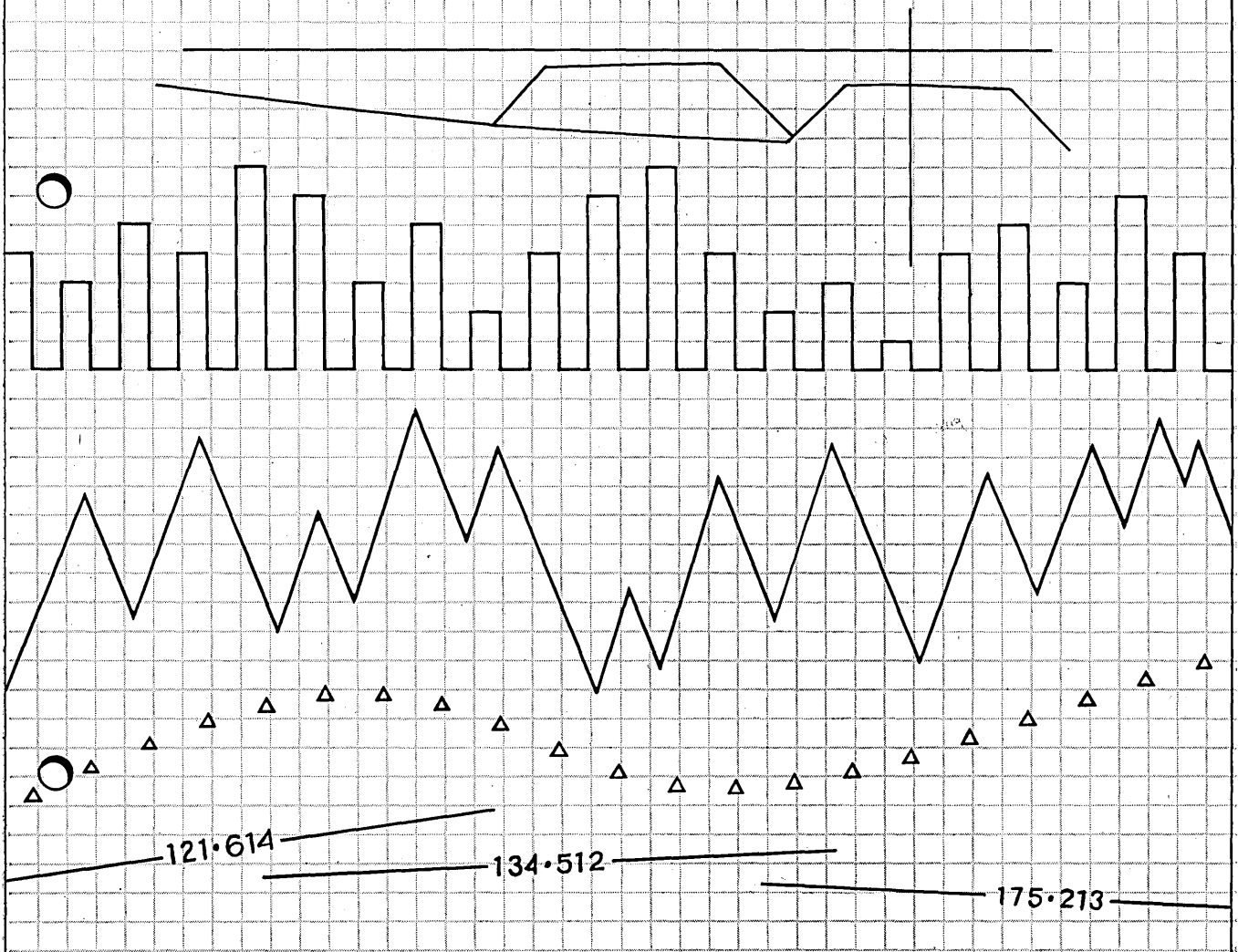
Translated in terms of tomorrow's industry, arts, and sciences, this progress gives promise of an era in which our present concepts of speed, efficiency, and economy will be so obsolete as to be harmful to those who retain them . . . In the immediate tomorrow, it may be impossible to remain competitive without systematized electronics.

There can be little doubt that we are in a changing industrial world. The Electronic Revolution is developing faster than any major industrial changes which preceded it. With this changing world, however, comes an inseparable challenge . . . the challenge to seek out, to bring to light, and to direct into constructive channels the new tools and techniques developing out of this increasing knowledge of electronics.

Applied as a means of improving and speeding our industrial, artistic, and scientific pursuits, electronics has the power to strengthen the nation and its economy, and to ease and enrich the lives of each of us to levels almost beyond the scope of imagination.

Theodore A. Smith
Executive Vice-President
Industrial Electronic Products
Radio Corp. of America

*From the opening address of the 82nd convention of the Society of Motion Picture & Television Engineers, Phila., Pa.

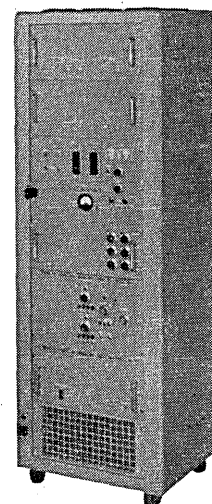
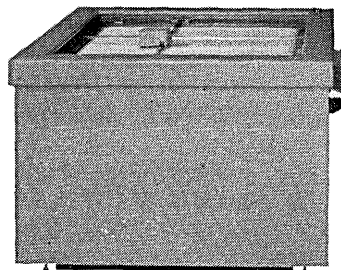


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a central computer installation
as a part of an . . .

Air Line Reservations System

by R. A. McAvoy
Sup't. of Communications, Data Processing
Eastern Air Lines, Inc., Miami, Fla.

The computer application to be described here differs considerably from the conventional application in several ways:

(1) The computer will *not* be required to handle many of the usual jobs, such as payroll, labor distribution, parts inventory, billing, and engineering problems.

(2) The input to the commuter will *not* be via the media of punched cards or magnetic tape.

(3) The employees who will operate the input-output devices will have had no training in computer programming or computer operation. Many of them will never see the computer.

These major departures from conventional methods can only point to one reasonable conclusion: the problem to be solved by the computer application must be substantially different from the usual problem.

The air line reservations problem *IS* different. With only superficial examination, it appears to be quite simple. This apparent simplicity has been the real cause over the years for enough lost tempers and enough lost dollars to over-flow a 12-digit register.

Because an understanding of the application requires an understanding of the problem, a fictitious air line—"Armour Air Lines, Inc."—will be described to acquaint the reader with the elements of the problem.

Figure 1 represents the complete system timetable published by "Armour Air Lines." Notice some of the facts obtainable from this publication.

(1) The operation of an aircraft from one end of the route to the other is named a "flight."

(2) Each flight is identified by a distinctive number.

(3) The same operational pattern is repeated day after day.

(4) The seating capacity of the aircraft is 60 passengers.

(5) Each flight operates over four legs—the name "leg" being given to portions of a flight between successive take-offs and landings.

As the operation of the air line begins, one quickly learns that customers are not content to come out to the airport on the chance that a seat will be available for them. They prefer, instead, to

telephone and have the air line reserve space for them.

To make the case more specific, say that "Armour" agrees to reserve space for Mr. Jones from Chicago to Jacksonville on Flight 1 of October 28. Obviously, it would not be possible to actually go out to the airplane and attach a note to one of the seats saying: "Reserved for use of Mr. Jones, etc." In fact, the air line didn't agree to reserve a particular seat for Mr. Jones—they simply agreed to reserve a seat.

Because something is needed to remind the air line of their agreement, a "reservations record" is created. Figure 2 is an example of such a record. Note that it contains various spaces for the pertinent items of information.

The primary function of this record is to verify

Figure 1. The complete system timetable published by an imaginary air line, "Armour Air Lines, Inc."

ARMOUR AIR LINES, INC.				
COMPLETE SYSTEM TIMETABLE - EFFECTIVE OCTOBER 24, 1957				
DAILY FLIGHTS BETWEEN CHICAGO AND MIAMI, VIA INTERMEDIATE CITIES - 60 PASSENGER "DELUXE EAGLES" - PRESSURIZED AND AIRCONDITIONED.				
SOUTHBOUND FLIGHT NO. 1			NORTHBOUND FLIGHT NO. 2	
9:00A. CDT	LV.	CHICAGO - MIDWAY	AR.	12:05A. CDT
10:17A. CDT	AR.	LOUISVILLE, KY.	LV.	10:50P. CDT
10:40A. CDT	LV.	LOUISVILLE, KY.	AR.	10:30P. CDT
12:04P. EST	AR.	ATLANTA, GA.	LV.	9:05P. EST
12:30P. EST	LV.	ATLANTA, GA.	AR.	8:36P. EST
1:44P. EST	AR.	JACKSONVILLE, FLA.	LV.	7:20P. EST
2:10P. EST	LV.	JACKSONVILLE, FLA.	AR.	6:56P. EST
3:36P. EST	AR.	MIAMI, FLA.	LV.	5:30P. EST

From a paper presented at the 4th Computer Applications Symposium, sponsored by Armour Research Foundation of Illinois Institute of Technology, Chicago, October 24-25, 1957.

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			A		
ACTION BY	FLT. DATE	STATUS	PTY. OF DEST.	RQ.-RQRP.-CFMD.-CNLD.	
SIG./EA.	WAS ON	TOTAL FARE	FIRMED		
FORM T310A	NOW ON	CNLD. BY	AGT. TIME DATE	2	1200-24
			AGT. TIME DATE		

Figure 2. A "reservations record."

the existence of an agreement with Mr. Jones and the details of that agreement. Closer examination of the record will reveal that no specific seat is mentioned, such as Seat 3, Row 5—only the quantity of seats involved is recorded.

While "Armour" was busy making a reservation for Jones, other agents of the air line in Louisville, Atlanta, Jacksonville, and Miami were also making reservations for Mr. Smith, Mr. Brown, etc.

Unless some safeguards are established to prevent it, there is a very real danger that "Armour" will one day find itself in the position of having agreed to carry 61 passengers, or more, in a 60-passenger airplane. If this occurs, they will have caused what is referred to as an "oversale" and greatly inconvenienced those individuals who were refused passage.

Tool needed to attain three objectives

Fundamentally, the tool which is needed here is some means of coordinating the sales and the cancellations of the various offices so that three basic objectives may be attained:

- (1) To so control sales as to render it virtually impossible to "oversell."
- (2) To minimize the quantity of space which is "in flow" and, thus, not available for sale.
- (3) To supply the company agents with an immediate and complete knowledge of what space is available for sale so that all potential customers may be "signed up" without delay.

These three objectives point to the requirement for a centralized inventory record which might take the form indicated in Figure 3, a form of ledger with each page containing the inventory record for one flight for one day. All records concerning a particular flight number are bound in a single ledger, the consecutive pages in each ledger containing the records for consecutive days.

The form consists of three sets of grids, each grid representing a third of the capacity of the airplane. Within each grid, 20 vertical columns represent 20 seats; four horizontal rows represent the four legs of the flight—Chicago to Louisville, Louisville to Atlanta, etc.

In order that the central inventory may be kept up-to-date, a set of procedures is established whereby each telephone sales agent who makes a commitment to a potential customer will immediately report this "sale" to the inventory clerk. Upon receipt of the information, the inventory clerk will first select the proper ledger, flip the pages until the correct date is exposed, and then make a simple mark in an appropriate space on one of the grids.

As the inventory clerk continues to make marks and erase them in accordance with the reports he receives regarding sales and cancellations, he is doing something more than being a mere puppet: he is also noting, in a general way, the quantity of space remaining available for sale.

At some time, when the quantity of space available for sale begins to approach zero, the inventory clerk must notify all the sales agents to stop selling space on this particular "flight-date" (a particular flight on a particular day). Perhaps his "stop sales" order is further qualified; for example, it may only stop sales over the Chicago-Louisville leg, thus continuing permission to sell space south of Louisville.

Figure 3. Centralized inventory ledger with each page containing the inventory record for one flight for one day.

ARMOUR AIR LINES, INC.
CENTRAL INVENTORY

CHI - LOU	
LOU - ATL	
ATL - JAX	
JAX - MIA	
CHI - LOU	
LOU - ATL	
ATL - JAX	
JAX - MIA	
CHI - LOU	
LOU - ATL	
ATL - JAX	
JAX - MIA	

FLIGHT 1 OF 25

The inventory clerk also is called upon to exercise a degree of control. Consider the following situation: Flight 1 of November 16, a Friday, three weeks in the future, is becoming bottle-necked at Louisville due to heavy sales over the Louisville-Atlanta leg. This situation is graphically indicated in Figure 4.

Although there are 20 seats available from Chicago to Louisville, and the same from Atlanta to Miami, the Louisville to Atlanta leg has only five seats remaining available. From his experience, the inventory clerk knows that before the three weeks have elapsed there will be sufficient demand for Chicago-Miami travel to warrant his holding the five seats open.

His experience also tells him that if he permits these seats to be sold for short-haul travel, the flight will operate with many empty seats over a substantial portion of the route because there is not sufficient demand for the other short-hauls which would complement the first one.

The inventory clerk (now raised to the status of "control agent") issues a qualified "stop-sales" order which prohibits additional short-haul sales over the Louisville-Atlanta leg, but which permits long-haul sales which include travel over that leg.

As the date of flight approaches, it may become apparent that the long-haul demand will not be as great as anticipated; in this case the control agent will remove the sales restriction, and he will release

Figure 4. Inventory record for one flight for one day.

ARMOUR AIR LINES, INC. CENTRAL INVENTORY												
CHI-LOU	/	/	/	/	/	/	/	/	/	/	/	/
LOU-ATL	/	/	/	/	/	/	/	/	/	/	/	/
ATL-JAX	/	/	/	/	/	/	/	/	/	/	/	/
JAX-MIA	/	/	/	/	/	/	/	/	/	/	/	/
CHI-LOU	/	/	/	/	/	/	/	/	/	/	/	/
LOU-ATL	/	/	/	/	/	/	/	/	/	/	/	/
ATL-JAX	/	/	/	/	/	/	/	/	/	/	/	/
JAX-MIA	/	/	/	/	/	/	/	/	/	/	/	/
CHI-LOU												
LOU-ATL	/	/	/	/	/	/	/	/	/	/	/	/
ATL-JAX												
JAX-MIA												

FLIGHT 1 NOV. 16

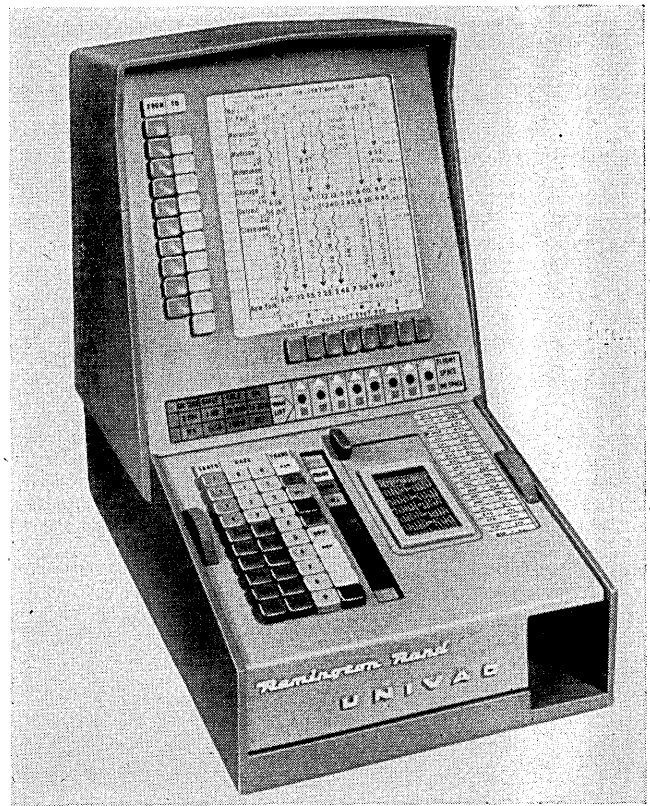


Figure 5. The "Agent Set," basic input-output device which will be operated by sales agents who will be in direct communication with the computer through this machine.

seats to Louisville for sale to potential customers whose names and telephone numbers have been listed for just such an eventuality.

In the description up to this point, two activities have been taken for granted which cannot be so lightly regarded in real life. The first was the requirement that the sales agents report sales and cancellations to the central inventory; the second was the requirement that the control agent at central inventory must sometimes notify all sales agents to stop sales on a certain flight-date over certain legs.

Both of these activities demand very fast communications—therefore, very expensive communications—between the sales agents and the control agent if the company is to realize their three objectives of preventing oversales, minimizing space "in flow," and equipping their sales agents with a full knowledge of space availability.

From an imaginary, to a real, air line

Let the reader move now from the imaginary air line to a real air line, and attempt to visualize or to comprehend the degree of complexity which results from multiplication of these simple elements.

Instead of having reservations offices in five cities, we have 99 such offices throughout the Eastern half of the United States, including two in Canada, one in Bermuda, one in San Juan, Puerto Rico, and one in Mexico City.

Instead of two flights per day, we have 400 flights per day. Instead of operating 480 "seat-legs" (meaning one seat over one leg of a flight) per day, we operate approximately 80,000 seat-legs per day.

Over 100 control agents are entering hundreds of thousands of tally marks per day, and issuing sales restriction messages at the rate of better than one a minute. Availability information must be distributed to 2,000 sales agents. Hundreds of people are engaged in various communications activities.

The only things which have retained their clear simplicity are the three objectives: no oversales, "in flow" space minimized, and full availability.

Univac File-Computer to solve problem

Our problem has been stated, I believe, as completely as is practicable. We propose to begin solving this problem through the use of a medium-size, general purpose, digital computer—the Univac File-Computer.

The computer will perform the functions of the control agent. In the magnetic drums of its general storage system, there will be contained the equivalent of our "central inventory" records. Instead of

tally marks, the drums will store digits representing the sum of the marks.

The computer will issue reports to supervisory personnel when the quantity of space remaining reaches a predetermined level. It will reject short-haul sales, which would result in inefficient utilization of space, and will make note of this unsatisfied demand, later reporting to the interested offices the availability of space to accommodate this demand.

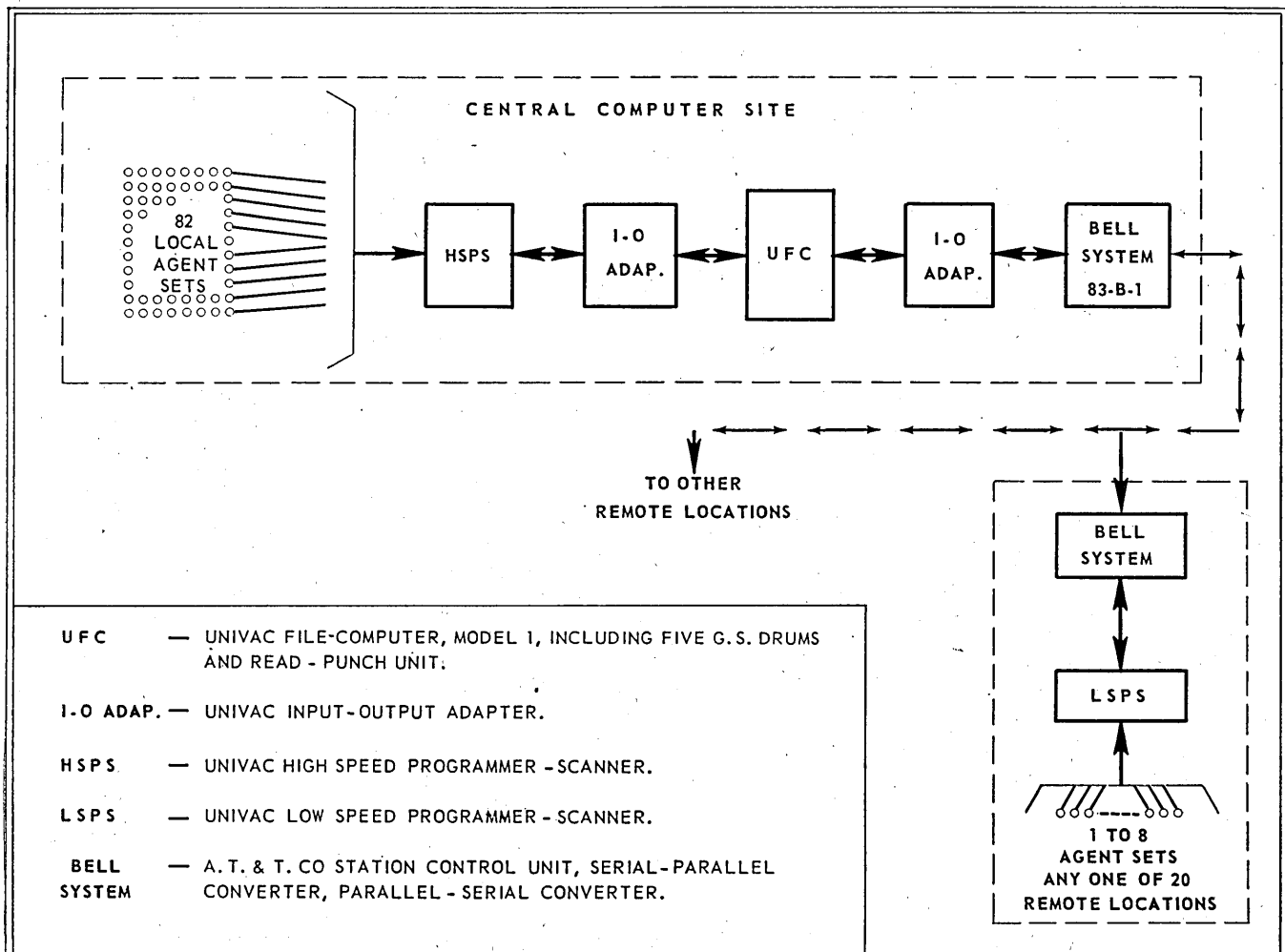
The computer will answer thousands of inquiries per hour regarding the availability of space, handling each such inquiry in less than a second and sometimes as fast as a tenth of a second.

Figure 5 displays a picture of the basic input-output device which will be operated by the sales agents who will be in direct communication with the computer through this machine which is called the "Agent Set." The unit pictured is the hand-made, pre-production prototype which was completed three months ago.

In demonstration tests at St. Paul in August, this set was used to communicate with a Model "O" File-Computer for querying availability, updating availability records, asking questions about the arrival time and departure of flights, and updating flight information.

Operation of the Agent Set is exceedingly simple and substantially fool-proof. By operation of a knurled wheel, the sales agent will move a film cartridge containing 30 photographic film slides

Figure 6. Representation of manner in which various pieces of equipment are interconnected to form a completely-integrated data-processing communications network.



until the desired slide is in position. Continuing the the same hand motion, the agent will operate a lever which turns on a projection lamp and moves the desired slide into the light beam.

The projected image appears as an air line timetable on the viewing screen on the upper portion of the set. In another application, the projected image might contain any of an almost-unlimited number of representations, such as personal signatures, images of people, description of machine parts, clothing, groceries, fingerprints.

The projected image is flanked on the left and at the bottom by rows of buttons. In our system, these will be used to select origin and destination of desired travel and, if required, the specific flight intended. On the lower panel, the various keys will be used to select the month, day of the month, number of seats, and the type of transaction.

Agent Set to perform following activities:

The sales agent will use the Agent Set to perform the following activities:

(1) To determine availability of space on as many as eight distinct flights at a time. The number of flight legs involved on any of the eight flights does not reduce the number of flights for which replies will be received.

(2) To sell space and cancel space, causing the immediate adjustment of the inventory, immediate signal to the agent that the transaction has been completed, and automatically initiating the automatic preparation of any supervisory reports which are to be prepared if this adjustment should cause the inventory to pass a marked boundary.

(3) To add to and subtract from an auxiliary central inventory which records the quantity of unsatisfied demand for travel.

(4) To determine the current operating status of today's flights in relation to the published schedule. Instantaneous replies will indicate whether a flight is on time, early, late, or cancelled, and when appropriate the amount of time and the reason for the departure from published schedule.

The Agent Set has been designed to cooperate with an accessory device, now under development, which would cause an electrical interlock and a data interlock between the individual reservations record and the transaction which adjusts inventory. We look for the addition of this accessory about 1960.

Protective devices in the Agent Set and its associated equipment, as well as in the computer program, provide safeguards against operator error and equipment error.

Figure 6 is a representation of the manner in which the various pieces of equipment are interconnected to form a completely-integrated, data-processing, communications network.

The box labelled UFC is the Model 1 Univac File-Computer which is really housed in several cabinets. Our system will use five magnetic drums in the general storage section with a storage capacity for 900,000 alpha-numeric characters. A read-punch unit will be used to process punched cards for the preparation of future inventory and the shared-time

processing of statistical and management reports.

The box labelled HSPS represents three devices called High Speed Programmer-Scanner which link the local Agent Sets to the I-O Adapter and thence to the computer.

To the right, various other boxes show the linkage to the remote locations. Travelling away from the computer, one passes through an I-O Adapter to the data-processing communications system by way of direct electrical connection.

This is a ten-character-per-second, five-channel code, selective system leased from the A.T.&T. Co. It is known as the "83-B-1 system, modified for use with the Univac File-Computer."

At each of the remote locations, one leaves the Bell System and enters a Univac device called the Low-Speed Programmer-Scanner, and from there on into the individual Agent Sets.

System scheduled for service 22 hrs. per day

The system will be scheduled for service 22 hours per day, seven days per week. It will serve approximately 125 Agent Sets including five in Chicago, two in Washington (D.C.), 35 in the various ticket offices in the New York Metropolitan area, and the balance at the central computer location in New York. Service will begin in June 1958.

Expansion is anticipated to a total of nearly 600 Agent Sets distributed among the busier cities on the system by 1959.




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Circle 3 on Reader Service Card

Decisive Breakthrough in Computer Economics

Despite vaulting technological advances, the electronic computer industry has been frustrated in the past by a major unsolved problem—high cost. “Giant” data processing systems are priced in the millions, requiring that the user extend his payout period over several years or even a decade.

Many customers who installed medium-priced computers two and three years ago have outgrown them—yet cannot justify a significantly greater investment than they made before. As a result of this economic dilemma, hundreds of business and scientific organizations with a definite need for automatic data processing have given up their attempts to scale the price wall.

Recently, encouraging news both for computer prospects and users came out of Pasadena, Calif. The ElectroData Div. of Burroughs Corp. announced its Datatron 220—first medium-priced digital computing system with full magnetic core memory. Burroughs, world’s third largest computer producer, claims that the 220 marks a “de-

cisive breakthrough in computer economics” by offering for the first time the *capabilities of large-scale systems at half the price.*

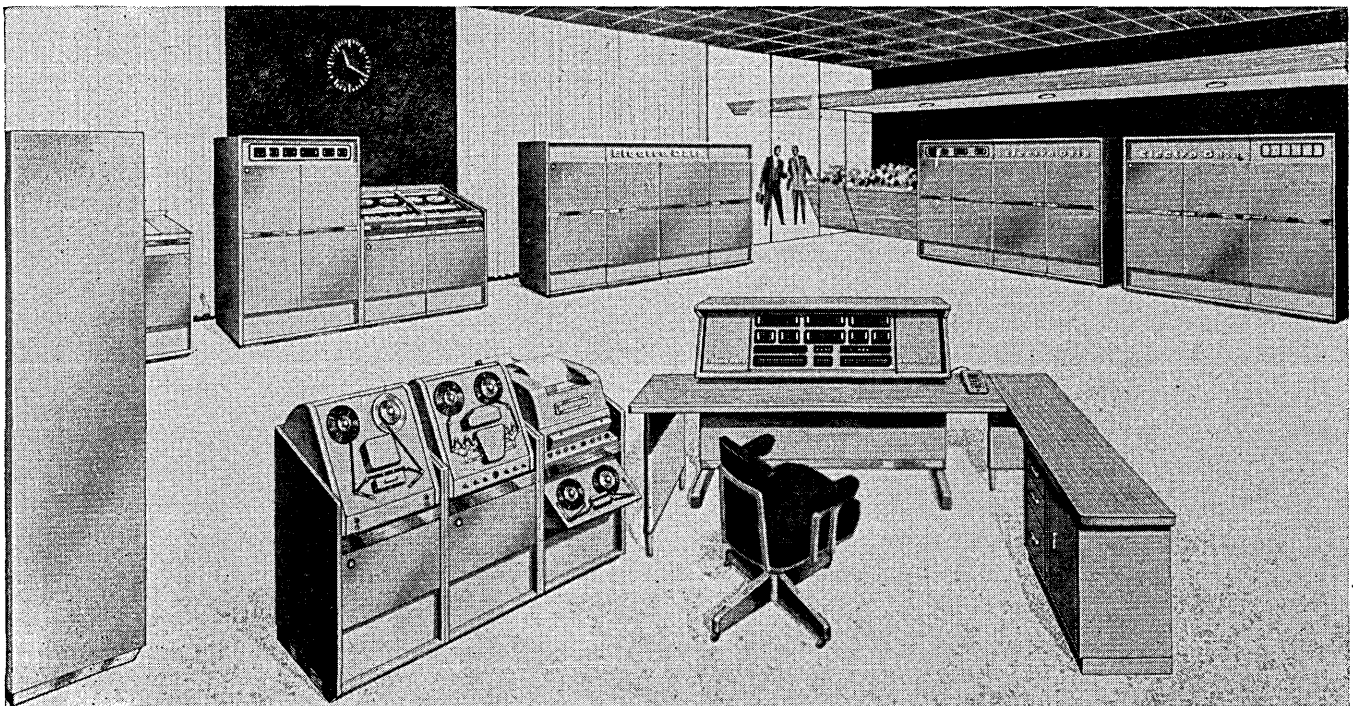
Now in production, the first Datatron 220’s will be delivered in mid-1958. Average cost, depending upon the magnitude of the system’s peripheral equipment, will range from \$325,000 to \$600,000. Vice-President James R. Bradburn commented that ElectroData expects the Datatron 220 “to accelerate the swing to electronic data processing by firms desiring quicker cost recovery than has previously been possible.”

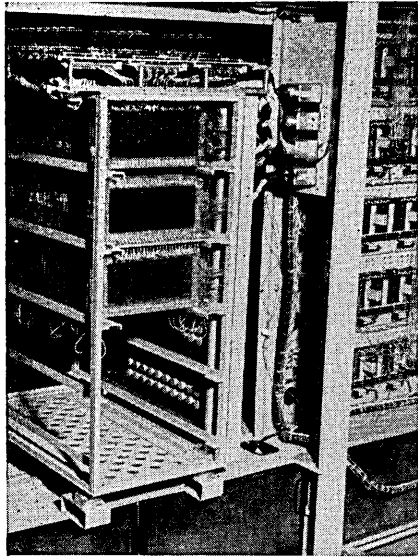
The new computer joins the Datatron 205 and E101 computers (of which over 200 are installed) in adding momentum to Burroughs’ competitive advance in the industry. Much of the system’s large-scale flexibility is drawn from an exceptional programming command structure. A total of 93 commands take full advantage of the high-speed core memory and multiplicity of input-output units.

Engineering and logical advances stemming from the proven circuitry of Datatron 205 have re-

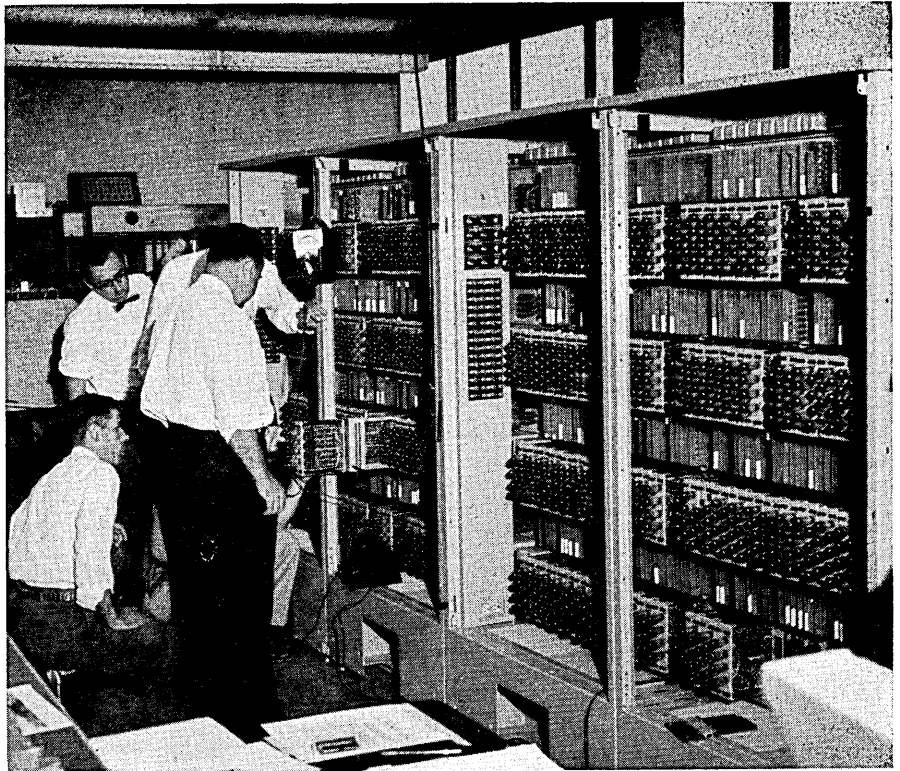
Typical layout of new electronic data processing system includes operator’s control console (center) flanked by high-speed paper tape input-output units and, around per-

imeter of room (from left), Cardatron punch-card system, magnetic tape system, digital processor, expandable magnetic core memory unit, and magnetic power supply.





(above) Stacks of core planes are shown in 220's memory cabinet.



(right) Part of Datatron 220's central processor gets check-out from engineers at ElectroData.

sulted in greater capabilities. The system combines large-scale computing abilities both for scientific problem-solving—where speed and data manipulation are critical—and business data processing, which requires volume capacity for automatic record handling.

Basic arithmetic speeds are over 300,000 additions or subtractions, 30,000 multiplications, and 15,000 divisions per minute. Up to 600-million characters of information can be filed electronically in the system—any record available in seconds for automatic computer processing.

Instrumental in the achievement of large-scale power is the integration into one system of the high-speed core memory, vast magnetic tape storage facilities, large repertoire of programming commands, and the full range of input-output “building blocks”—including punched cards, paper tape, supervisory printers, line printers, and keyboards.

These subsystem building blocks, together with an expandable memory, permit arrangement of the system to custom-fit any application—whether data reduction, equation solving, engineering design, insurance processing, accounting, billing, payroll, inventory control, statistical analysis, management forecasting, etc.

The computer's non-volatile ferromagnetic core memory is the heart of the system. The memory, housed in a separate cabinet from the data processor, is available in units of from 2,000 to 10,000 computer words (10 digits plus sign), in increments of 1,000. Any record in memory can be located in 10 microseconds.

The toroid, or “core,” is the memory's basic element. Its dimensions are 0.080” outside diameter, 0.050” inside diameter, 0.025” thickness. This diminutive doughnut-shaped magnet provides stor-

age space for the binary information required by Datatron 220.

Each of two memory units contains five groups of 44 planes apiece, with 1,000 computer words per group. Cores on each plane are interconnected by circuitry which transmits electronic impulses for access and storage. The five groups in each unit make up a miniature skyscraper of planes 22” high, 11” wide, and 7” deep.

The system's programming design includes 20 branching instructions, to permit a wide variation of conditions under which program control may be changed to new memory locations. Datatron 220 employs floating point arithmetic, partial-word operation, built-in index register for tallying and program modification, and an advance-design console which gives the operator complete control over the full system.

A maximum system consists of the data processor, 10 magnetic tape storage units (single-tape units or multiple-tape Datafiles), 10 local or remote paper-tape input stations, 10 local or remote typewriter or tape-punch output stations, and 7 punch-card readers, punches, and line printers.

The punched paper tape system provides a versatile link between the computer and universal commercial codes. Any of 10 photoreaders allows input of 1,000 alphanumeric characters per second. Output speeds are 60 characters per second by tape punch, or 10 characters per second by supervisory printer from any of 10 stations. A variable number of words up to 100 can be read at a single command. An inverse format feature permits the automatic transposition of data punched with the sign last. Paper tape code is seven-channel, single-frame alphanumeric design, with a recording density of 10 characters per inch.

Format control, scaling, editing, and translation between computer and data codes are all handled by the input-output subsystems. This design frees the central processor from "housekeeping" operations and allows it to proceed independently on productive work.

Exceptional high-volume file storage is obtained through the ElectroData magnetic tape system. Provided in single-tape reel units or 50-tape Datafiles, the dual-channel tape has a recording density of 208 digits per linear inch for each channel.

The tape travel speed, across the reading and writing heads, is 120" per second—enabling information transfer at the rate of 25,000 digits per second. Records can be of variable length, with many files contained on one tape.

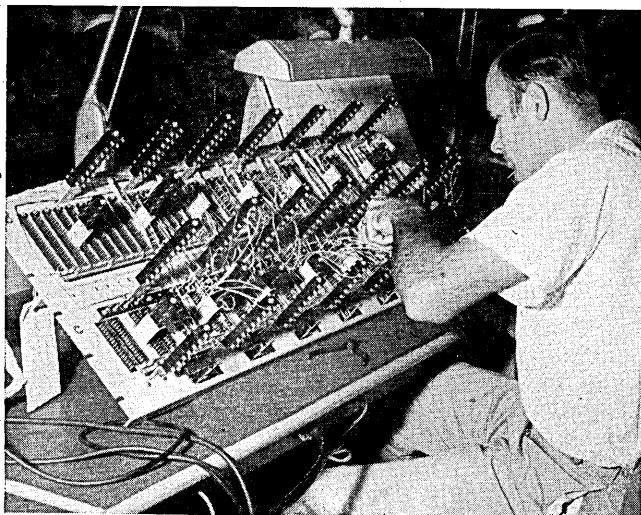
Maximum tape storage capacity, using 10 tape units, is 550-million characters. Reel units have a capacity of nearly a million words, and the Datafile bins can store 5-million words each. There are two means of tape searching. In bi-directional search, the first word of a tape record serves as the sorting key for conventional file maintenance. In uni-directional scanning, any one of the first 110 digits of a record can be recognized—permitting cross-filing within the established record framework.

The Cardatron input-output system used with Datatron 220 allows simultaneous, buffered operation of up to seven card readers, punches, and printers with the computer. By "splitting" the computer's D Register for information exchange between the computer and Cardatron units, transfer is extremely fast—up to 28 words of information in 10 milliseconds.

Datatron 220 is the latest in a series of engineering "firsts" by ElectroData. Its Cardatron input-output system, introduced last year, made possible for the first time the manipulation of punch-cards rapidly enough to take full advantage of the computer's speed.

The Datafile multiple magnetic tape system, also announced in 1956, created a new dimension in electronic filing—placing hundreds of millions of

Assembling a section of the 220's memory circuitry.



facts on instant computer call. Use of multiple tapes produced far greater file flexibility than was previously attainable with this medium.

The ElectroData Div. of Burroughs Corp. shipped its first computer system in June of 1954. The firm currently produces one Datatron system every 5 days at its 250,000-sq. ft. Pasadena plant. Employing some 1,800 persons, ElectroData maintains sales and service offices in 20 metropolitan centers through the U.S. and Canada. Burroughs Corp. recently purchased 160 acres in Santa Ana, Calif., for further expansion of the Division.

Circle 103 on Reader Service Card

R-W develops new airborne computer

The Ramo-Wooldridge Corp., Los Angeles, Calif., has announced that its Computer Systems div. has developed a new digital airborne computer that is designed to provide a light-weight, compact computing-control center for high-performance military aircraft.

The completely-transistorized device, designated the RW-30, employs specially-designed digital computing techniques, and will perform all computations for navigation, fire control, bombing and weapons control with the speed demanded by modern weapon systems.

The RW-30 was designed and built by Ramo-Wooldridge Computer Systems div. in a program undertaken in late 1954 under a development contract with the Air Arm div. of Westinghouse Electric Corp. at Baltimore.

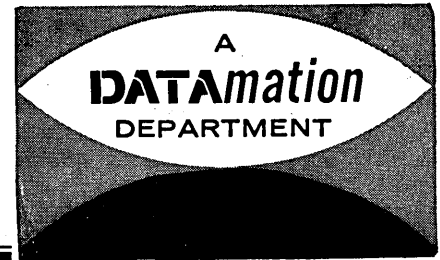
Objective of this program, just completed, was to develop a system which would perform reliably in an environment of planned future military aircraft—one which possesses a high degree of flexibility, and minimize size, weight, and power consumption.

The new control computer combines computation speed with reduction in size, weight, and power consumption. The complete computer has a volume of 4.19 cubic feet and weighs only 203 pounds. It consists of four separately-packaged units: magnetic drum storage unit, arithmetic and control unit, input-output unit, and clock generator and power supply unit.

Subminiaturized packaging techniques and silicon semiconductor circuitry are used throughout. Described as the fastest airborne magnetic drum computer in operation today, the RW-30 can conduct 4,000 complete arithmetic operations per second, including access time, and requires only 400 watts of power, permitting a significant saving in aircraft auxiliary power equipment.

Circle 104 on Reader Service Card

BOOK REVIEWS



Office Automation (3rd Edition), and **Updating Service**, by R. Hunt Brown, Automation Consultants, Inc., 155 Fifth Ave., New York City 10, 500+ pp., illus., \$37.50 ea.

"Office Automation," an important time saver for users or potential users of automated office machines and systems, is a classified handbook that clearly describes (1) what every known automated machine will accomplish, (2) where it is most valuable, (3) why it was developed, (4) how it operates, (5) who manufactures it, and (6) the price.

Compiled in loose-leaf form, it allows for revisions and additional information provided by its companion, "Updating Service," which consists of monthly supplements with up-to-date pages describing and illustrating new equipment and systems. Yearly subscriptions to the latter total a minimum of 200 supplementary or revised pages.

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Company Investigations of Automatic Data Processing, by Peter Laubach, 1957, Harvard University, School of Business Administration, Boston 63, Mass., paperbound, \$3.00.

This book reports the results of one of a series of studies conducted as part of the data-processing research project of the Harvard Business School. This project was started in 1954 and will continue indefinitely. It is concerned with data-processing systems used by business organizations, with the management use of information flowing out of these systems, and with automatic equipment developed for use in these systems.

Mr. Laubach's study is a report of what businessmen are doing. It is limited to a discussion of the approaches taken by various companies in investigating their data-processing needs to determine what, if any, automatic equipment should be acquired. Analogous administrative problems might arise in connection with installing new equipment and new systems and in their operation.

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Notes on Analog-Digital Conversion Techniques, prepared by staff members of the M.I.T. Servomechanisms Laboratory, edited by Alfred K. Susskind, 1957, The Technology Press of Massachusetts Institute of Technology, 40 Mass. Ave., Cambridge 39, Mass., 417 pp., illus., bibliographical references, \$10.00.

This book is developed from an informal set of notes prepared in 1956 for the first M.I.T. Special

Summer Program on Analog-Digital Conversion Techniques, a program which attracted considerable attention outside the Institute. This year's edition, completely rewritten and expanded for the 1957 Summer Program, has been formally published by The Technology Press in order to make it more generally available.

Designed for the practicing engineer, this book provides the necessary background for readers who do not have previous experience in the field. It includes: an introduction to the theory of sampling, quantizing, and coding; detailed analysis and evaluation of basic coding and decoding methods for electrical and mechanical analog quantities; and a case study showing how basic principles were applied in a digital flight-test instrumentation system.

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Dynamic System Studies (Part 5): Analog Computation, by F. W. Brattan, Naval Ordnance Laboratory for Wright Air Development Center, U.S. Air Force, Sept. 1956 (Order PB-121578 from OTS, U.S. Dept. of Commerce, Washington 25, D.C.), 78 pp., \$2.00.

This report describes recently-developed (to 1956) analog computer components and systems and their characteristics. General purpose computers are considered, and future developments in the systems and their components are anticipated. Sections also cover commercially-available analog computing equipment, operating characteristics of the Reeves analog equipment, measurement techniques, and analysis of an operational amplifier.

—br—

Dynamic System Studies (Part 6): Operation & Maintenance Procedures for Analog Computers, by W. R. Allen, University of Chicago for Wright Air Development Center, U.S. Air Force (Order PB-121792 from OTS, U.S. Dept. of Commerce, Washington 25, D.C.), 126 pp., \$3.25.

This volume contains a detailed discussion of analog computers, from basic philosophy of the devices to their final useful application. The report is primarily concerned with the electronic differential analyzer. Information is provided for setting up problems, checking problem setups or solutions, analyzing computer solutions, examining the operating staff, and deciding on maintenance procedure. Appendices discuss special computer techniques, a mathematical model useful in setting up spare parts inventories, and fast-time computers.

eastern joint computer conference
december 9 thru 13, 1957
washington, d.c. . . .



Computers with Deadlines to Meet

For the past six years, joint conferences sponsored by IRE, ACM, and AIEE on the East and West Coasts have provided the computer world's most valuable forum for the exchange of ideas and experiences among designers, producers, and users.

Behind the Eastern Joint Computer Conference theme for 1957 is the idea that modern automatic control and simulation systems are assuming a structure like that of an elementary organism, with its feelers, its action members, and its central nervous system.

Often, in our automatic systems, one can identify a trio of sub-systems that function in a similar way—the “receptor,” the “effector” and, for the central nervous system, a computer. Whenever the pace of receptor and effector set the tempo of the machine system, there is a permissible time for data to get through the computer.

Computers that can meet such “deadline” requirements, usually called “real-time” or “on-line” computers, are growing very rapidly in importance. For this reason, the theme *Computers with Deadlines to Meet* is the common denominator which runs through the wide range of computer problems and applications to be discussed in the nine sessions and 50 presentations of the 1957 Eastern Joint Computer Conference to be held December 9-13 at the Sheraton Park Hotel in Washington, D.C.

It is not necessary to belong to one of the sponsoring societies to attend the Conference; *non-members are cordially invited*. Advance registration fee: \$4.00; registration after November 25 (by mail or at the Conference): \$5.00. Registration Chairman: Richard T. Burroughs, IBM Corp., 1220 Nineteenth St., N.W., Washington, D.C.

Technical Sessions Program

December 9—10:00 am to 12:30 pm

I. Industrial Control Computers & Instrumentation

The Electronic Phase Shift Decoder, by G. T. Moore, Concord Controls, Inc. Digital-to-analog conversion is a necessary step in continuous position control systems which employ digital signals. One form of digital signal is a train of “command” pulses where the controlled position must change by a fixed increment in response to each “command” pulse. This paper describes a decoder in which two chains of flip-flops operated as counters derive the signals transmitted to a receiving synchro serving as the position feedback device.

Systems Design of a Numerically-Controlled Machine Tool, by E. C. Johnson & Y. C. Ho, Bendix Aviation Corp. The primary objective of a numerically-controlled machine-tool system is direct production from engineering data of finished machine parts with high accuracy and little human effort. A system concept comprising a small general-purpose digital computer with a flexible automatic programming system and, linked by means of a punched tape, the machine tool and control unit combination is presented.

Logical Organization of the Digimatic Computer, by J. Rosenberg, Electronic Control Systems, Inc. Initially, specifications for input data to the Digimatic computer were formulated, and output requirements determined. The black box to bridge between input and output with adequate speed, complexity, cost, and built-in programming characteristics is described in block diagram form. A short film demonstrating input and output operation will be shown, as well as machine pieces produced.

The Master Terrain Model System, by J. A. Stieber, U. S. Naval Training Device Center. An automatic data reduction system which will extract three-dimensional contour infor-

mation from maps of various projections, serial stereo photographs, or existing master models, and store these data in a universal format is described. Now in prototype production, it consists of a map scanning unit, a recording and playback unit, and a contour cutting mechanism, all controlled by digital computers.

2:00 pm to 5:00 pm

II. Industrial Control Computers & Instrumentation

A Coordinated Data Processing System & Analog Computer to Determine Refinery Process Operating Guides, by C. H. Taylor, Fisher & Porter Co. The design features and operation of a special-purpose analog computer for Esso Research & Engineering Co. are described. The computer has been automatically programmed to sequentially determine a series of Process Operating Guides. Although it is not dynamically varying process set points, the calculated data should lead to a better understanding of refinery performance.

System Characteristics of a Computer-Controller for Use in the Process Industries, by W. E. Frady & M. Phister, Jr., Ramo-Wooldridge Corp. Studies have been carried out with the objective of developing digital control systems for specific operations in the process industries. The requirements common to all these control systems are discussed, and a set of computer-controller characteristics which satisfy these requirements described. The RW-300 computer-controller, especially designed for process control applications, is also described.

Real-Time Hybrid Computers for Electronic Control Systems, by C. T. Leondes, University of Calif. The more unified point of view of considering both analog and digital elements has been recently evolving as a concept in the design of electronic control systems. A critical study of the field

of hybrid computers with a statement of some of the outstanding problems and their solutions is presented as well as a description of a new mechanization for control systems.

Real-Time Presentation of Reduced Wind Tunnel Data, by M. Bain & W. Hoover, California Institute of Technology, JPL. The Jet Propulsion Laboratory has two supersonic wind tunnels in operation, and one hypersonic wind tunnel under construction. The ability to save wind tunnel operating time by monitoring reduced coefficients has stimulated the plans for a data processing system to supply reduced data in real time. This paper presents the proposed JPL data handling and computer system for real time presentation of wind tunnel data.

Mechanization of Letter Mail Sorting, by I. Rotkin, National Bureau of Standards. Mail processing in the U. S. post offices today is almost entirely manual. This paper describes a study of the sorting of letter mail with the objective of mechanizing this operation, and discusses the system features of sorting equipment in development. The operation of the four basic units—code printer, code reader, translator, and distributor—is presented as well as the systems and engineering problems encountered.

December 10—9:00 am to 12 noon

III. Traffic Control, Navigation & Surveillance

Preparation for Tracking an Artificial Earth Satellite at the Vanguard Computer Center, by D. A. Quarles, Jr., IBM Corp. An IBM 704 is in use at the Vanguard Computing Center to perform calculations for tracking artificial earth satellites launched during the International Geophysical Year. Deadlines pertain to processing the observational data and to distributing predicted position information. Principal aspects of the structure and operational characteristics of the programming system are described.

Use of a Digital Computer for Airborne Guidance & Navigation, by S. Zadoff & J. Rattner, Sperry Gyroscope Co. Following a general statement on the use of digital computers in control loops and a brief statement as to the range of requirements of such computers, particular emphasis is placed on the application to Cytac, an airborne long-range all-weather tactical bombing system. The computer in Cytac is used as a guidance computer, as a system component, and as a source automatic bombing information.

Experimentation on the Human Operator Tie-In to an Airborne Navigation Computer Control System, by C. A. Bennett, IBM Corp. In an airborne navigation system, the human operator recognizes and essentially tells the computer to correct location errors indicated on the topographical display. Such tracking has typically involved continuous display from analog computers in the system. A series of experiments to determine the optimum solution rate by digital computers for periodic display will be described.

Multi-Weapon Automatic Target & Battery Evaluator, by A. E. Miller, Burroughs Corp. This paper will present the operational organization of the Matabe with respect to the real-time air defense system for which it was designed. The types and methods of computation of this large-scale digital computer, probably the first whose design was tailored to effect a control function, will be discussed, together with related topics.

Control of Automobile Traffic—A Problem in Real-Time Computation, by D. L. Gerlough, University of Calif. The principal deterrent to the great and increasing need for urban traffic control on an area basis by means of a computer has been lack of knowledge of traffic flow behavior. Simulation has been considered as a computational technique for real-time control and as a laboratory tool. The research to date, both theoretical and by simulation, is reviewed and areas requiring further research are indicated.

2:00 pm to 5:30 pm

IV: Simulation in Real Time

Physical Simulation of Nuclear Reactor Power Plant Systems, by J. J. Stone, B. B. Gordon & R. S. Boyd, Battelle Memorial Institute. The operating characteristics of a hy-

draulically-controlled nuclear reactor power plant were analyzed by simulation methods. This study which involved complete electronic simulation followed by a physical mock-up of the hydraulic control system coupled with an electronic simulation of the remaining parts of the system is discussed.

Application of Computers to Automobile Stability & Control Problems, by R. H. Kohr, General Motors Corp. Research has resulted in a verified mathematical model which describes the lateral rigid-body motions produced in an automobile by steering control inputs. The system of equations representing the "handling motions" of an automobile on a flat road is presented together with a description of methods used to verify them by means of full-scale response tests made with an instrumented vehicle.

Combined Analog-Digital Simulation of Sampled Data Systems, by H. K. Skramstad, A. A. Ernst & J. P. Nigro, National Bureau of Standards. Many complex control systems have the common characteristic that they are closed-loop sampled-data systems involving human beings in control loops. While ordinary analytical means have proved inadequate, simulation is proving an effective tool in their study. A simulation facility which inter-connects the digital computer Seac, an analog computer, and human-operated display and control equipment is described.

Facilities & Instrumentation Required for Real-Time Simulation Involving System Hardware, by A. J. Thiberville, Convair. This paper describes real-time simulation as used in closed-loop testing involving system hardware. Primary emphasis is placed on the hardware and associated instrumentation required. The discussion is general in nature, but evolved primarily from experience with testing B-58 systems.

Extending Flight Simulator Time Scale, by E. J. McGlinn, Bendix Aviation Corp. The Bendix Three-Dimensional Flight System Simulator is a device developed specifically for simulating high-performance air-to-air missile systems. Although the dynamic range of its three-axis flight table exceeds 1,000:1, some applications require performance on the low side of the range. Two techniques for extending the range into the lower dynamic performance region are presented.

Analog, Digital & Combined Analog-Digital Computers for Real-Time Simulation, by W. W. Seifert, Massachusetts Institute of Technology. For simulation of dynamic systems, analog and digital computers have disadvantages as well as advantages. For complex dynamic problems, analog techniques have the advantages of speed and direct analogy, with principal drawbacks of limited accuracy and the difficulties arising in problem changeover. Digital machines have high accuracy and quick changeover but require long solution time. The several developments of computers especially designed to meet the needs of real-time simulation are described.

December 11—9:00 am to 12:30 pm

V: Synthesis of Real-Time Systems

The Place of Self-Repairing Facilities in Computers with Deadlines to Meet, by L. Fein, Consultant. When the time available to do a job equals the time required for computer solution, the equipment is required to operate in real-time. For problems like this, which essentially require 100% equipment reliability, down-time must be zero. Automatic error detection, automatic failure diagnosis, and automatic failure repairing (self healing) philosophies and techniques that may effectively reduce computer down-time to zero will be discussed.

Organizing a Network of Computers to Meet Deadlines, by A. L. Leiner, W. A. Notz, J. L. Smith & A. Weinberger, National Bureau of Standards. This paper discusses some system requirements that are imposed on computers by the need to meet deadlines. It describes logical techniques for hooking together two or more digital systems into a network of computers, so that all of the machines in the network can be made to work collaboratively on a job that is beyond the capability of any single machine.

A Program-Controlled Program Interrupt System, by F. P. Brooks, Jr., IBM Corp. To facilitate real-time operation of a new large-scale computer system, an instruction con-

trol system has been designed which permits automatic interruption of the computer program upon occurrence of any of a large number of conditions. Special provisions are also described that permit interruptions of interruptions to occur without causing program confusion.

A Transistor Circuit Chassis for High Reliability in Missile Guidance Systems, by G. A. Raymond, Remington Rand Univac. The ground guidance computer for an intercontinental ballistic missile requires an entirely new order of magnitude of freedom-from-error. Significant features of its circuit design are explained, and the engineering and manufacturing operations that result in such circuit reliability are described.

A Method of Coupling a Small Computer to Input-Output Devices without Extensive Buffers, by J. H. Randall, National Cash Register Co. A system is described in which a small magnetic core memory was synchronized to the communication devices, thus eliminating expensive buffering. The input and output involved magnetic ledger cards, an accounting machine, and punched cards. Techniques used to transfer data between these sources and the computer are described.

The Optimum Synthesis of Computer Limited Sampled Data Systems, by A. S. Robinson, Bendix Aviation Corp. This paper discusses the synthesis of systems in which a single digital computer is used in conjunction with an array of outputs either to simulate the dynamic transfer characteristics of a number of linear continuous systems or to filter random messages from a number of continuous inputs. Although the computer operates on and supplies sampled data, the synthesis techniques assist the system designer in determining optimum match between the actual continuous system outputs and the ideal outputs.

2:00 pm to 5:00 pm

VI: Traffic Control, Navigation & Surveillance

SAGE—A Data Processing System for Air Defense, by R. R. Everett, C. A. Zraket & H. D. Bennington, MIT Lincoln Laboratory. SAGE is the data processing portion of our continental air defense system. Each of the 30 Direction Centers has its own computer in communication with a variety of terminal devices to maintain a current record of the sector situation for selective display. Major requirements, salient features, and the capability of SAGE data processing are described.

AN/FST-2 Radar Processing Equipment for SAGE, by H. W. Taylor, E. W. Veitch & J. Wylen, Burroughs Corp. The AN/FST-2, designed to operate as part of the SAGE system, is a computer that receives radar data, processes it, and transfers the processed data to the Direction Center. In order to handle data that varies unpredictably in amount and structure, a special-purpose machine was designed. The paper discusses its design and operation.

Operation of the SAGE Duplex Computers, by P. R. Vance (MIT Lincoln Laboratory), L. G. Dooley (Rand Corp.) & C. E. Diss (IBM Corp.). Large-scale digital computers perform the routine control and data processing functions of the SAGE Direction Centers. Duplexed computers are provided to assure system reliability around the clock. This paper describes the functions of the standby computer and the process of transfer of the air defense function from the active computer to the standby computer.

A Digital System for Position Determination, by D. C. Ross, IBM Corp. A prime requirement in improving the nation's air traffic control system is the provision of frequent, accurate, and identified position information on all aircraft in the system. This paper describes a system which satisfies these requirements for all aircraft aloft on a single pair of radio frequency channels without infra-system interference. Flight tests of the radio communication portions of the system have been successfully completed.

Real-Time Data Processing for CAA Air Traffic Control Operations, by G. E. Fenimore, CAA Technical Development Evaluation Center. As a result of experimentation with a special-purpose message storage and processing system, requirements for an air traffic control system were developed and became the basis of a three-phase program for evolutionary improvements in air traffic control operations.

The first phase, now in the development and evaluation stages, is described and the objectives of the second phase reviewed.

December 12—9:00 am to 12:00 noon

VII: On-Line Business Systems

Design Techniques for Multiple Interconnected On-Line Data Processors, by F. J. Gaffney & S. Levine, Teleregister Corp. Three important characteristics of multiple interconnected on-line data processors are reliable performance, use of specialized input-output devices, and unusual communication design methods. The application of these techniques to several special-purpose data handling systems is discussed, and their importance to overall system performance analyzed.

Reservations Communications Utilizing a General-Purpose Digital Computer, by R. A. McAvoy, Eastern Airlines. This is a review of the reasoning leading to the design of Eastern Airlines' new reservation system. The installation represents one of the first applications of an intermediate speed general-purpose, digital computer to a real-time data processing application. The unique Ticket Agent Set (input-output device) and the communications facilities will also be described.

Stock Transaction Records, by A. H. Payne, Melpar, Inc. The output of the New York Stock Exchange Ticker (6-channel punched paper tape) is run through a converter to produce a paper tape input to the Datatron Computer. Hourly indices of the highs, lows, and last prices for 500 selected stocks are computed for Standard and Poor's Corp. and transmitted to their New York office via teletype.

On-Line Sales Recording System, by J. S. Baer, A. S. Rettig I Cohen, Radio Corp. of America. This paper presents an equipment description of a pilot on-line sales recording system consisting of point-of-sale units connected to a central computer by means of an input-output buffer unit. Its operating characteristics are such that they may be extended to include, for example, inventory and production control, and the handling of transportation reservations.

The G. E. Integrated Bank Data Processing System Model 2B100, by J. Levinthal, J. Weizenbaum & H. Herold, General Electric Co. This paper describes a new system evolved in converting the Erma prototype into production systems capable of meeting the stringent deadline imposed by banking applications. Characteristics of the data processor and the automatic electronic reading device are presented, and programming techniques for gaining operating speed are discussed.

2:00 pm to 5:30 pm

VIII: Digital Communications Techniques

Derivation of Business Machines Data Channels from Standard Telephone Lines for Simultaneous Transmission with Speech, by E. Hopner, IBM Corp. This paper describes the basic principle of how to derive data channels from regular telephone channels, allowing for simultaneous transmission of speech with little effect on the speech quality. Experiments have been carried out using up to four IBM data transceivers on a single telephone channel simultaneously with speech.

A Self-Checking System for High-Speed Transmission of Magnetic Tape Digital Data, by E. J. Casey & D. W. Fritze, Remington Rand Univac. The communications requirements of integrated data processing systems are discussed. Typical data origins, media, codes, formats, and quantities are considered; data processing, retransmission, and transmission speed and accuracy needs are briefly analyzed prior to a presentation of the logical design and specifications of the Transrecorder. Experimental results obtained in the laboratory and in phone channel tests are also given.

Communications Between Remotely-Located Digital Computers, by F. P. Forbath, Collins Radio Co. Communication between digital computers doing historical and real-time computations and between accounting type equipment

is required on a rapidly increasing scale. Limitations of data communications between remotely-located stations severely hamper the advancement in data transfer. Means of adapting the communication links to the stringent requirements of the computers are discussed, followed by a description of Kineplex system.

Communications Switching Systems as Real-Time Computers, by A. E. Joel, Bell Telephone Laboratories. Communication switching systems are probably the oldest known form of real-time digital data processing systems. This paper describes the similarities and differences between communication switching systems and digital computers, and then analyzes some of the design features which are made necessary in communication switching systems as a result of its real-time information processing aspects.

An Introduction to the Bell System's First Electronic Switching Office, by R. W. Ketchledge, Bell Telephone Laboratories. The first fully-electronic telephone central office will be put into experimental Bell System service in late 1959. The electronic switching system consists of electronic voice frequency switches controlled by electronic memory and logic. Operation of the system is outlined, and the characteristics of its components are described.

Traffic Aspects of Communications Switching Systems, by J. A. Bader, Bell Telephone Laboratories. To design a communications switching system which provides a satisfactory grade of service at minimum cost, an understanding of the nature of the offered traffic is necessary. This paper discusses the character of the input sources and the effect of service criteria on the capacity of the system. Traffic engineering methods with some examples are discussed.

December 13—9:00 am to 1:00 pm

IX: Document Reading, Pattern Recognition & Character Synthesis

The Use of an IBM 704 in the Simulation of Speech Recognition Systems, by G. L. Schultz, IBM Corp. The simulation approach to the problem of speech recognition requires the construction of a device to select speech events for study and an analog-to-digital converter to transform the acoustic speech signal into a digital representation for use in an IBM 704. This paper discusses the selection device, the analog-to-digital converter, and the set of calculator program thus far evolved.

An Automatic Voice Readout System, by C. W. Poppe & P. Suhr, Fairchild Controls Corp. Capable of being employed with either analog or digital computing systems, the Automatic Voice Readout System offers a new approach to the man-machine coupling problem in real-time computers. The basic system which consists of a vocabulary storage unit, a word sequence control unit, and an input control unit is described, and its application to real-time computers discussed.

Experimental Use of Electronic Computers in Processing Pictorial Information, by L. Cahn, R. A. Kirsch, L. C. Ray & G. H. Urban, National Bureau of Standards. An input device has been connected to the Seac computer which can digitalize a photograph and copy it into the Seac memory. Results of experiments in the analyses and syntheses of pictorial information using this equipment and output equipment which produces a photograph from Seac are given. Equipment capabilities, programming techniques, and areas of application are also discussed.

Optical Displays for Data Handling System Output, by J. Ogle, Burroughs Corp. The human being is still an important part of most computing and data handling systems and, consequently, there is a need for techniques for presenting information more efficiently and with greater interpretive reliability. Two specific devices are described which display digital information and prerecorded message or graphic information with maximum use of available display area.

Devices for Reading Handwriting Characters, by T. L. Dimond, Bell Telephone Laboratories. Nearly all business information processed by computers originates with humans. It is, therefore, desirable to provide inexpensive means to convert the original record to machine readable form. This paper describes methods and devices which permit machine

reading of handwritten arabic numbers and block letters, either as it is produced or later from the written record.

Automatic Registration in High-Speed Character Sensing Equipment, by A. I. Tersoff, Intelligent Machines Research Corp. A high-speed system for scanning and analyzing ordinary typewritten or imprinted information on documents is described. This system employs a high resolution mechanical scanner and photo multipliers to convert the optical image into electrical signals. A special locator circuit is employed in the character sensing system to provide automatic registration. Examples are given of its application to various character sensing equipment.

The NCR High-Speed Electromagnetic Printer, by J. M. Seehof, National Cash Register Co. Designed to operate in conjunction with an electronic data processing system at a rate of 1,000 to 10,000 characters per second, this device operates on the principle of recording a latent magnetic image on special paper, which is essentially magnetic tape with a white top coat. Technical problems involved in recording patterns of desired resolution and means of encoding directly from a computer are discussed.

E.J.C.C. EXHIBITORS

Alwac Corp.
Div. of Logistics Research, Inc.

AMP, Inc.

Ampex Corp.

Instrumentation Div.

Autonetics Div.

North American Aviation, Inc.

AVCO Research & Advanced Development Div.
AVCO Manufacturing Co.

Bendix Computer Div.
Bendix Aviation Corp.

Burroughs Corp.
ElectroData Div.

C. P. Clare & Co.

Computer Control Co., Inc.

Deltime, Inc.
Div. of Sealectro Corp.

Dynacor, Inc.
Div. of Sprague Electric Co.

Ferranti Electric, Inc.

Gawler-Knoop Co.
Berkeley Div., Beckman Instrument Co.

Hughes Aircraft Co.

International Business Machines Corp.

Potter Instrument Co., Inc.

Reeves Soundcraft Corp.

Remington Rand Div.
Sperry Rand Corp.

Rese Engineering, Inc.

Royal McBee Corp.

Soroban Engineering, Inc.

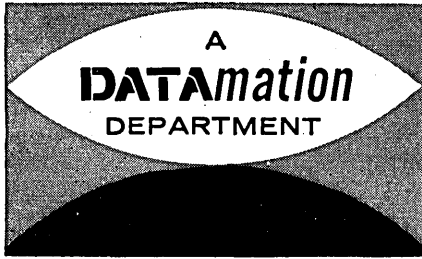
Sprague Electric Co.

Stromberg-Carlson Co.

Telemeter Magnetics, Inc.

The National Cash Register Co.

John Wiley & Sons, Inc.



PROGRESS & PROMOTION

Beckmar Instruments, Inc., Calif., has announced the following appointments: **Joseph W. Lewis**, assistant to the president; **William F. Kamsler**, product line sales supervisor, Systems Div.; and **Stanley F. Molner**, product lines sales supervisor, data handling equipment, Systems Div.

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Fischer & Porter Co., Hatboro, Pa., manufacturer of process instrumentation and data reduction systems, has announced the appointment of **Edward H. Muhleisen** as manager, Aircraft & Missile Industry.

Muhleisen joined Fischer & Porter in 1944 and has served in various capacities since then, including an assignment as application engineer for the aircraft industry from 1951 to 1953. Most recently, he was district manager of the Wilmington, Del., office.

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The appointment of **David E. Laughlin** as manager of the Digimatic Marketing Section of Electronic Control Systems, Inc., has been announced by **Leonard Mautner**, president of the company.

Electronic Control Systems,

Inc., the Los Angeles affiliate of the Stromberg-Carlson Div. of General Dynamics Corp., has recently formed a separate marketing section to handle Digimatic, a tape-controlled system for machine tools.

—p&p—

ElectroData, Div. of Burroughs Corp., Pasadena, Calif., has announced the following appointments: **Arthur R. Marshall**, engineering supervisor, Boston district; **Frank C. Mears**, field engineer supervisor, Los Angeles district; **James Ford**, central regional manager; **John T. Allen**, field engineering supervisor, Dallas, Tex.; **Robert E. Todd**, field engineering manager, New York district; and **W. H. Stewart**, manager, Seattle district.

—p&p—

International Business Machines Corp. has announced the appointment of **Robert P. Crago** as director of engineering for the company's Military Products Div., with headquarters in New York City. **Richard J. Whalen** has been named general manager of the division's plant at Kingston, N.Y., the post previously held by Crago.

Crago joined IBM in 1949 at

Poughkeepsie, N.Y., as a member of the electronics laboratory staff, and was appointed project engineer in 1951. Since 1953, he has held several managerial posts in connection with IBM's work on the Sage computer, and in 1955 was given responsibility for all IBM's air defense engineering activities.

Whalen joined IBM in 1946 at Poughkeepsie and was associated with the manufacture of electronic computers there until 1954 when he went to Kingston as plant superintendent. The following year he was appointed manager of engineering.

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Datran Electronics, Div. of Mid-Continent Mfg. Inc., Manhattan Beach, Calif., has announced the appointment of **Allen J. Edwards** as director of customer relations.

Edwards joins Datran after several years as standard sales manager of Coleman Engineering Co., and is well known in the fields of data transmission, analog-to-digital conversion, data processing, and automatic control.

—p&p—

Abe Osborn has been appointed staff engineer in charge of quality

Danforth W. Comins
Epsco, Inc.



Allen J. Edwards
Datran Electronics



Henry S. Forrest
Control Data Corp.



Joseph W. Lewis
Beckman Instruments



control for **Waters Mfg., Inc.**, Wayland, Mass. He will be responsible for all quality control in the manufacture of Waters precision potentiometers and trimmer pots.

In addition, Osborn will be director of the test laboratory of **Aerohm Corp.**, a Waters affiliate specializing in environmental and qualification testing of electronic components and devices.

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George V. Mueller, noted mid-west engineer, has been appointed to the motor design and development staff of **Robbins & Myers, Inc.**, Springfield, Ohio. He will serve as development engineer on a computer program for motor design by the Ohio firm, and will specialize in oscillography, electrical transients, and electrical machinery.

For the past 32 years, Mueller has been professor of electrical engineering at Purdue University. He is the author of two books, "Introduction to Electrical Engineering," and "Alternating Current Machines," and has contributed numerous articles on his field to leading publications.

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William C. Norris, president of **Control Data Corp.**, Minneapolis, Minn., has announced the following appointments: **Arnold J. Ryden**, vice-president, secretary, and treasurer; **Frank C. Mullaney**, director of engineering; **Willis K. Drake**, director of marketing; **William R. Keye**, associate director of engineering; **Robert N. Kisch**, **Robert L. Perkins**, **Howard**

Shekels, and **Seymour R. Cray**, senior technical staff members; and **Henry S. Forrest**, director of government service engineering and manager of the company's eastern office located in Washington, D.C.

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The Government & Industrial Div. of **Philco Corp.**, Phila., Pa., has opened a regional office in Washington, D.C., for marketing its large-scale transistorized computer, the Transac S-2000.

The company has also announced the appointment of **James M. Murray**, formerly a Washington representative for **Sperry Rand Corp.**, as regional manager of Transac sales.

During World War II, Murray was a navigation officer with the U.S. Maritime Service and, more recently, has served as a reserve officer with the Army Transportation Corps.

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Charles P. Quinn has recently become a member of the management staff of both **Grayhill, Inc.**, and **Grayhill Moldtronics, Inc.**, LaGrange, Ill. He will serve as administrative assistant to **Ralph Hill**, president.

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Dr. George H. Brown, nationally known engineer, has been appointed chief engineer, Industrial Electronic Products, **Radio Corp. of America**.

Since last January, Dr. Brown has served as chief engineer of the former RCA Commercial Electronic Products unit, which has

been incorporated in the new Industrial Electronic Products organization.

In his new capacity, Dr. Brown will have engineering responsibility for all RCA industrial equipment and systems, including broadcast, communications, and industrial electronic equipment, and computer, telecommunication, and industrial control systems.

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Danforth W. Comins, Jr. has joined **Epsco, Inc.**, Boston, Mass., as general manager of the Components Div. In his new position, he will be responsible for the design, production, and sales of Epsco's magnetic shift registers, computer logic elements, and precision delay lines.

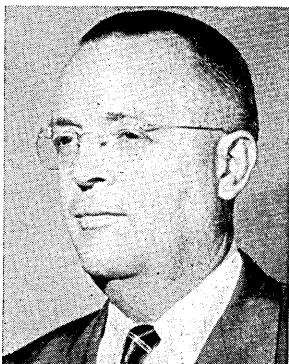
Comins, who holds a number of patents for the design of miniaturized electronic components, was previously associated with the Cambridge Thermionic Corp. where he was successively chief engineer and vice-president in charge of sales.

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Mid-Century Instrumatic Corp., New York City, has appointed **Wild & Associates, Inc.**, as Atlantic coast sales representatives for its line of analog computers and simulators including components and accessories.

Wild & Associates, Inc., Roslyn, N.Y., will represent Mid-Century in the following states: New York, Connecticut, New Jersey, Maryland, Virginia, Delaware, Washington (D.C.), and eastern Pennsylvania.

George V. Mueller
Robbins & Myers, Inc.



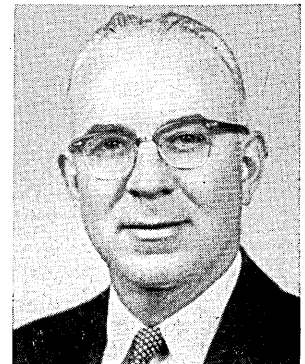
Edward H. Muhleisen
Fischer & Porter Co.



James M. Murray
Philco Corp.



Charles P. Quinn
Grayhill/Moldtronics



NCR electronic computer system at
University of Southern California to . . .

Speed New Research in Intelligence Measurement

Speeding new research in measuring man's intelligence is the first job given the electronic digital computer which was officially presented recently to the University of Southern California by the National Cash Register Co., Electronics Div. of Hawthorne, Calif.

D. E. Eckdahl, NCR division manager, made the presentation on behalf of Stanley C. Allyn, chairman of the board, with Dr. A. S. Raubenheimer, SC educational vice-president, and Dr. Robert Vivian, dean of the SC School of Engineer-

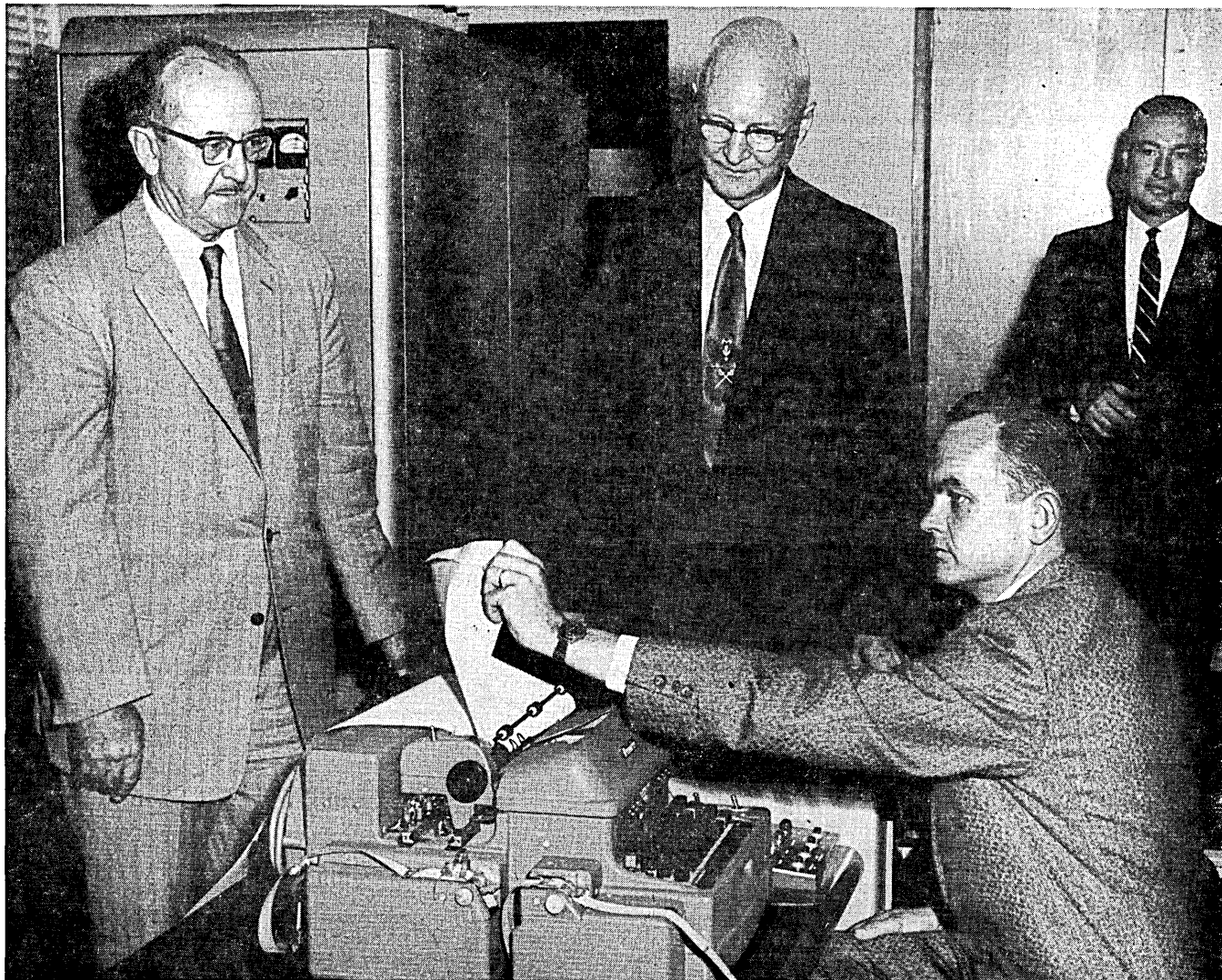
ing, accepting for the university. The computer, complete with an auxiliary tape memory unit and input-out equipment, is installed in special new facilities in the SC engineering building.

In addition to making computations in engineering and the physical sciences, the computer will play an important part in other fields of research. One example of this may lead to a comprehensive theory about the intellectual processes of man, with special emphasis on creativity.

The project is being conducted for the Office

Operating the electronic digital computer presented to the University of Southern California by NCR, Electronics Div.,

are: (left to right) Dr. Robert Vivian, Dr. J. Paul Guilford, D. E. Eckdahl, and Prof. Edgar Jagger.



of Naval Research by Dr. J. Paul Guilford, SC professor of psychology, with Philip R. Merrifield as assistant director. The old, standard IQ test, with its single score, comes a long way from being an adequate yardstick of adult intelligence, according to Dr. Guilford.

His new system, based on about 45 established factors of intellect, provides a "many-sided" picture of intelligence; one of the implications of the system is that there may be as many as 75 intellectual factors in which individuals may differ.

The NCR electronic computer system, by reducing the time needed to analyze test scores, will make it possible to obtain the results, even from large groups of people, much more quickly. As data from many tests are fed into the computer, intercorrelated results emerge immediately on punched paper tape. The tape, in turn, operates an automatic typewriter which rapidly prints the results in tabular form.

Dr. Guilford pointed out that IQ tests were originally designed for children, to indicate how well they would get along in elementary school. Adapting this kind of test for adults has not only short-changed some of the subjects, but has also limited scientific knowledge of what intelligence really is, he said.

Computer installation makes new courses possible

Installation of the NCR computer makes possible important new courses in the SC engineering curriculum. These will be taught by Prof. Edgar J. Jagger of the electrical engineering department, who will also supervise use of the computer equipment for the university's research studies.

"With technology now entering the computer era, we feel it extremely helpful to give students a basic understanding of computer logic and operation," Prof. Jagger stated. He pointed out that the equipment will serve not only as the subject for special courses, but will also be introduced briefly in many of the school's regular engineering and science courses.

The computer installation consists of a general purpose computer, using magnetic drum memory, housed in a single cabinet complete with power supply and all logical elements. The operator's console, which controls the computer, has an electric typewriter which controls and transmits information to the computer, printing out results of the computation.

By use of a magnetic tape unit, an additional memory storage is provided which is able to operate independently of the main computer memory, performing search operations and transmitting information by means of its own internal logical circuitry.

The new research in intelligence measurement now in progress at SC under the direction of Dr. Guilford is a start toward a general theory of thinking that would include accounts of problem solving, creative performance, and decision making. It includes many new ways of measuring creativeness,

judgment, reasoning, and other elements of mentality.

It describes the intellect as made up of a large group of thinking abilities and a small group of memory abilities, all falling into an orderly system. The approximately 45 factors of intellect measured by Dr. Guilford and his research associates fall into six general categories:

- (1) Cognition factors: discovery, comprehension, and recognition of ideas and their relations.
- (2) Convergent thinking factors: working toward a definite solution for a problem.
- (3) Divergent thinking factors: producing many different results from given information.
- (4) Evaluation factors: deciding whether two or more ideas are consistent, logically or in terms of the individual's experience.
- (5) Memory factors: remembering facts or associations.

A further classification is in terms of the kind of material involved. There are three major divisions of this sort: conceptual, dealing with ideas; figural, dealing with recognizable forms such as pictures or melodies; and structural, dealing with more abstract symbols and patterns.

In short, the project measures abilities to become aware of information, to do something about it, and to determine whether the result was adequate or workable. While current work is basic research, ultimate applications will be in aptitude testing, education, vocational guidance, and psychopathology.

Emphasizing the need for creativity in the arts, in the sciences, and in business, Dr. Guilford explains that the new tests both measure creativity and provide possible approaches to developing it further. Factors measured in the tests cover creativity, powers of deduction, ability to discover and become aware of important things, and faculty for drawing conclusions. They measure an individual's powers to follow divergent lines of thinking—to see both sides of a matter without losing the power of critical judgment.

Additional SC projects to be aided by computer

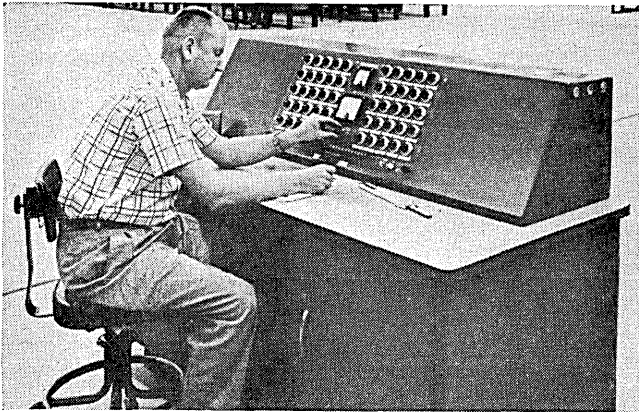
Besides advancing intelligence measurements, thus permitting more valid aptitude tests, the new research will also help educators teach youths how to think creatively, Dr. Guilford indicated. Private industry has already expressed an interest in the system for testing executive personnel.

Other current SC projects in which the NCR computer will play a role are basic research in X-ray crystallography, now being conducted to determine the structure of molecules, and basic research in the field of microwave and radar antennas.

Current projects in the SC Engineering Center which will be aided by the NCR computer include calculation of molecular distribution in problems encountered by flights at extremely high altitudes and at speeds ten to twenty times faster than sound, and calculation of flow fields about special body shapes in transonic and supersonic flights.

Circle 105 on Reader Service Card

Special purpose analog computer



General Electric Co., Computer Dept., 1103 N. Central Ave., Phoenix, Ariz., has announced a tabletop special purpose analog computer designed primarily to solve office and factory business production problems, and which can be operated by the average clerical worker after only eight hours instruction.

Essentially, the computer can be used for any type of problem which requires the multiplication of two numbers and the summing of the results. Numbers multiplied may have a variety of values. Typical problems encountered in manufacturing which can be solved by the computer include production scheduling, materials explosion, work station load impact, and similar situations.

In determining production bottlenecks, the computer can handle up to 50 products as they affect up to 24 work stations in any one problem set-up. Answers can be obtained within a matter of minutes so that corrective action can be taken almost immediately.

The computer can also reveal the effects of new designs and methods which change the amount of time or number of work stations required for production. It can also analyze the effects of varying sales volume and costs on profits.

The unit is simple to operate; dials are set according to data at hand and appropriate signal buttons are pushed to arrive at the answer. No special installation is required, and the computer can be plugged into any 115 volt AC power outlet. In use, it consumes less current than the average television set. Accessories and special dust-proof or air-conditioned rooms are unnecessary, and normal maintenance and service costs are negligible.

Circle 151 on Reader Service Card

Printed circuit continental connector

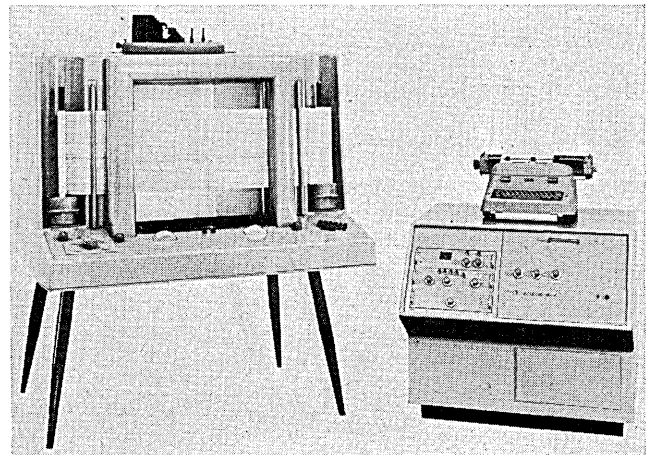
DeJur-Amsco Corp., Electronic Sales Div., 45-01 Northern Blvd., Long Island City 1, N.Y., has announced production of the longest precision printed circuit known . . . designed for one of the country's largest military data processing systems.

This new connector is a one-piece molding of Plaskon reinforced (glass) Alkyd. Thirty-four contacts have .250" spacing including heavy barriers for extra protection and long creepage path. Patented "Bellows Action" contacts are conservatively rated to accept printed circuit board thickness of .054 to .072", while maintaining low contact resistance and positive spring action grip over the entire printed circuit contact area.

Self-alignment of "Bellows" contacts allows for any residual warpage of printed circuit board. The connector accepts a board length of 8-3/4". An anodized aluminum shield for dissipating heat is available as an optional accessory when required.

Circle 152 on Reader Service Card

Data reduction unit



Benson-Lehner Corp., 11930 Olympic Blvd., Los Angeles 64, Calif., has announced a new data reduction unit that utilizes Mylar crosslines as the X-Y reading reference.

Designated "Oscar Model N-2," the machine can be used for the reduction of both frame-by-frame film and multiple-trace oscillograph records. Output range is 10,000 counts in both X and Y. Plug-board programmer makes unit compatible with all existing digital computers.

Circle 153 on Reader Service Card

Dynograph recorder



Offner Electronics, Inc., 5320 N. Kedzie Ave., Chicago 25, Ill., has announced production of a new Dynograph direct writing oscillograph recorder, the Type 503. The new unit, a mobile console assembly, is designed for applications requiring more than 8 channels of information on one recording chart.

Up to 19 recording channels are available in the Type 503, using either ink or electric curvilinear recording. The manufacturer supplies 24½" printed paper, either in roll or folded form, and 500-foot unprinted rolls as desired.

Pen spacing of 2" is normally provided with assemblies of 12 channels or less, and pen spacing of 1¾" with assemblies of 13 through 19 channels. Other pen spacing can be supplied if desired.

The paper is driven by a synchronous motor and eight-speed gear box, providing instant selection of speeds of 1, 2.5, 5, 10, 25, 50, 100, and 250 mm/sec., accurate of 1%. Paper is driven from both edges.

Circle 154 on Reader Service Card

Junction photodiode

Sylvania Electric Products, Inc., 1740 Broadway, New York City 19, has introduced a tiny new photodiode for applications ranging from computers to headlight dimmers. With a diameter of only .077", the new 1N77B junction photodiode is particularly applicable for highly-compact assem-

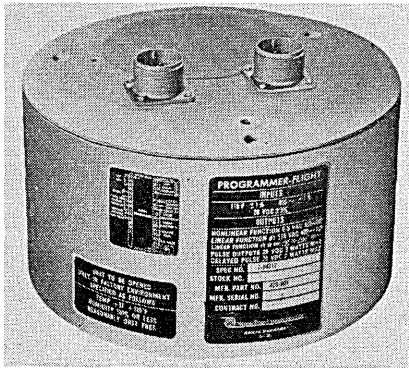
blies where space is at a premium.

Designed for rapid, highly-sensitive scanning and reading applications such as in computer tape or punched-card "readout," the 1N77B is also readily adaptable to infrared detection and heat-seeking devices because it is sensitive to light wave lengths extending from near ultraviolet into infrared.

The 1N77B is hermetically sealed in glass with a built-in lens that focuses light on the sensitive portion of the junction. The light interruption frequency response of the photodiode is flat from 300 cycles to 15 kc. at 100% with 260 lumens per square foot.

Circle 155 on Reader Service Card

Flight programmer



Western Design & Mfg. Corp., Div. of U.S. Industries, Inc., Santa Barbara Airport, Goleta, Calif., has announced a flight programmer that provides desired variable voltages versus time outputs to perform various linear and non-linear functions in the planned flight of missiles.

Known as the Model 426-001, the flight programmer weighs only eight pounds and operates on 28 volts, DC and 400 cycle, 115 volts AC. The desired functions are etched as lines and bars on a copper-clad epoxy glass laminate which moves in spiral tracks cut in the programmer housing. The laminate edges have punched sprocket holes similar to 35mm film by which the laminate can be driven.

In addition to the pulse functions, reverse, and stop information, a non-linear function capable of producing a non-linear voltage versus time is carried

along the entire length of the program. Information for the pulse functions and command functions are wiped off by contactors.

The non-linear function, carried by the program, wipes across a linear potentiometer which has been wrapped on a cylindrical form. This potentiometer is free to rotate as the etched function line passes by it, thus rolling contact is assured which greatly extends the program life.

Circle 156 on Reader Service Card

Current pulse generator

Rese Engineering, Inc., 731 Arch St., Philadelphia 6, Pa., has announced their Model 1020 Programmed Current Pulse Generator, a "packaged" system that provides precisely-controlled, fully-programmed current pulses for the research development and production testing of digital systems and components.

Incorporated in the instrument are an extremely-flexible program generator; highly-stabilized, heavy-duty power supplies; two negative and two positive output current drivers. Operating at 525 volts DC, two current drivers deliver negative pulse currents to 3 amperes from source impedance as high as 20,000 ohms, while two deliver positive pulse currents to 4.5 amperes from a voltage-type source.

Programming is based on an 8-step, periodically-repeated pattern, with a maximum step repetition frequency of 200 Kc. Pulse repetition frequencies of up to 400 Kc may be obtained through incorporation of both a primary and a controlled delay secondary pulse during each step.

Circle 157 on Reader Service Card

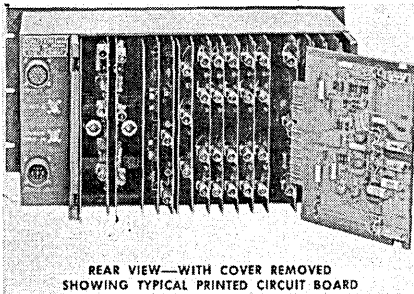
Data reduction system

Fischer & Porter Co., 292 Jacksonville Rd., Hatboro, Pa., has announced a Series 1200 Industrial Data Logger & Alarm Scanner that simultaneously records a variety of inputs, up to a maximum of either 200 or 2,000, depending upon the scanning method selected.

Comparison of input data is made with alarm set points; deviations are recorded, and the particular point alarmed. In addition to the modular or "building-block" construction of the logger, which allows ready modification or expansion of a system, plug-in sub-assemblies and pin-board programming make for flexibility of operation.

Circle 158 on Reader Service Card

Analog-to-digital converter



Avion Div., ACF Industries, Inc., 800 N. Pitt St., Alexandria, Va., has announced an all-electronic Type 525 Encoder (analog-to-digital converter) designed to provide precise and dependable conversion of analog input data to digital output voltages.

Particular emphasis is placed upon accuracy and resolution. Dependable operation is maintained over a wide range of environmental conditions. When used in combination with an Avion Model 1002 decoder, it becomes possible to solve problems in telemetering, analog computation, digital computation, PCM, and many other data processing applications.

Circle 159 on Reader Service Card

Miniature potentiometer

B-H Electronics, P. O. Box 25124, Los Angeles 25, Calif., announces a new miniature precision potentiometer, Model DM. Only 1/2" in diameter, 0.1 ounce in weight, this .6-watt wire-wound unit is available in stock values from 10 ohms to 50K ohms, and features a resolution of 0.2%.

Case is thermo-setting plastic. An "O" ring seal protects against moisture, dust, salt, etc.

Model DM requires no mounting hardware, and mounts directly to chassis or printed circuit either manually or by machine.

Tinned leads (0.032 diameter) are EIA modular spaced. Shock tested to 40G, 3 planes. No electrical noise under 25G, 3 planes. Other features include 320-degree rotation, temperature range -55°C. to +150°C., and retention of setting during vibration and shock.

Circle 160 on Reader Service Card

Event recorder

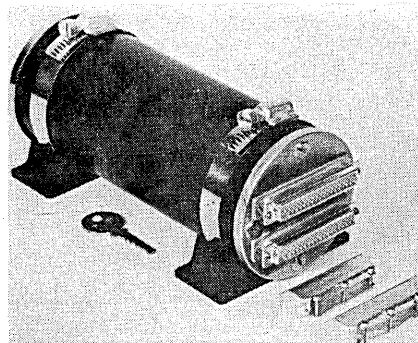
Sanborn Co., Industrial Div., 175 Wyman St., Waltham 54, Mass., now has available 4-, 8-, 16-, 24-, and 32-channel event recorders for recording "on-off" events.

The new and portable units consist of standard recorders used in the Sanborn 150 Series oscillographic recording systems, but with a 4-styli model 189 Multi-Marker in place of each galvanometer.

Input impedance is 3,000 ohms minimum, with +2 volts (max.) required to supply Multi-Marker coil power. This is a Class B circuit accepting positive-going signals only. Rise time of the combination is approximately ten milliseconds.

Circle 161 on Reader Service Card

Telemetering switch



Applied Science Corp. of Princeton, Princeton, N. J., has announced a new, multi-channel sampling switch designed for use in missile telemetering applications. Known as the Type AS Telemetering Switch, the cylindrical pressure-sealed container allows the switch to operate at

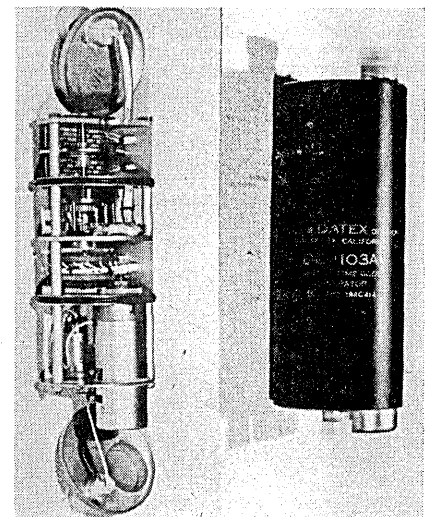
altitudes up to 200,000 feet, and in temperatures from 125° C. down to -65° C.

This switch is available with from one to five poles with up to 60 contacts per pole, at sampling speeds ranging from 0.5 to 30 RPS. The various motor drives offered include 6, 12, and 27.5 VDC governed or ungoverned, 60-cycle single phase, or 400-cycle single or three phase.

The governed DC units have a speed regulation of ±3%. The rugged construction will withstand 150G shocks by-directional in each of 3 planes, and 100G continuous acceleration bi-directional in each of 3 planes, and a vibration of from 20 to 2,000 cycles at 20G for 1/2 hour.

Circle 162 on Reader Service Card

Binary time code generator



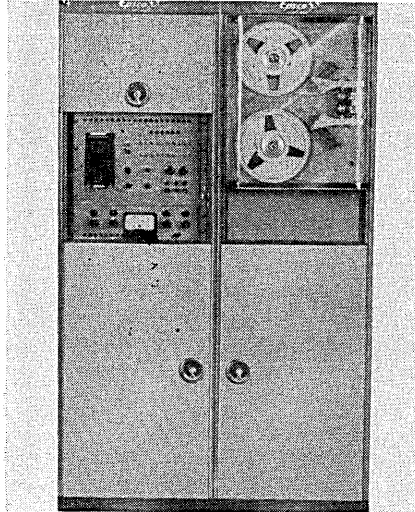
G. M. Giannini & Co., Inc., 918 E. Green St., Pasadena 1, Calif., announces their Datex Model DC-103 binary time code generator which is functionally designed to produce a serial output of one synchronizing pulse followed by eight bits of binary coded d-c timing signals per second. The total number of binary coded time signals produced is 128.

The binary pulses identify each second of time (using pure binary notation) while the synchronizing pulses identify the beginning of each second. The reference pulse is readily identifiable since it is three times the width of the coded pulses (minimum code pulse width is 30

milliseconds). The pulse voltage levels are not critical since a pulse signifies an "on-off" condition rather than an absolute value.

Circle 163 on Reader Service Card

Digital recorder unit



Epsco, Inc., 588 Commonwealth Ave., Boston, Mass., has announced a new digital recorder unit (Model DR-704/711 Compu-Corder) that receives and gathers asynchronous digital data from several external sources and combines them in any selected sequence together with manually-inserted fixed data and internally-generated record numbers.

The Compu-Corder then records the combined digital record of information on magnetic tape in exact computer format. Complete flexibility of programming is provided allowing selection of gap length, tape format, and information sequence.

Internal magnetic storage permits peak data entry rates as high as 40,000 12-bit words/sec. Average data entry rates are limited only by the computer format selected, and by the permissible tape packing density.

Circle 164 on Reader Service Card

Computer power supplies

Universal Transistor Products Corp., UAC Electronics Div., 143 E. 49th St., New York City 17, has announced multi-output transistorized computer power

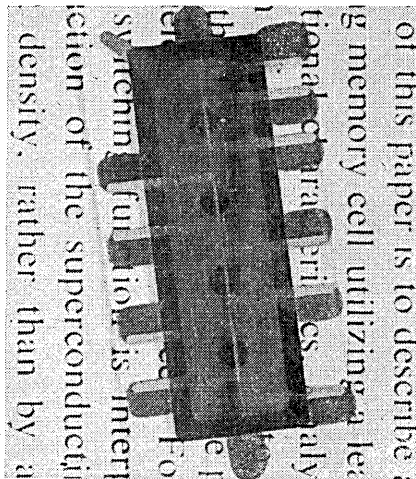
supplies for Airborne applications, portable instruments, and line-operated equipment.

Three different types are being manufactured to operate from either (1) 115v 60 cps input, for line operation, (2) 115v 400 cps input, for Airborne applications, or. (3) 24 VDC input, for portable instruments.

A typical line-operated model produces seven outputs ranging from +30 VDC @ 2 amps to -30 VDC @ 5 amps. This unit fits a standard 19" x 8-3/4" x 13" relay rack, and weighs 22 lbs.

Circle 165 on Reader Service Card

Minute memory cell



International Business Machines Corp., 590 Madison Ave., New York City 22, has announced the development of a super-high-speed "memory" device that responds in a hundred-millionth of a second. The device, which utilizes a miniature printed circuit of metallic lead at temperatures close to absolute zero (-459.7° F.), is believed to hold great promise for use in high-speed, high-capacity electronic computers of the future.

The new memory cell is based on the unusual properties of special superconducting materials which offer no resistance to the flow of electric current at extremely-low temperatures. Even after the source of electricity is removed, current will continue to flow without diminution.

An additional advantage of the device is that it requires only about a third of the current

needed to drive the ferrite memory units now widely used in electronic computers, while providing an increase in speed of about a hundred times.

Circle 166 on Reader Service Card

Epoxy-encapsulated units

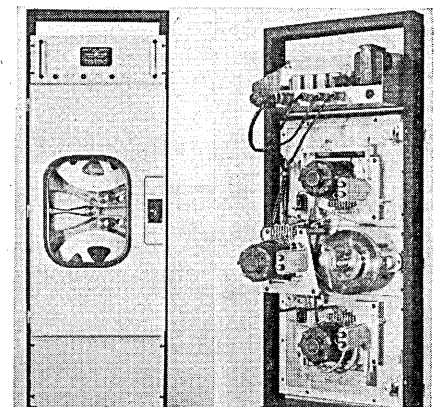
Rixon Electronics, Inc., 2414 Reddie Dr., Silver Spring, Md., has announced a series of eight epoxy-encapsulated units originally designed for use in their AN/TCC-35 Teletypewriter Multiplex terminal equipment.

These modules were developed after a detailed study of transistors, diodes, and magnetic cores was made to determine the practical aspects of utilizing such components.

The number of different types can be kept to a minimum for circuit simplicity, interchangeability, and maintenance of spares. Currently available units consist of: three magnetic register modules, two flip-flop modules, one PNP transistor module, one NPN transistor module, and one diode module.

Circle 167 on Reader Service Card

Magnetic tape handler



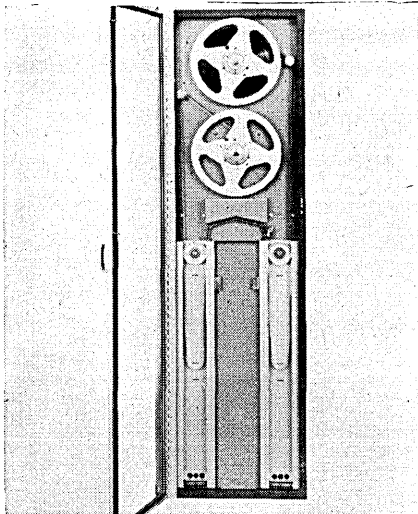
Telectro Industries Corp., 35-16 37th St., Long Island City 1, N.Y., has announced a multi-channel magnetic tape transport, Model TA-1085, designed to meet the most exacting instrumentation requirements and engineered to provide a positive means of driving recording tape with extremely low flutter.

Its modes of operation are electrically controlled by means of 5 back-lighted control buttons.

The unit accommodates up to 1" wide by 4,800'-long magnetic tape on NARTB 14"-diameter reels. The entire transport mechanism is mounted on a hinged frame for easy access to rear of tape transport without mechanical or electrical disconnection.

Circle 168 on Reader Service Card

Magnetic tape transport



ElectroData Div. of Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif., has announced a 10-speed magnetic tape transport for electronic data processing systems known as Model 546-53368 Digital Magnetic Tape Transport. A speed ratio of 60:1 is available with this transport.

The unit selects any one of the 10 closely-regulated tape speeds by remote or local control. The speeds, in inches per second, are 1.5, 2.25, 3, 4.5, 9, 15, 22.5, 30, 45, and 90.

Three-quarter-inch tape is used, wound on two 10½" reels. Start-stop time is 6 milliseconds. The oxide surface of the tape touches only three stationary members, one of which is the magnetic head. During the rewind operation, the tape is automatically removed from the head.

Circle 169 on Reader Service Card

Precision voltage monitor

G. M. Giannini & Co., Inc., 918 E. Green St., Pasadena 1, Calif., has announced precision voltage monitors for reducing normal telemetering and recording system

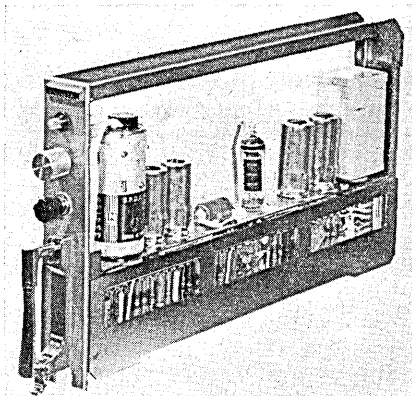
errors from 4 or 5% to 0.04% or less.

Basically, these small, lightweight servomechanisms increase the accuracy of recorded data to an accuracy comparable with the raw data picked up by the sensing devices. The Voltage Monitor is a servomechanism which accepts analog signals from sensing devices such as temperature probes, pressure transducers, potentiometers, or synchros.

Output is provided by potentiometers, synchros, or coded discs. These are shaft-driven through a precision gear train at a ratio of 100:10:1 with respect to one another. Thus, one output will be a function of a 100% change in input signal, the second output a function of a 10% change, and the other a function of a 1% change.

Circle 170 on Reader Service Card

DC computing amplifiers



Dynalysis Development Labs., Inc., 11941 Wilshire Blvd., Los Angeles 25, Calif., announces their Series 5-1100 chopper-stabilized dc computing amplifiers featuring plug-in computing components, high reliability, rugged construction, small size, and high-frequency response with extremely-low noise level.

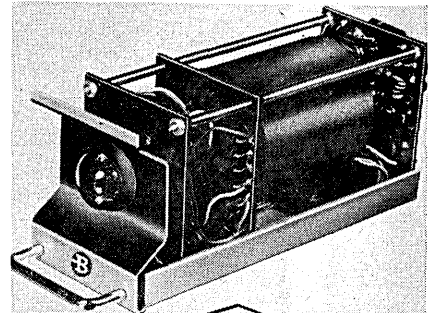
Output voltage range is ± 100 volts with a 10,000 ohm load. The total dc gain is greater than 175 million and, with unity closed loop gain, the amplifier is flat to within ± 0.5 db from dc to 7Kc/s, and down 6db at 60 Kc/s with a 15-volt rms signal.

The low frequency noise level is less than 2.0 mv peak-to-peak, and the total noise level is less

than 3.0 mv peak-to-peak. Ten of these plug-in amplifiers mount in a Model 5-1201 mounting rack having 8-3/4" x 19" front panel.

Circle 171 on Reader Service Card

Decade counter



Electronic Tube Div., Burroughs Corp., Plainfield, N. J., has announced a new decade counter with an all-electronic numerical readout. Made up of the Burroughs Beam Switching Tube Type 6700 and Nixie Indicator Tube Type 6844, the unit is described as the first basic decade counter which displays numerical information that is directly controlled by a single counter tube.

Precise "in-line" figures are visible 30 to 40 ft. Unit reliability and a potential counter tube life of 50,000 hours are claimed. These plug-in units have been designed for a minimum panel height (3-1/16") and may be cascaded to provide any desired count capacity with provisions for manual and electronic zero setting.

Circle 172 on Reader Service Card

New push button switch

Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill., has extended its extensive and well known line of miniature push button switches to include a new, precision-built double-pole model known as the 35-1.

It is a silent-action, momentary-contact, double-pole, single-throw switch which is rated ½ ampere, 115v AC, resistive load. It is claimed to have a life expectancy of over 100,000 operations (manual).

Housing and button are of electrical-grade molded phenolic. Equipped with 15/32" - 32 thread-

ed mounting bushing with a hex nut; solder terminals only. It will presently be furnished as normally open (with red button).

Circle 173 on Reader Service Card

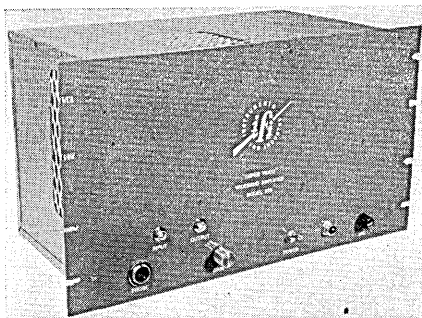
Ferrite memory core

Ferroxcube Corp. of America, 50 E. Bridge St., Saugerties, N.Y., announces the availability of their new ferrite memory core, designated the "M-2," that measures only .075" OD x .048" ID x .022" thick.

These fully-tested memory cores operate at 670 ma. full current, and have a switching time of less than 1.5 micro-seconds.

Circle 174 on Reader Service Card

Super video amplifier



Instruments for Industry, Inc., 150 Glen Cove Rd., Mineola, N.Y., has added a rack-mounted Model 395 Super Video Amplifier to its line of standard amplifiers.

Model 395 features a very-high gain over a wide bandwidth; specifications are: bandpass, 1 Kc to 50 Mc; gain, 70 db; input impedance, 90 ohms; output impedance, 90 ohms; output voltage capability, more than 1Vrms; noise figure, 15 db; gain control, provided on front panel; rise time, 10 millimicroseconds; tube complement, 24 - 6AK5, 1 - 5R4-GY.

Circle 175 on Reader Service Card

Recorder/reproducer system

Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif., has developed a new 14-channel magnetic tape recorder/reproducer system designed to handle analog, PDM, and FM signals.

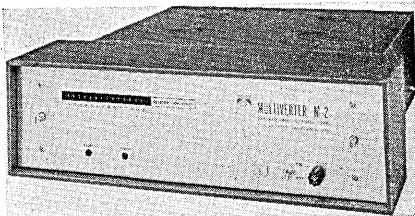
Extremely versatile (the system is expected to find wide use in wind tunnel, engine test stand, and other research studies where high-speed acquisition of large amounts of precise data is required), the unit receives information directly from sources such as RDB telemeter receivers and PDM equipment.

It will also accept signals from self-generating transducers, strain gages, bridge-type transducers, etc., when transmitted through amplification equipment. Frequency range is from 0 cycles to 100 kc at input levels from 0.25 volts rms to 25 volts rms.

Fourteen individual tape tracks for the simultaneous recording of separate signals on 1" tape are provided. The system takes reels up to 14" in diameter, has a capacity of 5,000' of 1.5-mil tape, and is capable of operating at tape speeds of 1-7/8, 3-3/4, 7-1/2, 15, 30 and 60 ips. Other tape widths can also be accommodated.

Circle 176 on Reader Service Card

Conversion system



Packard-Bell Computer Corp., 11766 W. Pico Blvd., Los Angeles 64, Calif., has announced the Multiverter M-2, a highly accurate, high speed voltage-to-digital, digital-to-voltage conversion system that can perform various arithmetic operations in the process of conversion.

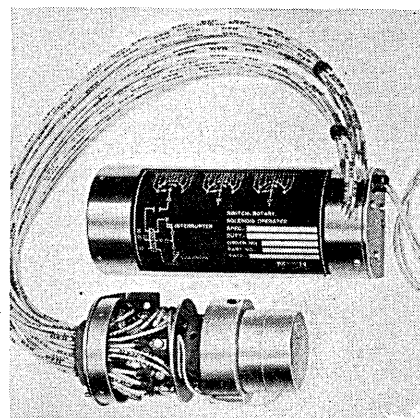
Completely transistorized, it is small in size and requires little power. The speed of operation in translating a voltage to a number varies with the accuracy of conversion. A 14-bit conversion at an accuracy of 0.01% requires approximately 60 micro-seconds, while an 11-bit conversion at an accuracy of 0.05% requires 50 microseconds.

The conversion of a number to a voltage requires 4 microsec-

onds. Binary-coded-decimal models are available. If two voltages, X and Y, are supplied to the Multiverter, the digital result will be their quotient.

Circle 177 on Reader Service Card

Automatic programmer



Mason Electric Corp., 3839 Verdugo Rd., Los Angeles, Calif., has announced a compact, lightweight power programmer that controls 24 separate circuits without complication. The unit programs a sequence of operations with high reliability.

Designed for direct actuation of power devices, the unit eliminates the need for relays and interlocking circuits. Switching capacity is high enough to carry loads normally carried by relays. All contacts make and break simultaneously.

Programmer is unaffected by vibration of 50-600 cps at 0.05 double-amplitude . . . unaffected by 5g acceleration, and 15g impact shock. There is no detectible contact opening or bounce at 40g shock loading, or vibration of 50-500 cps at 0.036 double amplitude—a feature made possible by extremely-high-contact pressures and controlled contact dwell time.

Circle 178 on Reader Service Card

Perforated tape reader

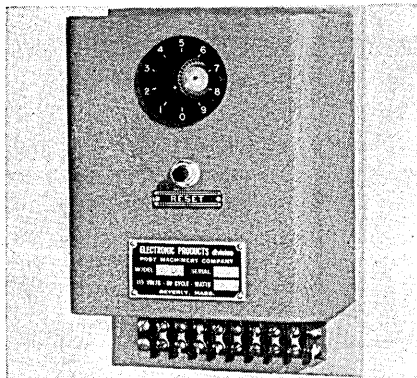
Digitronics Corp., Albertson Ave., Long Island, N.Y., announces their Dykor perforated tape reader that can handle paper tape strips or reels with equal facility, and can operate at speeds up to 750 characters per second with

less than 5 millisecond start or stop time.

At 300 characters per second, it stops in the space following the stop character; for 750-character-per-second operation, a two-character stop space is recommended. All standard 5-, 6-, 7-, or 8-level tapes (plus sprocket hole) are handled, and 11/16"-, 7/8"-, or 1"-wide tape can be used interchangeably.

Circle 179 on Reader Service Card

Booster for registers



Post Electronic Products Div., Beverly, Mass., has announced an SD-1 unit that is designed to increase the life and speed range of electro-mechanical registers or counting devices as much as 15 times.

This inexpensive, compact booster can be placed several hundred feet from switch contacts, registers in counts of 10 while counting up to 50 units per second, and can be equipped with a visual totalizer if desired.

The SD-1 is energized by electrical or magnetic fields, and does not involve a photo-cell.

Circle 180 on Reader Service Card

Audio frequency delay line

ESC Corp., 534 Bergen Blvd., Palisades, N.J., has announced the development and availability of a new audio frequency delay line designed for use as a component or as test equipment in advanced computer and radar systems.

This new fixed delay line offers a 3,000 μ sec. delay $\pm 5\%$, standard tolerance. The unit has a 3 db. bandwidth of 5 kc. Inser-

tion loss is 5.5 db; impedance, 510 ohms $\pm 5\%$. Outside dimensions 4" x 10" x 8". The unit can be tapped as required.

Circle 181 on Reader Service Card

Silicon power rectifiers

Microwave Associates, Inc., Burlington, Mass., announces the availability of the 1N253, 1N254, 1N255, and 1N256 silicon power rectifiers.

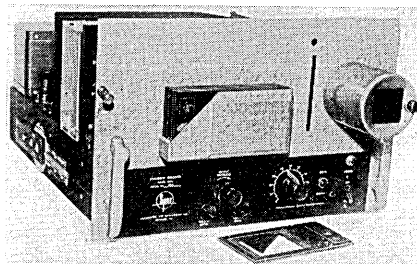
These stud-mounted rectifiers are designed for use in the temperature range -65° C. to 150° C.; their rugged internal construction can withstand extended vibration and shock exposures.

The 135° C. (case temperature) ratings of the rectifiers are as follows: average forward currents and maximum RMS voltages—1N253, 1000 ma., 65 volts; 1N254, 400 ma., 135 volts; 1N255, 400 ma., 270 volts; and 1N256, 200 ma., 400 volts.

The glass-metal hermetically-sealed package with a solid copper base combines a high thermal conductivity with small size. These new rectifiers are produced to the military MIL-E-1/1024A, 989B, 990B, and 991B specifications.

Circle 182 on Reader Service Card

Program scanner



Spar Engineering & Development, Inc., Paxton & South Avenues, Wyncote, Pa., announces a new non-mechanical instrument that converts a curve drawn on graph paper into a voltage to be used to program radiant heat, test load, and other control, programming, or computing applications.

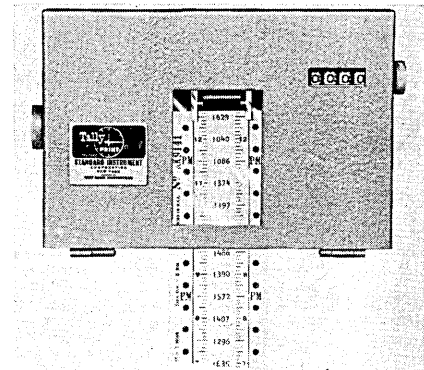
The all-electronic unit, known as the Program Scanner, operates when a photographic transparency of a curve is inserted in front of the "flying spot" tube

which is swept by a vertical line moved horizontally across the face of the tube.

The photomultiplier circuit in the scanner acts as a switch, sees the "flying spot" during the time it is below the curve, and turns on and off a Schmidt trigger which has its output clamped to a glow tube reference to produce constant amplitude, variable width pulses.

Circle 183 on Reader Service Card

Print-out counter



Standard Instrument Corp., 657 Broadway, New York City 12, has announced a predetermined print-out counter, designated "Tally-Print," that is electrically connected to the machine or process to be monitored.

A chronologically-marked chart roll is sprocket-driven through the instrument. At predetermined intervals, the total elapsed time or the total number of units monitored in that interval is printed on the tape. In addition, a visual cumulative total is provided for longer periods.

Tally-Print is available in 5-digit or 4-digit printers. The standard print-out intervals are 5, 15, 30, or 60 minutes (special intervals can be supplied, if desired). It will register up to 300 impulses a minute, and can be actuated by closure of external contacts.

Circle 184 on Reader Service Card

Frequency converter

Robertshaw-Fulton Controls Co., Aeronautical Div., 401 N. Manchester, Anaheim, Calif., is marketing a new transistorized fre-

quency converter designed for application with autopilot systems, guidance systems, and in telemetering functions, as a source of high-frequency power for magnetic amplifiers.

Provided with an output frequency of 1,200 or 2,400 cycles per second, it consists of a synchronized-transistor square-wave generator driving a switching-transistor power output stage. Synchronization of the square-wave generator is accomplished by injection of 2,400 cycles sine-wave synchronizing signal across base resistors of generator.

Synchronizing power is obtained by frequency multiplication of the 400-cycle 3-phase input. Power specifications: input, 95 watts; output, 75 watts. Special units, synchronized to any multiple of the 400-cycle input up to the 10th multiple (4,000 cycles) at power levels between 25-100, are being developed.

Circle 185 on Reader Service Card

Oscilloscope & plug-in unit

Tektronix, Inc., P.O. Box 831, Portland 7, Ore., has introduced an oscilloscope (Type 536) that has identical horizontal and vertical deflection characteristics with the same type of preamplifier plugged into both channels. It converts to a general-purpose instrument when the Type 53/54T time-base generator is plugged into the horizontal amplifier.

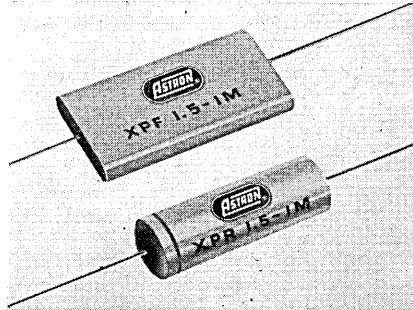
Horizontal and vertical characteristics with Type 53/54G units plugged in are: differential inputs, dc-to-10 mc passbands, 0.035- μ sec risetimes, 9 calibrated deflection factors from 0.05 v/div to 20 v/div with vernier controls for adjusting sensitivity between steps, less than 1 degree relative phase shift to well beyond 10 mc, control on front panel to adjust phase balance up to 20 mc, 5 divisions of deflection at 20 mc without overdriving input amplifiers.

Horizontal characteristics with the Type 53/54T time-base unit are: 22 calibrated sweep rates from 0.2 μ sec/div to 2 sec/div with vernier control to adjust sweep rate between steps, 5 x magnifier increases calibrated

sweep rate to 0.04 μ sec/div, fully-automatic triggering or amplitude-level selection with manual or preset stability control.

Circle 186 on Reader Service Card

Mylar dielectric capacitors



Astron Corp., E. Newark, N. J., has announced that a new miniature Mylar dielectric capacitor is now available in production quantities.

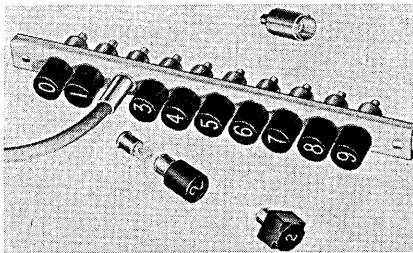
These new capacitors, Type XPR and XPF, are designed for applications requiring minimum size, high insulation resistance, and exceptional capacitance stability.

A Mylar polyester outer wrap affords good protection against moisture, its ends being sealed with a plastic thermosetting resin. Voltage rating is 150 V at 85° C., 100 V at 125° C.

Reliable performance is achieved over the entire operating temperature range of -55° to +125° C. The new series is available in flat and round construction.

Circle 187 on Reader Service Card

Miniature indicator lights



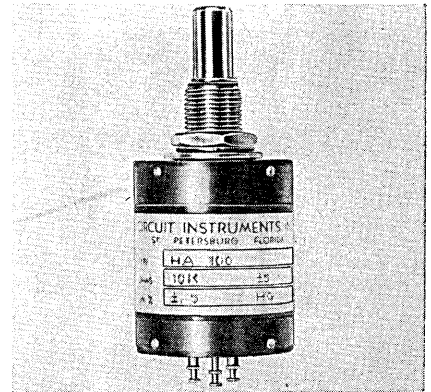
Hetherington, Inc., Delmar Dr., Folcroft, Pa., has introduced a new series of miniature indicator lights that provide analog and digital computers and other instruments with an attractive,

easily-mounted display of numerals.

Known as "Digicator" Lights, the units are available individually, in pre-assembled strips, or as custom-built assemblies. To allow sockets to be grouped closely together, the usual mounting nut and lockwasher have been replaced with an integral collar which is flared to the mounting surface — like an eyelet — using an inexpensive flaring tool and anvil.

Circle 188 on Reader Service Card

2 precision potentiometers



International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa., announces the addition of two new precision potentiometers, Types HA-100 and HA-105, to the product line of its St. Petersburg (Fla.) subsidiary, Circuit Instruments, Inc.

Available in 5- and 10-turn types, these units feature very short case lengths: 15/16" on 5-turn model, and 1-1/4" on 10-turn. Encased in Grade XX laminated phenolic with a polished natural finish, the units can be furnished with flexible silver-plated terminals riveted to case, or with rigid turret-type terminals. Standard linearity is $\pm 0.5\%$.

Circle 189 on Reader Service Card

Telemetering receiver

Industrial Television Inc., Clifton, N.J., has announced a new crystal-controlled, single-frequency receiver for telemetry and similar applications. Completely transistorized, the unit is intended for applications requiring a high-

performance, low-power drain receiver at frequencies up to 50 mc.

The unit can be supplied with a resonant reed-type output relay to permit selective control by means of tone modulation, or with a standard audio output circuit delivery 100 mw. Using a plug-in sub-chassis arrangement, any section of the receiver may be quickly replaced in the field.

Sensitivity is 2 uv 30% modulated for 65 mw output, with over-all bandwidth of 6 kc. AGC is provided with a threshold level of 2 uv. Battery power requirement is 40 milliwatts under no-signal conditions, rising to 400 milliwatts for full output.

Circle 190 on Reader Service Card

Long-wear magnetic tapes

Minnesota Mining & Mfg. Co., 900 Bush St., St. Paul 6, Minn., has introduced two new long-wearing magnetic tapes for instrumentation use that outwear conventional "Scotch" brand instrumentation tapes by an average of 6

to 1, yet increase short wave length response by 3.5 db.

Key to the superior wear characteristics of the new tapes is a new, more durable binder construction which minimizes problems of oxide rub-off and deposit on the machine heads. The tapes contain no more than one drop-out per 2,500' roll.

In direct recording, the tapes are said to conform to proposed Navy specifications defining drop-outs as variations of 22% or more in signal magnitude, lasting 300 or more microseconds (based on a 8,750 cps signal played at 7.5" per second).

Tape No. 148 employs a 1.5-mil backing and comes in lengths of 1200, 2500, and 5000', while No. 149 employs a 1-mil "extra play" backing and comes in lengths of 1800, 3600, and 7200'.

Both tapes are available in standard widths of 1/4, 1/2, 5/8, 3/4, and 1", and are hermetically sealed in plastic bags to protect the tape from contamination by dust or moisture during shipment or storage.

Circle 191 on Reader Service Card

Machine tool control system

Wang Laboratories, Inc., 37 Hurley St., Cambridge 41, Mass., has announced the design, development, and completion of the first Weditrol, a numerically-controlled machine tool control system.

The first model, recently delivered, was specially designed to control a production lathe with a cutting speed of approximately 100" per min., a rapid travel speed of 240" per min., and a minimum incremental distance of .0002".

The system is so designed that it can easily be adapted to 3-dimensional control on other types of machine tools. The Weditrol gets its command from a punched paper tape and develops the control.

The repetition rates of the pulses are so proportioned that their simultaneous control of the X and Y direction will cause the table to travel the desired path. All the programmings are generated internally, and require no special computers to generate the pulses.

Circle 192 on Reader Service Card

The New Camera Microscope



ULTRAPHOT II

MADE IN WEST GERMANY

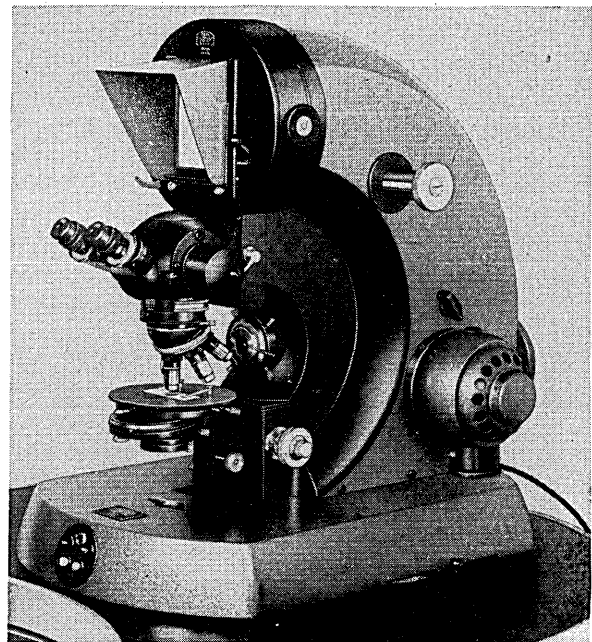
Microscope, camera and exposure meter combined in one instrument. Completely automatic shutter is activated by a photo-electric cell computing exact exposure times and insuring correctly-exposed photomicrographs under even the most adverse conditions.

By utilizing the Koehler principle specimens can be observed and photographed in bright field, dark field and phase contrast as well as with incident light.

A built-in movable mirror system simulates bellows extension up to 12 inches and permits gradual magnification change from 6.5X to 1700X. A 4x5-inch Graflok back allows also the use of available smaller sheet film adapters.

The revolutionary design of the ULTRAPHOT II is years ahead of existing equipment!

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Circle 4 on Reader Service Card

RCA develops new high-speed switching transistor

A new type of transistor that "approaches the ideal electronic switch" for high-speed switching functions in electronic computers and automatic control systems has been developed experimentally by scientists of the Radio Corp. of America, according to a recent announcement by Dr. Irving Wolff, Vice-President, Research.

The new device, called the *Thyristor*, was described by Dr. Wolff as "a marked advance" over both gas tubes and existing transistor switching devices because of its combination of simplicity, speed, and "extremely low" power requirements. "The Thyristor has a number of characteristics which come close to the ideal for high-speed switching functions," said Wolff.

"Among these are its ability to switch substantial currents from one circuit to another in periods as short as one fifty-millionth of a second, and the ability to switch from 'Off' to 'On' and vice versa simply by the application of low energy pulses to the base circuit in one polarity or the other. This bi-stable performance characteristic will now permit us to do with one transistor a job that has previously required two."

The Thyristor was developed by an RCA Laboratories research team including C. W. Mueller, J. Hilibrand, and L. E. Barton, members of the technical staff at RCA's David Sarnoff Research Center in Princeton, N. J. Discussing the new device, Doctors Mueller and Hilibrand pointed out that the Thyristor may be operated either as a bi-stable switching element or as a more conventional high-frequency transistor, either in switching or in amplifying circuits.

They pointed out that while the new device has many of the properties of existing types of gas switching tubes, it is "markedly superior" in many respects as a high-speed switching device. They stated, for example, that the commercial gas switching tube cannot be switched "Off" from the control element in the same way that it is switched "On," whereas the Thyristor is switched either way simply by changing the polarity of low energy pulses applied at the base.

Among the other principal advantages of the new device, according to the two scientists, are:

(1) In operation it has an extremely low sustaining voltage, "of the order of a half volt at 100 milliamperes," permitting good "On/Off" stability.

(2) It conducts very little current in the "Off" position, "amounting to about 2 microamperes," which provides for a high-impedance "Off" position.

(3) It permits the use of simple circuitry for switching.

(4) Fabrication of the Thyristor is "simple and can be carried out with ordinary diffusion and alloy techniques."

Doctors Mueller and Hilibrand described the Thyristor as a modified alloy-junction transistor. A novel feature, they said, is a new form of collector contact which makes possible the high-speed switching action. The device is still under development, they pointed out, and is not yet commercially available.

Circle 106 on Reader Service Card

U.C.L.A. Announces New Computer Film

The University Extension of the University of California, Los Angeles, has announced the release of a third new 16mm sound color film for industry and business entitled *Electronic Computers Improve Management Control* (EF-5610). The film presents a predicament in a typical manufacturing organization when a large customer order is cancelled because of delays in production.

The history of the order is traced step by step, from the order placement, to the inventory check, to material requisition and, finally, to production. The culprit is found to be paperwork delays with resulting lack of management control.

A variety of the latest types of business machines are shown, with a description of how these machines can best be utilized in designing an efficient production control system. The system is then applied to the specific problem presented in the film, illustrating how the system actually works in practice.

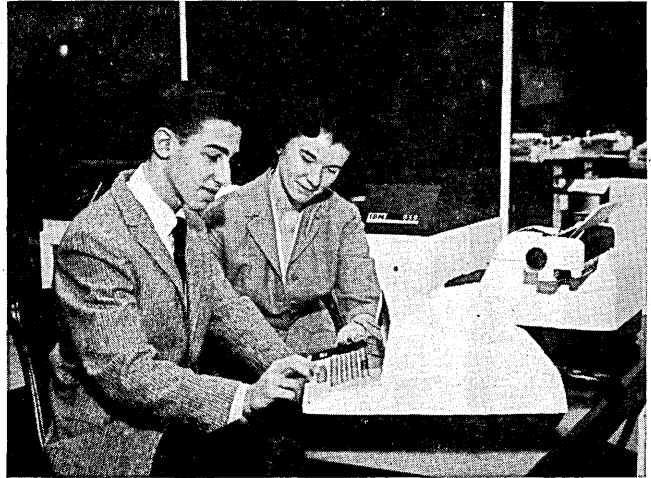
The graphic animation technique employed in the film reduces the complexities of the subject matter to concise procedures—illustrating the methods of applying electronic data processing to the problems of management control.

Preview prints of the film are available to organizations interested in purchasing; the only charge is for transportation. Sales copies (\$150) and preview prints are available from the Extension's Educational Film Sales Dept., rental copies (\$10) from the Dept. of Visual Instruction.

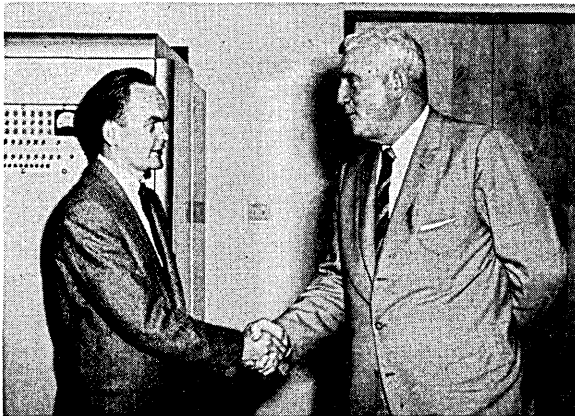
Circle 107 on Reader Service Card

PICTORIAL REVIEW

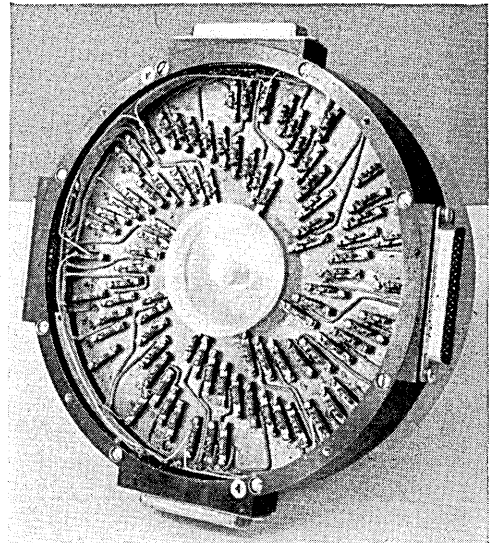
(right) Table-sized IBM Auto-Point computer is operated at NY's recent National Business Show by Richard Holzsager, 16, a senior at Bronx High School of Science. After an hour's instruction by Mrs. Lucy Field of IBM, Richard is now doing his homework at electronic speeds.



(below) D. E. Eckdahl (left), div. manager of the National Cash Register Co., Electronics div., congratulates Dr. A. S. Raubenheimer, educational vice-president of the Univ. of Southern Calif., on establishment of new digital computer center in the school's engineering department. Electronic computer was presented to the university by NCR.



(right) 88 separate recording heads are intricately arranged over this 8"-diameter head plate of this high-capacity and rugged air floating disk magnetic memory unit, a type used in Autonetics' portable, general purpose digital computer, Reomp. These memory units have operated over 1,300 hours in the field without requiring any maintenance.



(left) Automatic digital computers, such as the one shown here, can quickly solve engineering problems related to highway construction, but in the engineering and design James Stone, chief of Battelle Memorial Institute's Systems Engineering div., recently organized the first Battelle-sponsored Workshop on Highway Engineering Applications of Automatic Computers. Stone points out that currently a real limiting factor in how quickly the Nation's highway system can be improved is not in the actual physical construction, but in the engineering and design work that must precede groundbreaking. Some of the 20 state highway officials and consulting engineers participating in the Workshop, which ended Oct. 4, are shown working at one of the IBM 650 computers at the Columbus, O., research center.

Users Conference reports growing market for electronic computers in low-cost field . . .

'Medium' computer gains popularity in U.S. industry

The medium-size, low-cost electronic computer is rapidly becoming an indispensable tool in American industry and defense because of its economy and convenience, reports submitted to a national computer users conference indicated recently.

The conference at the Drake Hotel, Chicago, was attended by more than 200 industry leaders and research experts, all users of Bendix Aviation Corporation's middle-range general purpose G-15 computer produced in Los Angeles.

Purpose of the conference was to exchange new ideas on how to use the medium-size digital computer for maximum results at minimum cost and time. Chairman of the conference was Dr. Joseph Grandine of the duPont Co., Pioneer Research Laboratory, Wilmington, Del.

Versatility of the medium computer was demonstrated by the variety of its current applications. These included:

Textiles. Synthetic fibers for 1960 dresses are being tested for strength, durability, and resilience of threads by medium-size computers and auxiliary devices. Already several Bendix G-15 computers are installed in five major textile-making and research organizations.

Preliminary tests indicate the rapid computation method allows approximately 400 fabric test samplings per day compared to 200 per day under the old manual process.

Previously, time prohibited a wide range of fabric testing. Now, electronic computation makes it feasible to enlarge testing scope for new, versatile fabrics. The new process, which brings automation into the textile testing field, links a digital computer directly with fabric testing equipment.

Samples, placed in the test mechanism and subjected to various environmental conditions, produce data—such as strain gauge readings—which is transmitted into the computer for quick computation.

Magnetic tape, used for recording test data, is fed into the machine for computation of fabric characteristics, for example,, wearing quality and resistance to moisture.

Highways. Computers are being used for calculation of freeway, highway, cloverleaf, and bridge-building earthwork. In some cases the computer is combined with aerial photography to obtain three-dimension measurement of roadbed ter-

rain, softening the impact of the civil engineer shortage and saving tax money.

Petroleum. Medium-size computers are being used for analysis of possible oil-bearing deposits, and to study oil pressure buildings and reservoir flow. Four major oil companies use the Bendix G-15 for research, development, and operations.

Military Defense. In one outstanding military application, the computer is being used aboard an aircraft carrier as part of an advanced electronic system to direct automatic all-weather jet aircraft landings.

Nuclear Energy. The computer is being used in Michigan to speed development of nuclear reactors for peacetime atomic energy power plants.

Natural Gas Transmission. The computer explores the effects of variables in gas pipeline flow and analyzes compression.

Water Power. The computer is used by Bonneville Power Administration to predict rainfall and to chart reservoir loads in the watershed of the Columbia river and its tributaries. This information, in turn, is used in the regulation of hydroelectric power outlets in the Pacific Northwest states.

Gear-Shaping. One of the nation's leading gear-shaping companies uses the computer to reduce design and layout time for its manufacture of gear-shapers and gear-shavers.

Special Research. The medium computer is used by numerous laboratories to up-grade the technical staff and take up the slack of the engineer shortage. In one outstanding application, the computer is used by specialized mathematicians to determine the design of half-dollar-size cams to be used in the Bendix Air Data computer. So far, hundreds of thousands of equations have been solved on this project alone.

Motor Design. A motor manufacturing company used the computer to solve one problem—a design study on turbine motors. The company solved in 17 hours what would have required 2,899 hours by manual methods.

Wind Tunnel. Massachusetts Institute of Technology used the computer 16 hours per day in connection with tests being conducted at the M.I.T. Naval Supersonic Laboratory wind tunnel.

Circle 108 on Reader Service Card

An Air-Floating Disk Magnetic Memory Unit

by W. A. Farrand, Computer Specialist
Autonetics, a Div. of North American Aviation, Inc.

Most rotating magnetic memories in use today are of drum shape. A disk was used here because a flat surface requires forming only to shape, whereas a cylinder requires forming in both shape and dimension. Recording is done on the flat surface of the disk, with the head-to-disk gap set by the autolubricated air bearing (see Figure 1).

This bearing should not be confused with the usual air bearing, because air is not pumped into the gap. The functioning of this bearing involves a boundary layer property, and the forces developed are actually opposite in sense to those indicated by a simple application of aerodynamic principles. The force of separation is found to be a function of the viscous shear of the medium in the gap.

The disk is attached to the shaft by means of

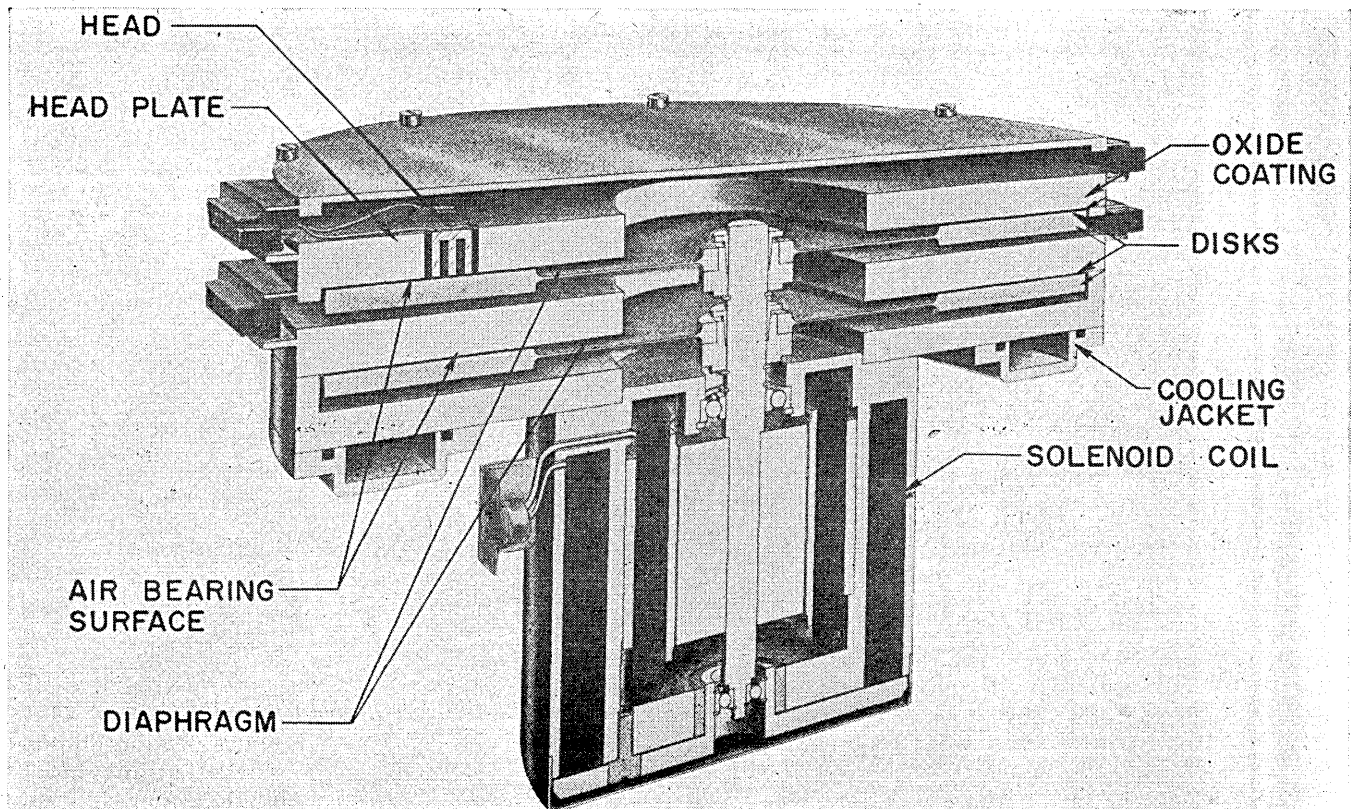
a very thin diaphragm (Figure 1). This diaphragm is designed to provide extremely stiff coupling between the disk and the shaft about the rotational axis, and very loose coupling in other directions. This loose compliance is of the order of thousandths of an inch, and is utilized in the design for several purposes.

First, the spring (diaphragm) sets the preload on the disk. Next, if there is any misalignment of the headplate with respect to the shaft axis, this diaphragm flexes so as to maintain the disk parallel to the headplate. The diaphragm also flexes so that the force of the air bearing can offset exterior forces operating orthogonal to the surface of the bearing.

Because there is no support force at low speeds, the surfaces must be separated to prevent scoring

From a paper presented at the 1957 Western Electronic Show & Convention, San Francisco, Calif.

Figure 1. Magnetic disk memory.



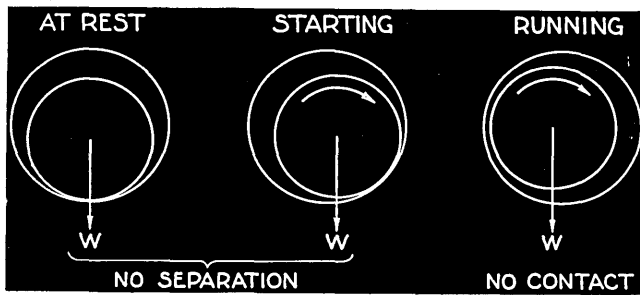


Figure 2. Hydrodynamic journal bearing.

the bearing surfaces. This is done by means of a solenoid actuator (Figure 1). The solenoid's travel is the separation distance from disk to air bearing, and the additional distance necessary to cock the diaphragm to the preload force.

To insure that the action of the solenoid does not enter into the dynamic problem of head-to-disk spacing, the solenoid produces a force when closed greater than the force which will react against it through the shaft. This can be accomplished simply, as the force across the solenoid for fine gaps is inversely proportional to the cube of the gap.

The heads, as mounted in the headplate, are fixed in their general position, but are adjustable through a small arc. These heads are of the open, rather than of the ring, variety; therefore, utilize orthogonal rather than transverse recording (through, rather than along, the surface). This type of recording requires that the backing to the retentive oxide coating be a soft ferromagnetic material.

Open heads are preferred to ring heads, because the open configuration is far more adaptable to full shielding. It is not contended that these heads will give higher pulse density, nor that they are more efficient, but rather that they can be better shielded against magnetic crosstalk.

The diaphragm coupler, which maintains the disk irrotationally fixed to the shaft, allows stacking of as many disks on a shaft as needed, provided that the motor torque to drive them and the solenoid force to lift them are available.

The unit is liquid cooled, with cooling applied between the heat source and the portion of the unit which is most thermally sensitive. Heat flows from the sensitive area (headplate) into the cooling jacket (sink), and from the heat source (motor-solenoid area) into the sink, but never from the motor or solenoid to the headplate.

Because the main objective is reliability, the first requirement was for simplicity of design, and only two radial bearings are used for the entire structure. Shaft to air bearing orthogonality is not critical. The disk is so designed that uniform thermal variations will not affect its surface characteristics. The headplate is designed to minimize the effect of thermal variations.

All in all, the design demands a minimum of care and accuracy in the manufacture and assembly of machined parts. The two surfaces which make up the air bearing need to be accurately machined only with respect to the reference plans of the air

gap, which is self-aligning. The accuracies of the air bearing shapes are measured in micro-inches, but this is a shape tolerance, not a dimensional tolerance.

Air Bearing. The bearing can be described qualitatively by a consideration of Figure 2 which, though not depicting a thrust bearing, represents the most prevalent viscous shear bearing in use today—the common oil journal bearing. It is seen that when the journal bearing has no velocity, the shaft rests at the bottom of the bearing, actually in contact with the bearing surface; that is, the surfaces are not physically separated by an oil film.

When the shaft begins to rotate, it climbs uphill and, except for the effect of vibration, remains in contact with the wall of the bearing. However, as the shaft comes up to speed, the position shifts to that shown in the third part of Figure 2. This "floating" position is assumed due to the viscous shear of the material. The lubricant wedge formed underneath the journal, produces the balancing force which is equal and opposite to the vector sum of loads on the shaft member.

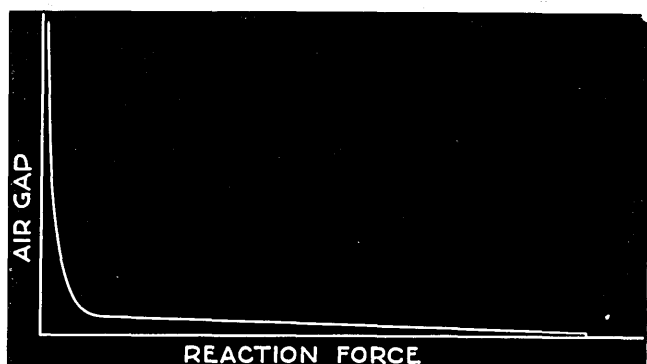
One component of the total shaft load is the reverse viscous shear force caused by the wedge at the top of the shaft. Early work on this type of bearing using air as the lubricant was done by Hern and Kingsbury in the nineteenth century. (*Engineering*, January 30, 1885, p. 118, and *Journal of American Society of Naval Engineers*, Vol. IX, p. 267-292.)

As stated previously, the autolubricated air thrust bearing works in the same manner as the journal bearing. However, a very efficiently shaped stationary member is utilized, so that the part analogous to the lower wedge develops maximum separation force, and that analogous to the upper wedge develops minimum counter force.

This bearing, instead of using a high-viscosity material like oil, uses air which has a very low viscosity. Bearing characteristics, moreover, are only to a minor degree a function of temperature; this function is opposite in sign to that which is obtained by the use of conventional lubricating oils.

This means that as the temperature rises, the viscosity of the air increases. A dimensionless curve of approximate air-bearing properties, shown in Figure 3, indicates a very pronounced stiffness. Spring constants of the order of pounds per micro-inch of deflection and ultimate strengths of the

Figure 3. Properties of an air bearing.



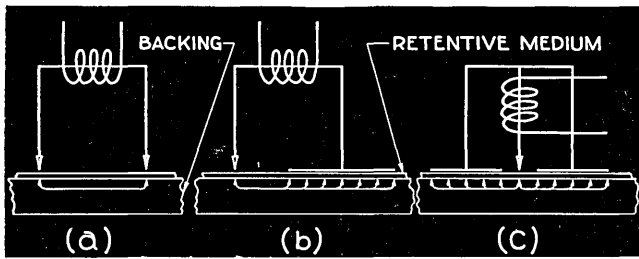


Figure 4. Open-type heads.

order of hundreds of pounds, are not uncommon. Operation of the bearing in the region where the curve is almost flat, results in a very constant gap width even under extremely large variable loads.

Recording. A few open heads are schematically shown in Figure 4. The first illustrates a head which writes through the recording medium onto two tracks. This head is difficult to utilize because it requires alinement of the read and write heads on two separate tracks. Moreover, it requires that the land (the portion of the recording medium left blank between the tracks to minimize crosstalk) be doubled.

The second portion of Figure 4 depicts an open head in which the heel area is very much larger than the toe area; therefore, saturation flux density can exist in the toe tap with very low flux density in the heel gap. Heads of this type, with the heel area covering only the track, have been tried, but cannot be made to operate for certain patterns of stored data (long-magnet effect).

Operation can be effected by increasing the heel gap. This does not change the reluctance of the head gaps appreciably, as the heel area is much larger than the toe area, but does increase the effective area of the heel. If enough of the land area can be associated with the heel gap, then the heads will operate at full efficiency for any pattern of stored data.

Increasing the heel gap, however, increases the leakage flux; in fact, crosstalk increases so greatly that very little use is made of this method of magnetic recording on either drums or disks. Part C of Figure 4 shows the configuration which appears to be most useful. It uses the same gap distance for heel and toe, but wraps the heel completely around the toe.

This means that in writing, for example, the toe cannot illuminate any portion of the disk unless the return path goes directly to the heel. There is essentially no fringing flux from this configuration. With these heads, the crosstalk has been reduced to less than 2%, even when the read and write heads are absolutely adjacent.

Crosstalk is measured as a percentage of full read output, with full write current being utilized in the adjacent head. It should be noted that the heads are very thin (0.1" thick); therefore, the above-mentioned crosstalk data are taken at 0.1" spacing, far narrower than is normally necessary.

Physically, the heads are constructed as in Figure 5. The coil is a simple layer-wound coil

placed on the center leg of a high-permeability metal E which is very thin. Around this are placed two fairly high-permeability, low-loss slabs of material which form the shielding and the heel pole faces. These very-high-permeability E's are not long enough on their outside legs to be a part of the heel pole face; thus, the heel flux is not concentrated in their area but is distributed over the entire heel area.

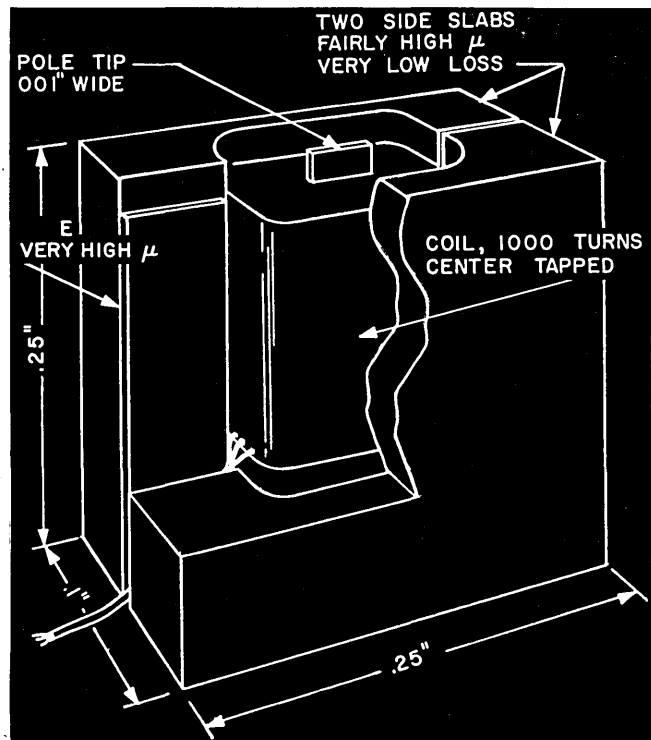
In the NRZ system of recording, the most perfect flux pattern that can be written is a square wave with slightly rounded corners (because this is a distributed parameter system). For this reason, squared demarcation lines are obtainable. A perfect derivative read head would, thus, produce a very sharp impulse voltage waveform at rise and fall of the flux.

The best that one might actually achieve would be a nearly-triangular wave of read voltage shaped such that the peaks of all waves are at the same amplitude, both positive and negative, with the base of the wave absolutely flat. This would mean that the dynamic characteristics of the read heads were critically damped, and that the write heads had very little capacitance; if the write heads were highly capacitive, their flux would build up exponentially rather than linearly.

It can be seen in Figure 6 that, where a triangular output voltage pulse of width "d" results from a flux reversal at low density, then two flux reversals during the interval "d" represent the maximum pulse density which can be utilized without resorting to amplitude discrimination in the output.

Such a condition corresponds to an alternate 1, 0 pattern in which the width of the output pulses

Figure 5. Fully-shielded open magnetic head.



is decreased by a factor of two as a result of increased pulse density, while a reduction in output amplitude is just being encountered. In Figure 6, it is seen that the coincidence of a sampling pulse with a read head output voltage above the dotted baseline is required to generate either a "set one" or "set zero" input to an associated memory flip-flop.

The two output signals indicated are obtained by use of a centertapped transformer at the output of the read head voltage amplifier. Variations from this perfect waveform can be accounted for by a consideration of peak modulation from disk or drum runout, from the possible lack of homogeneity in the magnetic character of the retentive medium, and from noise pickup.

Base modulation arises from electrical head circuit oscillation and its associated damping, from noise pickup, and from inhomogeneity in the magnetic characteristics of the retentive medium. Also, one might consider the specific shape of the read pulse. In most cases, however, it is sufficient to assume that all peak modulation is noise, defined as not signal, and that all base modulation is noise, again defined as not signal.

Conclusions

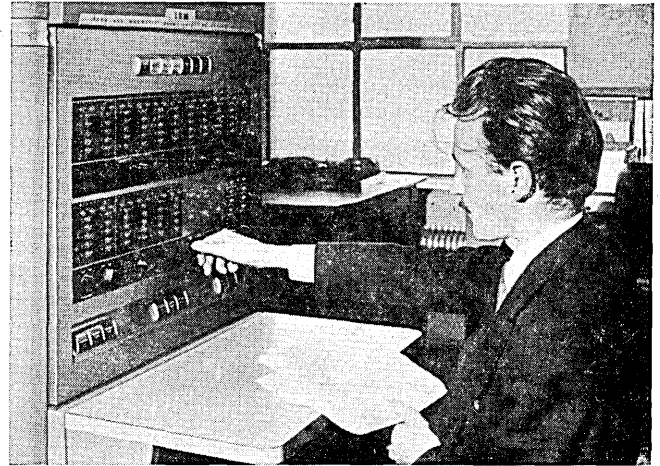
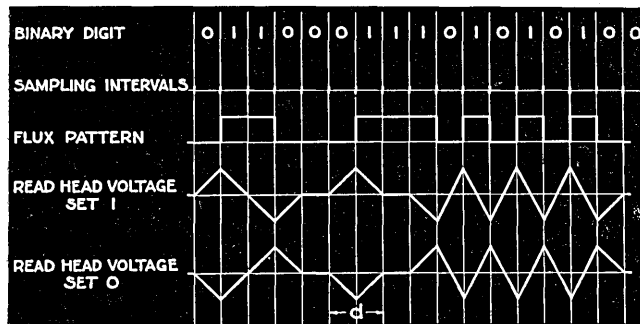
Magnetic memory systems have been built as described in this report with less than 5% envelope noise and 5% base noise, and with short loops at pulse densities of 500 per inch. Many computers require, or could use, very short loops (a loop being defined as a recirculation register).

These heads, with no modification, produce loops as short as 0.1". If the recordings were at 100 cells per inch, this would be a 10-cell loop. With modification in the read and write head, effective head widths of 0.050" with very low crosstalk may possibly be obtained. This provides a 25-cell loop at 500 cells per inch, or a 5-cell loop at 100 cells per inch.

It should be noted that in a synchronous system, the angular cell density is a constant, and the linear cell density varies with radius. Memories are in field service today with 340 cells per inch on the inside track, and 180 cells per inch on the outside track. Thirty-two bit loops are utilized on the outside track.

Circle 109 on Reader Service Card

Fig. 6. Flux & voltage output waveforms for NRZ recording.



belgium gets its 1st d-p machine

In the presence of Belgian Government officials and representatives of the American Embassy, Belgium's first electronic data processing machine (an IBM 650) was recently inaugurated at Ghent.

Installed in the plant of the *Societe d'Electricite et de Mecanique* (S.E.M.), a 120-year-old company producing electric motors, transformers, generators, and electric traction machinery for railroads, the 3-ton machine will complete 78,000 additions or subtractions per minute, 5,000 multiplications, 3,700 divisions, and 138,000 "logical decisions."

Hired, in accordance with IBM practice, at approximately \$5,000 a month, the machine was transported by special trucks from one of the company's European plants and was entirely fitted by Belgian technicians within one week.

The time-saving it will represent to S.E.M. is exemplified by such problems as the study of the possible performances of a diesel engine train on a given schedule. By traditional means 1,000 hr. of work would be needed to find the answer that the 650 gives in 9 hr. at 1/8 of the cost.

The machine has a magnetic drum memory which at 12,500 rpm turns five times faster than the propellers of a modern four-engined aircraft. It can register 20,000 figures, and feed any one back at will in less than three-thousandths of a second.

This installation is part of the rapid move towards automation taking place in Belgium's leading industries. The S.E.M. has itself opened a bureau to study the applications of automation, and Sabena, the Belgian airline company, has flown in an IBM 650 that will be used to calculate mean value of monthly stocks, timetables, tariffs, costs of petrol and oil consumption, etc.

A computation center is also shortly to be opened in Brussels by Electronic Associates, Inc. of Long Branch, N. J. This will serve the whole of Europe.

IBM's 650 Computer Registers Systems Conference

Business "doctors" attending this year's International Systems Meeting in Los Angeles in October found themselves taking a dose of their own "medicine."

Sponsored by the Systems & Procedures Association of America, this meeting was the first business show where electronic methods recommended to American industry by these systems experts actually were used to help make the conference itself run more smoothly.

Brains of the mechanical management was IBM's 650 medium-sized electronic computer. Working with the computer was a direct output printer which wrote individual programs for the registrants at the rate of 150 lines per minute.

The primary task of the computer-printer combination was the complicated task of keeping track of the more than 5,000 visitors who attended this international meeting. This involved such jobs as recording the seminar preferences of each registrant and directing him to the location where his meetings were to be held.

Because 110 different study sessions were scheduled during the 3-day conference, 27 conference rooms or hotel suites in 4 different buildings were utilized for meetings.

In the General Sessions, executives and management staff covered the highlights of the most important areas of systems and procedures. Seminars were "pitched" to the systems technician's operating level, with participants contributing their own experiences for collective study.

Industry group meetings were programmed to provide an interchange of ideas within each industry through stimulation of case reports from specific functions in selected divisions of the industry.

The Systems Panorama was a comprehensive and concentrated 3-day project to cover the entire systems field. Systems applications and equipment reports explained the latest developments in systems equipment.

Located in the Los Angeles room of the Statler Hotel, headquarters of the conference, the automatic registration procedure went into effect the moment each guest stepped up to the desk to begin his registration.

The pre-registered visitor received an IBM card which contained his name and the session number of each of the sessions he planned to attend. For those who did not pre-register, an IBM card punch operator prepared similar "program" cards at the time of registration.

With these "calling cards" as his introduction, the participants then asked the "Electronic Registrar" to consult its 20,000-digit magnetic drum memory and tell them the exact time and location of their meetings.

The IBM 650 analyzed the registrations as they came in to show the executive committee of the association the relative popularity of each conference event. These figures were used to determine which conference rooms to use, and will also be used in scheduling the program for 1958.

Other statistics kept by the 650 included the counts of meal tickets and *Ideas for Management* books sold, and the amount of money received.

Through the use of "Inquiry" cards, conference officials were able to receive immediate answers from the 650 to such questions as: "How many chairs will be needed at the sessions on 'Operations Research Techniques' this afternoon?" or "How many members should we expect for lunch today?"

The 650 system also provided a personalized invitation to all visitors who had not registered for study meetings to visit the office equipment exhibits and to register for any of the sessions.

A medium-sized decimal computer, the IBM 650 is a stored-program machine with logical ability; it remembers instructions and follows them as dictated by conditions arising during the course of solving each problem.

The computer consists of 3 basic units: a punched card input-output unit which feeds data into the computer's "memory," a console unit containing the magnetic drum for storing data and instructions, and a power unit.

Heart of the 650 is its magnetic drum which revolves at 12,500 revolutions per minute and has a storage capacity of up to 20,000 characters. It can perform as many as 78,000 additions and subtractions per minute, make up to 2,300 logical decisions per second, and automatically check the accuracy of its own answers.

Widely used in business and industry, applications of the computer range from such scientific and engineering problems as missile design and highway cut and fill operations, to commercial assignments such as payroll processing, market research analysis, centralized branch store accounting, utility customer billing.

Auxiliary equipment, such as the 407 printer, can be attached to give additional flexibility of performance. The International Systems Meeting was the first business show where IBM has displayed this on-line printing feature which gives users the advantage of cutting down the number of operations steps to complete processing.

Circle 110 on Reader Service Card

Air Conditioning Essential to Electronics Growth

Air conditioning has become an important element in the growing electronic automation of business, industry, and defense.

Modern computers, producing tremendous heat from their electrical systems while making intricate calculations, require extensive cooling to insure efficient operation.

Carrier Corp. (Syracuse, N. Y.), a leading air conditioning firm, has had wide experience in computer cooling. The company has installed climate control systems for some of the largest electronic units in the country.

Carrier air conditioning equipment is in such electronics plants as International Business Machines, Ramo - Wooldridge, Texas Instruments, Sylvania Electric Products, and ElectroData Div. of Burroughs Corp.

Semi-conductor manufacturing is a chemico-metallurgical process in which tiny crystals are "grown" around a quartz "seedling" placed in a solution and stimulated through a chemical process. These growths become the material from which transistors are made.

Exacting air conditioning performance is necessary in such plants. With production of semi-conductors such as transistors, extremely-pure materials are a necessity since a single speck of dust can render them useless.

Temperature and humidity, too, must be carefully controlled because extremely-close tolerances are essential in machines which may contain nearly one million parts.

Major producers of electronic data processing units also recommend that temperature, humidity, and air purity be accurately governed in rooms where their equipment is installed, since high temperatures may seriously damage the equipment.

ElectroData Div. recommends an operating temperature of 60

to 80 degrees to protect its computing equipment.

Humidity should not exceed 60% because magnetic tape becomes sticky at higher temperatures, causing problems of registration resulting in wrong answers.

Another factor calling for the air conditioning of electronic data processing equipment is operator comfort, since electronic tubes produce large amounts of heat.

To dispel this heat and cool adjacent areas as well, Carrier Corp. has developed several methods of computer room cooling. In its most simple application, a Self-Contained Weathermaker may be sufficient for efficient operation and operator comfort.

Other installations are more complex. A two-part cooling system with a capacity of 74 tons, the equivalent of 3,000 50-pound blocks of ice melting every 24 hours, has been installed in the Univac room of Franklin Institute in Philadelphia.

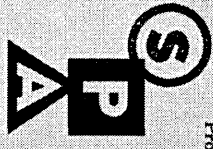
In one-half of the system, a Carrier compressor circulates chilled water through a built-in Univac transfer surface to carry off heat generated by the electronic speedster.

The other half supplies conditioned air for the room in which Univac is installed and an exhibit area from which the machine can be seen.

The largest computer ever air conditioned is said to be the Bizmac installation, cooled with Carrier equipment for the U.S. Army's Ordnance Tank-Automotive Command in Detroit. It is composed of 361 recording, transcribing, and computing units, occupying some 20,000 square feet of floor space.

The conditioning equipment must remove 1,800,000 British Thermal Units of heat each hour (enough to cool 75 average-size homes), to protect Bizmac against heat-induced damage.

Circle 111 on Reader Service Card




PROGRAM SCHEDULE FOR W. M. MASLINE

SYSTEMS & PROCEDURES ASSOCIATION of AMERICA
1957 INTERNATIONAL SYSTEMS MEETING

Session No.	Seminar, General Session, or Industry Group	Date	Time	Location	Room
101	MGMT COMMUNICATIONS-SYSTEMS	MON OCT 7	2:00-4:30	STALLER	NEW YORK
203	FORMS DESIGN AND CONTROL	TUES OCT 8	3:30-4:30	STALLER	NEW YORK
392	ACCTG & BILLING MACHINES	TUES OCT 8	9:00-10:30	STALLER	GOLDEN STATE
493	REGULATING EQUIP APPLIC	TUES OCT 8	10:30-11:30	STALLER	GOLDEN STATE
563	INSURANCE	TUES OCT 8	1:30-3:00	STALLER	SUITE 3W18
563	INSURANCE	WEDS OCT 9	8:00-11:30	STALLER	SUITE 3W18
917	REPORT ON G. E. EDP INST	WEDS OCT 9	2:00-3:00	STALLER	NEW YORK
18	REPORT ON BK OF AMER EDP	WEDS OCT 9	3:30-4:30	STALLER	SIERRA

Registration & conference materials are being prepared by us
 IBM 650
 DATA PROCESSING SYSTEM

Card-Punch and Printer units communicate alphabetically with the magnetic drum.



Your registration at the 1957 meeting of the Systems and Procedures Association brings over total number of visitors to 2812

* Registered for Systems Applications and Equipment Reports 249
 * Registered for Industry Groups 743
 * Registered for Systems Division 137
 * Registered for Seminars 601
 * Registered for General Sessions 153

DATES TO REMEMBER

Nov. 4-8, Institute on Electronics in Management, theme: "Current Developments in Automatic Data Processing Systems," The American University, 1901 F St., N.W., Washington 6, D.C.

Nov. 5-7, Military-Industry Guided Missile Reliability Symposium, Naval Air Missile Test Center, Pt. Mugu, Calif.

Nov. 13-15, National Conference on Standards, held in conjunction with the 39th annual meeting of the American Standards Assoc., St. Francis Hotel, San Francisco, Calif.

Nov. 19 & 20, Symposium on Analog & Digital Computation & Systems Dynamics, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio.

Dec. 9-13, Eastern Joint Computer Conference & Exhibit, theme: "Computers with Deadlines to Meet," sponsored by Institute of Radio Engineers, Assoc. for Computing Machinery, & American Institute of Electrical Engineers, Sheraton Park Hotel, Washington, D.C. (For further information, write R. T. Burroughs, IBM Corp., 1220 Nineteenth St., N.W., Washington, D.C.)

Dec. 12 & 13, Automation Conference, sponsored by the University of Chicago Downtown Center, Congress Hotel, Chicago, Ill. (For further information, write UoCDC, 19 S. LaSalle St., Chicago 3, Ill.)

Dec. 18 & 19, Conference on Maintainability of Electronic Equipment, sponsored by Electronics Industries Assoc. (formerly RETMA), University of Southern Calif., Los Angeles. (For further information, write EIA, 11 W. 42nd St., New York 36.)

Jan. 22-24, 1958, Conference on Automation, theme: "The Place of Automation Systems in Business & Industry," sponsored by Electronics Industries Assoc. (formerly RETMA), Arizona State College, Tempe (Phoenix), Ariz. (For further information, write EIA, 11 W. 42nd St., New York City 36.)

May 6-9, Western Joint Computer Conference, theme: "Contrasts in Computers," sponsored by Institute of Radio Engineers, Assoc. for Computing Machinery, & American Institute of Electrical Engineers, Ambassador Hotel, Los Angeles, Calif.

June 2-4, National Telemetry Conference, sponsored by American Institute of Electrical Engineers,

American Rocket Society, Institute of Aeronautical Sciences, & Instrument Society of America, Lord Baltimore Hotel, Baltimore, Md.

June 9-13, International Automation Congress & Exposition, Coliseum, New York City. (For further information, write Richard Rimbach Associates, Show Management, 845 Ridge Ave., Pittsburgh 12, Pa.)



Motivation Training at Ward Leonard

More than 113 executives and supervisors at Ward Leonard Electric Co. (Mt. Vernon, N.Y.), manufacturers of resistors, rheostats, relays, and other electrical control equipment, have recently completed a brush-up course on techniques of executive leadership. Those in attendance ranged from the chairman of the board to fledgling foremen.

The course, conducted in a series of seminars by noted business counselor Jack Wolff of New York, laid heavy stress on the motivations that propel both individuals and groups toward desired goals. Wolff's job, as he sees it, is to "motivate each manager to motivate his people." Motivated properly, each individual exerts maximum effort toward such desirable goals as increased production, bigger sales, greater inter-departmental cooperation.



Errata: We regret that an incorrect picture was used to illustrate the "Pulse generator" story which appeared on p. 47 of the October '57 R/E. Although the text is correct, the accompanying illustration is not a product of American Electronics Labs., Inc.

with Johns-Manville, the move to
electronic machine calculation
is more than financial . . .

How d/p Service Bureau Serves J-M Customers

A high-speed electronic computer is now being used by Johns-Manville Corp. to continue its long history of top flight customer service. The Industrial Insulation Div. is making use of one of the "giant brains" to prepare both their heat transmission tables and tables showing recommended insulation thicknesses based on

economic considerations.

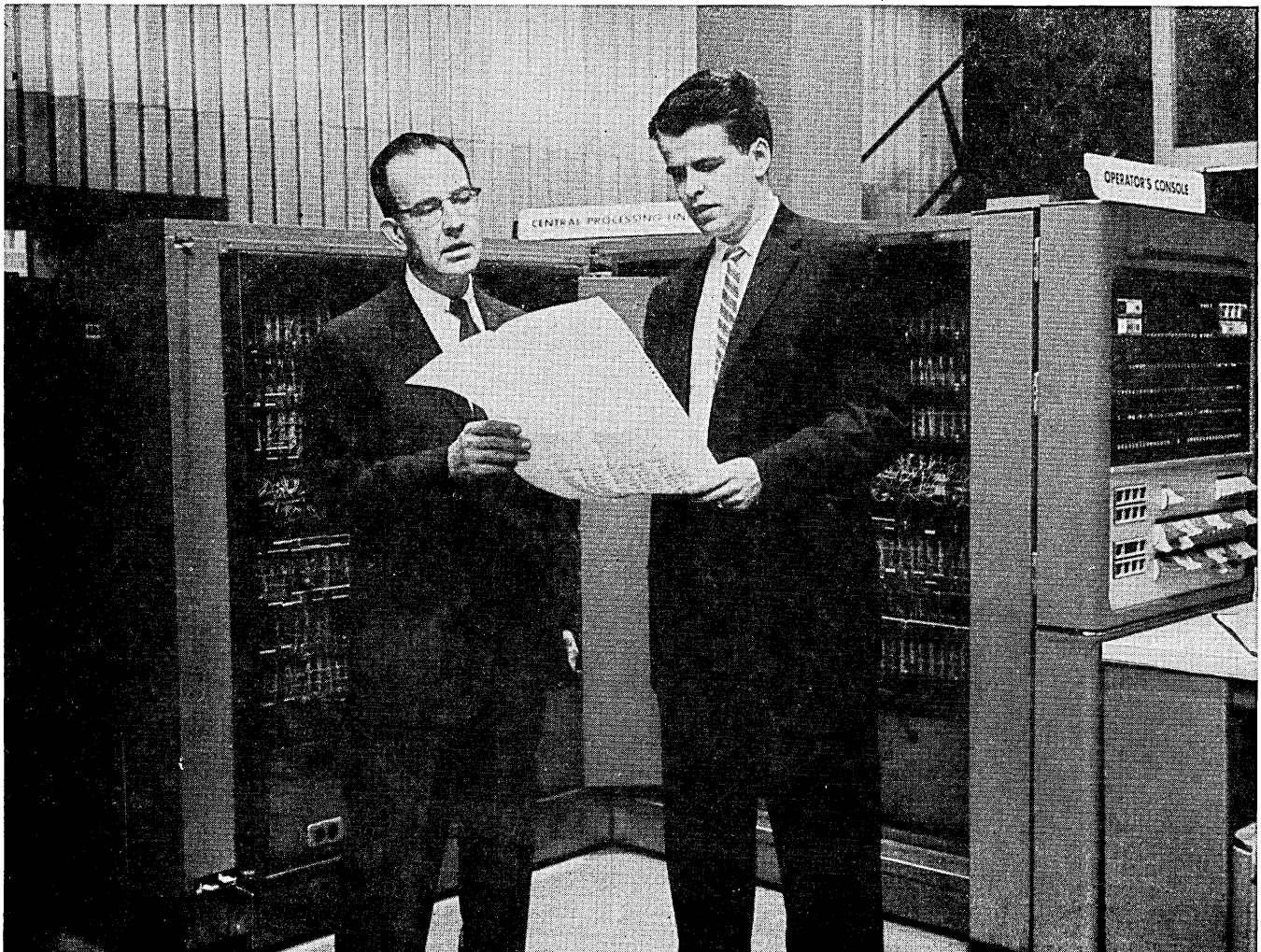
Economic thickness is that which will pay for itself over a given period while producing a specified return on its cost. At this thickness, the sum of annual cost of heat loss and insulation is a minimum.

According to C. E. Ernst, senior engineer, "Although many

man hours have been saved, the importance of the move to electronic machine calculation is more than financial. Now the heat transmission tables can be done faster, more accurately and, as an added bonus, more information is available to the engineering department and Johns-Manville customers than ever before."

C. E. Ernst, Johns-Manville Corp., checks information on heat transmission tables with a programmer of Service Bureau Corp., a subsidiary of IBM. In the background is

the "704" which keeps up-to-date J-M heat transmission tables and additional tables that show recommended insulation thickness based on economic considerations.



The Johns-Manville Research Center is constantly at work on the development of new and better insulations. It is, therefore, imperative that these tables be kept up-to-date for all thermal insulations so that customers are kept fully informed of resultant insulation improvements.

Heat transmission tables are developed for 85% Magnesia, Thermobestos, Superex, the recently-introduced Banroc H.T., a mineral fiber block, and many other J-M insulations. All of these insulations have their own particular uses in industry.

In addition, recommended thickness tables are developed for such applications as utilities, process industries, commercial installations, and others.

Calculation formulae, thermal conductivities, surface coefficients, pipe dimensions and thickness are given to the data processing Service Bureau Corp., a subsidiary of International Business Machines Corp., for the heat transmission tables.

Additional information must be fed through the computer for the calculation of economic thicknesses such as: cost of heat, an-

nual hours of operation, unit cost of insulation, and yearly fixed charge for insulation. When all of this information is fed into the 704 Computer, it produces the mass of data required for compiling the tables.

The information is fed to the computer on magnetic tape. This tape is stored by IBM for future use in revising the tables, thereby cutting down the work time and cost. These tables provide Johns-Manville sales representatives with the information they need to guide their customers in selecting insulation for any given job.
Circle 112 on Reader Service Card

IDP school for businessmen

In an ivy-covered building on a former Rochester, N.Y., college campus, American businessmen are going to school to learn a new language. It is the common language of the punched-tape as used in Integrated Data Processing.

The 43-year-old building which once was part of the University of Rochester now houses the new Educational Center of the Friden Calculating Machine Co. H. J. Lindsay, the company's director of training, calls it simply "the schoolhouse."

That is exactly what the Educational Center is—a schoolhouse for business people of all kinds who are interested in integrated data processing. Its curriculum revolves around the sales, service, and systems design of IDP, by which business is able to link together many of its machines and utilize repetitive information without repetitive effort.

This businessman's schoolhouse is in session 12 months a year. The "students" may be new Friden office managers. They may be trainees who will sell the company's equipment and methods, or servicemen who will keep the electro-mechanical IDP devices running properly.

Or, the "students" may be executives from all walks of business and government. They come to the Educational Center for a basic indoctrination in what the IDP machines will do and how they handle business paperwork. Specific-interest groups, such as accounting, railroading, and banking organizations, send representatives to seminars about IDP as applied to their interests.

The objective of this educational program is to build a mutual understanding on which sales must be based in the office automation field.

Educational Center courses run in duration from five days (for Customer-Prospect IDP Schools) to 14 weeks (for an exhaustive service training rundown on equipment such as the complex Computyper automatic billing-calculating machine). Periodically, the school-house population is

supplemented by groups of young women in training as Customer Systems' Secretaries.

In a three-week course, they learn to assist salesmen by working out program tapes, conducting machine demonstrations, and training customer operators. New managers of Friden sales offices also are briefed at the Educational Center in office operations, company procedures, and correct management practices.

During a typical day's program in the schoolhouse, a trainee will hear as many as two-million words. Over a five-week course, he will collect more than 3-1/2 linear feet of "textbooks" in the form of catalogs, manuals, and other essential data. Collectively, the written material accumulated during the business systems sales course will weigh more than a ton.

Each of the dozen classrooms and lecture halls in the Friden schoolhouse is, in effect, a laboratory for research into integrated data processing. There is more than \$700,000 worth of IDP equipment in the Educational Center, a collection regarded by the company as among the largest and most varied of its kind in the nation.

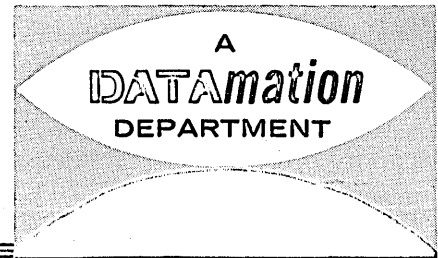
The comprehensive nature of the IDP collection enables the Educational Center to follow a program of "shirtsleeve schooling." Practical experience is the keynote, and those in session actually operate the equipment at every opportunity.

Friden has a specially-trained facility of men and women who conduct the Educational Center courses in the methods and mechanics of integrated data processing. Some of the instructors are chosen from the Friden field sales force and, after serving at the schoolhouse for a given time, will be advanced to responsible office positions in the organizations.

In the meanwhile, they will have gained valuable insight into the company's policies, and added a broad field of IDP knowledge to the sales area in which they have specialized.

Circle 113 on Reader Service Card

CURRENT LITERATURE



Millisadic Data Reduction (6 pp.), Brochure No. 5-02-110, explains how the Millisadic analog-to-digital converter is linked to Datatron by special modifications permitting the computer to read and process test data directly from the Millisadic's magnetic tape and bypass the card-punching and subsequent input operation that made overall reduction times unnecessarily large. (**ElectroData**, 460 Sierra Madre Villa, Pasadena, Calif.)

Circle 201 on Reader Service Card

Taller & Cooper Data Processor, a 1-page bulletin, describes T&C's versatile punch-card system that provides simple, fool-proof control over data handling problems. Heart of the processor is a console containing a keyboard, a slot for tabulating cards, a key switch, a slot for an operator-identification plate, and a digital counter that provides a visual indication of the number of items processed. The output of the console is fed to a T&C tape punch. If desired, a timing mechanism can also be built into the console. (**Taller & Cooper, Inc.**, 75 Front St., Brooklyn 1, N.Y.)

Circle 202 on Reader Service Card

Catalog 58P, an 8-page illustrated technical brochure, describes Power Sources' facilities and 20 new standard DC-DC, DC-AC, DC to multiple AC, and DC output transistorized power supplies. A special section is devoted to describing new regulation techniques which allow outputs to be furnished up to 500 volt-amperes with 1% over-all regulation from -55° to $+85^{\circ}$ C. Both saturable reactors, series and parallel transistor-Zener diode combination regulators are described. Methods are also outlined for providing

sinusoidal AC outputs with distortions of less than 5% and better than $\pm 3\%$ frequency regulation over wide temperature ranges. (**Power Sources, Inc.**, Burlington, Mass.)

Circle 203 on Reader Service Card

Anatherm Magnet Wire (14 pp.), Publication No. C-99, describes Anatherm, the first polyester film-coated magnet wire to be offered under the new Class F (155° C.) rating established by AIEE. Developed and marketed by Anacanda, the new product supplements the company's line of Class B Epoxy enamel magnet wire. Designed to give greater thermal and chemical stability, abrasion resistance, and dielectric strength, Anatherm is available in single and heavy film thickness in AWG sizes from 15 through 25. (**Anacanda Wire & Cable Co.**, Muskegon, Mich.)

Circle 204 on Reader Service Card

Automatic Data Processing, a 16-page brochure outlining the steps that should be taken in installing automatic data processing systems in business, describes the methods that Diebold has developed to yield maximum return from such systems for its clients. The elements in such a step-by-step practical approach to data processing, as detailed in the brochure, are: problem definition; systems studies; orienting, selecting, and training personnel; equipment specification; and programming aid. (**John Diebold & Associates, Inc.**, 40 Wall St., N. Y. 5, N. Y.)

Circle 205 on Reader Service Card

Analog-to-Digital Conversion, a completely-revised reprint from the Proceedings of the 1956 Symposium on Automatic Data Log-

ging Systems, discusses the various types of analog-to-digital converters, with particular emphasis placed on the voltage sweep analog-to-digital converter. Examples are given of the operation of the converter, and how it logically arrives at the final digital value of the original analog inputs. (**Beckman Instruments, Inc.**, Systems Div., 325 N. Muller Ave., Anaheim, Calif.)

Circle 206 on Reader Service Card

New Advances in Common Language Data-Processing, a 6-page brochure, is highlighted with easy-to-read diagrams showing the use of common language equipment in conjunction with wire transmission facilities to speed data processing among offices, factories, warehouses, and branches. Applications described include decentralized billing, sales order transmission, branch order writing, personnel records, record retention, and local payroll data reporting. (**Remington Rand, Div.**, of Sperry Rand Corp., 315 Fourth Ave., New York City 10.)

Circle 207 on Reader Service Card

Computers in the Process Industries, a reprint of a paper delivered by William Gunning at a Symposium on Computers in Real-Time Simulation, as part of the Data Reduction & Control Group of the IRE National Convention, contains an interesting analysis of past, present, and future applications for computers in the process control. It describes problems for computer applications as follows: the formulation and verification of satisfactory mathematical models; development of adequate data acquisition techniques and equipment; the accumulation of convincing proof that the advanced computer and

control equipment required is sufficiently reliable for process control. (Beckman/Systems Div., 325 N. Muller Ave., Anaheim, Calif.)

Circle 208 on Reader Service Card

Universal Stabilized Amplifier (1 p.), Technical Bulletin No. USA-3, describes the Philbrick universal stabilized amplifier, Model USA-3, which has such a high inherent gain that the feedback circuitry alone determines the loop gain. The open-loop gain drops off smoothly at 6 db/octave over its entire working range, decreasing to unity in the vicinity of 1 megacycle. (George A. Philbrick Researches, Inc., 230 Congress St., Boston 10, Mass.)

Circle 209 on Reader Service Card

Model C Computyper, a 6-page brochure, describes Friden's Model C Computyper, a new unit in the automatic office which brings full automation to billing—yet a typist uses it without special training. Common-language tape or edge-punched cards automatically supply all basic, repetitive information, automatically instruct the Computyper to write, calculate, tabulate, place decimals. These punched data are prepared only once, in advance, to be used over and over again. In addition, the Computyper produces a tape automatically that contains all data required for inventory control and such necessary reports as cost analysis, sales distribution, statistics. (Friden Calculating Machine Co., Inc., San Leandro, Calif.)

Circle 210 on Reader Service Card

Analog Computer Multiplier, a 4-page brochure, describes Chadwick-Helmuth's Model 251 AM-PM Multiplier, an all-electronic, high-speed function multiplier which generates a voltage proportional to the instantaneous product of two arbitrary input voltages. It may be used in all types of electrical-electronic analog computers and simulators where high- or slow-speed multiplication is required. The instrument operates with a 450 KC carrier which is first phase-modu-

lated and then amplitude-modulated in Ring Modulators. The resultant carrier is then demodulated to produce an output proportional to the instantaneous product of the two modulating voltages. (Chadwick-Helmuth Co., 472 E. Duarte Rd., Monrovia, Calif.)

Circle 211 on Reader Service Card

alwac III-E High-Speed Paper Tape Punch & Reader, a 1-page bulletin, describes alwac's new high-speed paper tape console consisting of a 200-character per second photo-electric reader and a 60-character per second punch. This makes possible an 1,800% increase in the input speed and a 500% increase in the output speed of the alwac III-E electronic digital computing system. Modular construction of the new unit permits the purchase of either punch or reader if application does not require both. (alwac Corp., 13040 S. Cerise Ave., Hawthorne, Calif.)

Circle 212 on Reader Service Card

A Study for Management—The Univac II Data Automation System (196 pp.), Manual No. U-1352, is a new aid to help top management investigate the electronic computer, its capabilities, operation, and applications.

Written entirely from the management point of view, the illustrated manual is an ideal starting point for thorough exploration of electronic data processing. The material is based on the collective experience of hundreds of Univac specialists who have trained management and operating personnel since the first Univac was installed in 1951.

The manual begins with a study of the data processing areas in a typical manufacturing firm, then a listing of current computer applications, classified by type of industry. A survey of the types of data processing systems—manual, key driven, punched card, and electronic computers, rounds out the introductory section.

Considerations for electronic data processing are covered in the second section: choosing the applications, selecting equipment, selecting and training personnel,

preparing the computer program, the cut-over to an electronic system, planning the computer organization—all areas that management will want to study in detail.

The operations of the Univac system itself are explored in following sections. The "what, why," and "how" of the components of the computer—the central computer, memory units, control units, and arithmetic units—are discussed and illustrated.

Similar detail is provided for the input-output units of the system, which convert data to the magnetic tape language of Univac, and reconvert the output to printed form or to other data storage media such as punched cards or punched paper tape.

A complete introductory course of Univac programming, suitable for use as a classroom text, is presented in five sections. These include: process charting, flow charting, and coding; processing internally-stored data, processing externally-stored data, and coding techniques.

Tested exercises are provided throughout the programming sections, with answers in the Appendix. Also included are techniques for sorting data on the Univac System and common operational routines. (Remington Rand Univac, 315 Fourth Ave., New York 10.)

Circle 213 on Reader Service Card

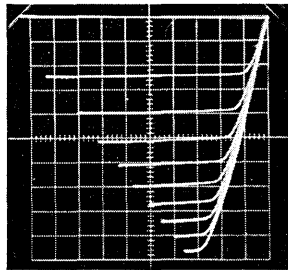
Instrumentation Cables for Telemetering, Data Recording, Circuit Control Testing, & Electronic Computers (8 pp.), Bulletin No. RCD-400, is the first complete technical bulletin on instrumentation cable offered by a wire and cable manufacturer. (Rome Cable Corp., Rome, N. Y.)

Circle 214 on Reader Service Card

New Tailored Pulses, a 2-page bulletin, describes the new IDL high-speed rotary switches for telemetering, programming, sampling, and scanning. PDM switches are available for 45 contacts at 20 rps, 90 contacts at 10 rps, and 30 contacts at 30 rps. (Instrument Development Labs., Inc., 67 Mechanic St., Attleboro, Mass.)

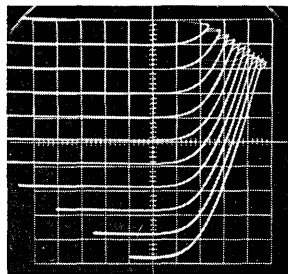
Circle 215 on Reader Service Card

NEW TRANSISTOR-CURVE TRACER



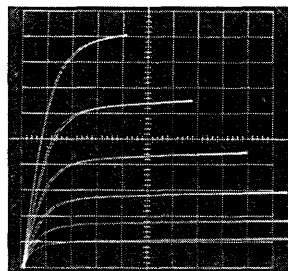
HIGH COLLECTOR CURRENT

PNP transistor, collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 5 v with a 0.25-ohm load, base current is 50 ma/step. Vertical deflection is 1000 ma/div, horizontal 0.5 v/div.



HIGH INPUT CURRENT

PNP transistor, collector current vs collector voltage with base grounded and constant-current emitter steps. Collector sweep is 0 to 1.5 v, emitter current 200 ma/step. Vertical deflection is 200 ma/div, horizontal 0.1 v/div. Zero voltage is at center scale.

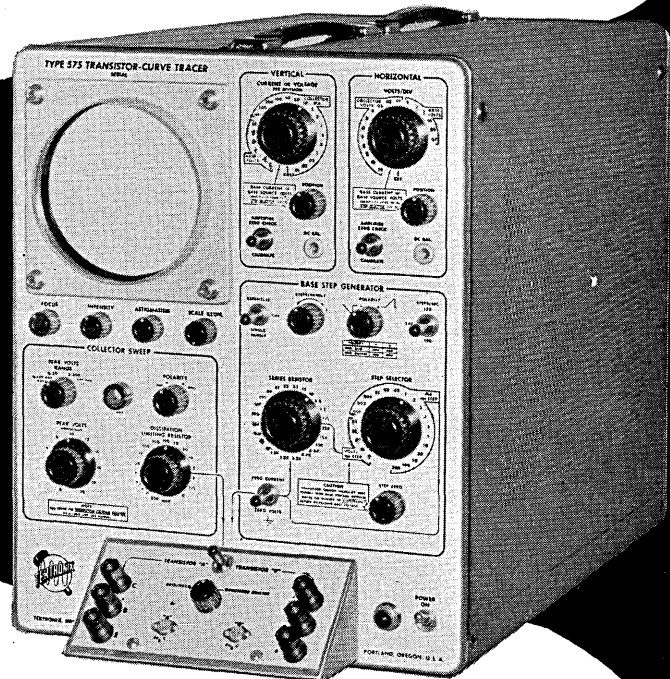


LOW INPUT CURRENT

NPN transistor, collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 1.5 v, base current 1 microamp/step. Vertical deflection is 10 microamp/div, horizontal 0.1 v/div.

**has 10-AMPERE COLLECTOR SUPPLY
2.4-AMPERE BASE SUPPLY**

**Displays 4 to 12 curves per family
with input current from
1 MICROAMP/STEP
to 200 MILLIAMPS/STEP**



The Tektronix Type 575 traces characteristic curves for both PNP and NPN transistors on the face of a cathode-ray tube. Seven different types of curves can be plotted. Vertical deflection is calibrated in collector current, base voltage, base current and base source voltage. Horizontal deflection is calibrated in collector voltage, base voltage, base current and base source voltage. Collector current supply is capable of 10 amperes from 0 to 20 v, 1 ampere from 0 to 200 v. Constant current or constant voltage step supply to either base or emitter is calibrated in 17 values from 1 microamp/step to 200 milliamps/step, and in 5 values from 0.01 v/step to 0.2 v/step with 24 values of driving resistance from 1 ohm to 22 kilohms. Input steps are adjustable from 4 to 12 per family, with repetitive or single-family display.

TYPE 575 TRANSISTOR-CURVE TRACER . . . \$925

f.o.b. Portland, Oregon

Tektronix, Inc.

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First shipments against a sizeable backlog occurred early in November. Please check with your Tektronix Field Engineer or Representative for current Type 575 shipping schedule.

ENGINEERS—interested in furthering the advancement of the oscilloscope? We have openings for men with creative design ability. Please write Richard Ropiequet, Vice President, Engineering.

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MINIATURE CONNECTORS

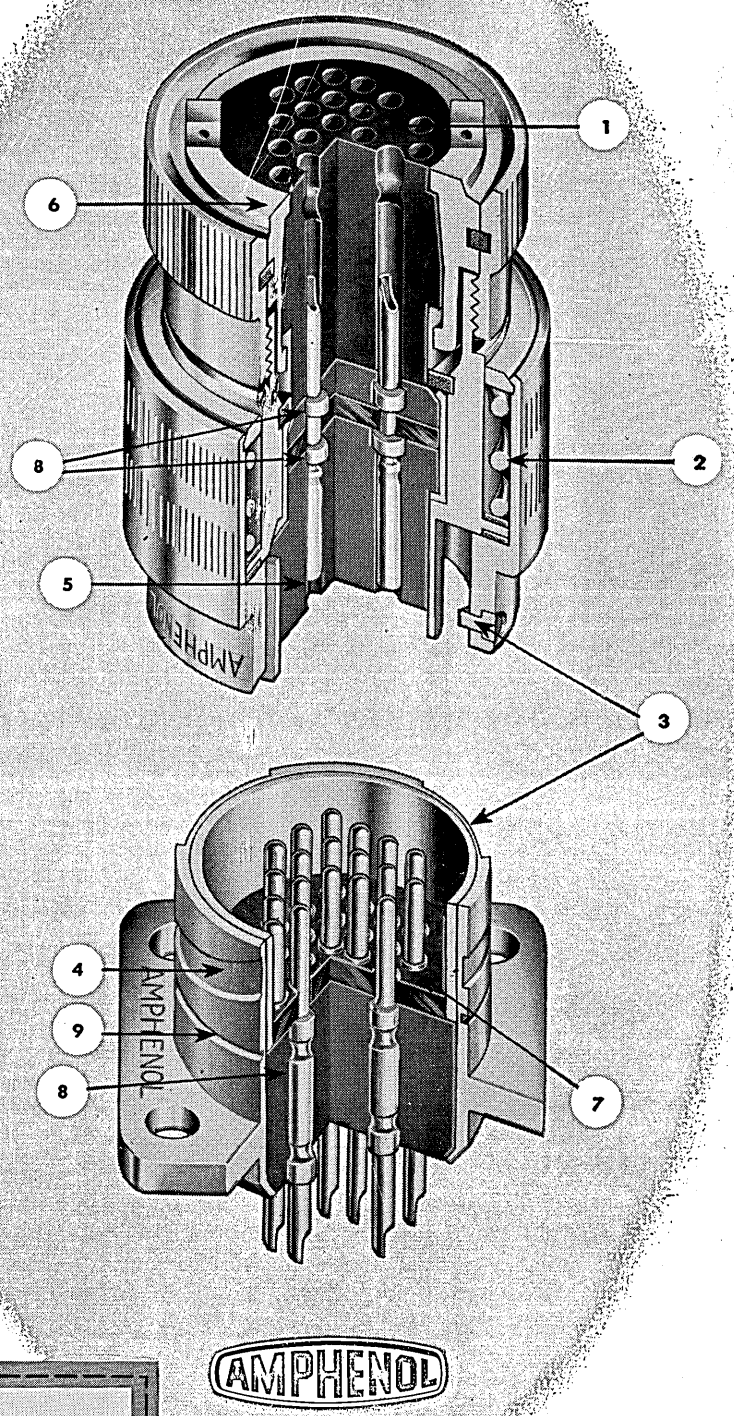
... the only miniature connector line fully conforming to the "E" REQUIREMENTS OF MIL-C-5015C.

Meet minniE—a complete line of miniature connectors with outstanding reliability features! The first miniatures to meet fully the "E" performance requirements of MIL-C-5015C, minniE's are environmentally sealed to resist moisture and humidity; ruggedly built to resist shock and vibration; imaginatively designed to provide application versatility.

FEATURES

1. Environmentally sealed with unitized back end grommet. (Also available with provision for potting.) Either grommet seal or potted seal meets moisture resistance requirement of MIL-C-5015C, Paragraph 4.5.21.
2. Spring-loaded coupling ring provides a positive locking action in the bayonet slot, and a constant compensating force which eliminates the effects of resilient face seal compression set.
3. Stainless steel bayonet slots and pins reduce wear and frictional characteristics. The three pin bayonet coupling minimizes the rocking action of the mated plug and receptacle.
4. Flattened incline angle of bayonet slots reduces mating force requirement.
5. Hooded contacts resist test prod damage as defined in Paragraph 4.5.14 of Amphenol Specification 340-43-2108.
6. Unitized grommet seal; clamp and grommet form a single unit for ease of assembly and maintenance.
7. Face seal gasket with individual barriers to isolate each contact.
8. Hard insert dielectric (plus resilient face seal) positively retains contacts with no possibility of contacts being pushed out of the insert.
9. A visual full engagement indicator is included in the design to insure the user that he has fully engaged the connectors. The indicator is an orange line around the receptacle shell.
- When using mated sealed connectors, no derating for altitude is necessary at 70,000 feet.
- Test voltage 1,500 volts RMS 70,000 feet on sealed connectors.
- Vibration per Method 204 of MIL-Std-202A. 10 to 2,000 cps at 20 g's.
- Temperature cycling range per MIL-C-5015C, Paragraph 4.5.3 increased to 257°F. maximum and -67°F. minimum.

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- 5 SHELL SIZES: 12, 14, 18, 20, 22
- 17 INSERT ARRANGEMENTS: Up to 48 contacts; coax and hermetic seals also

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