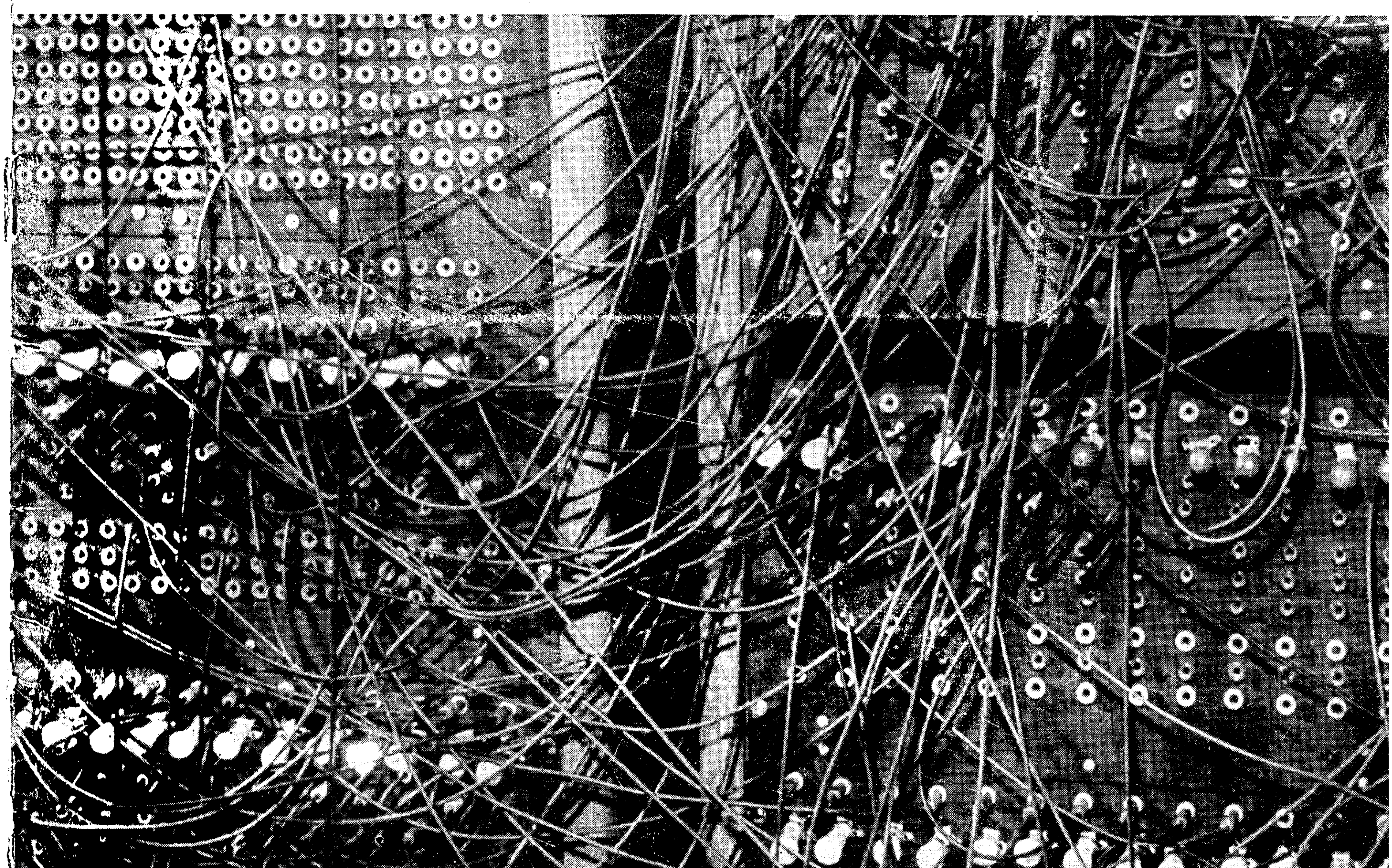
The Magazine of

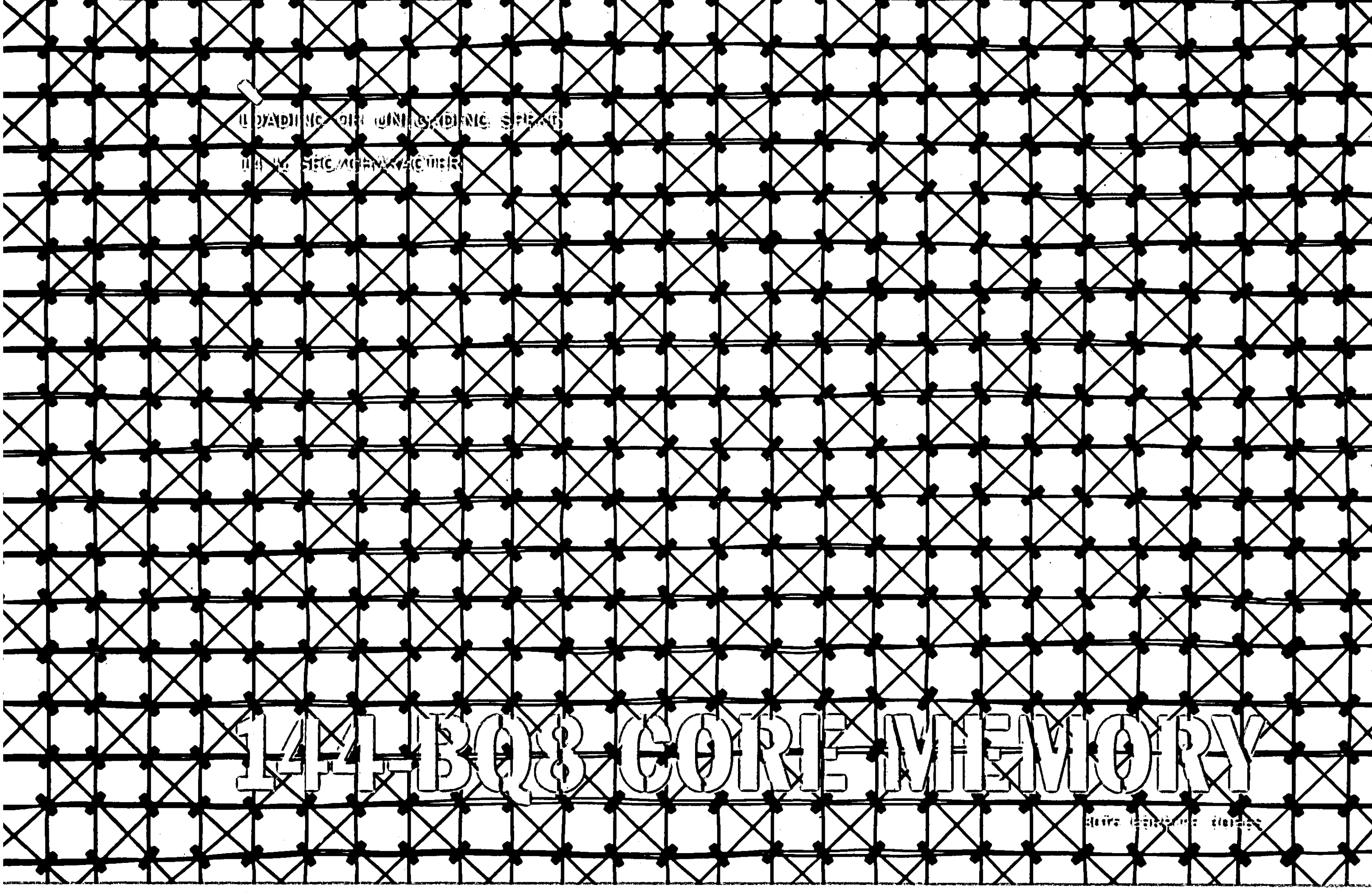
DATAMATION 58

January / February

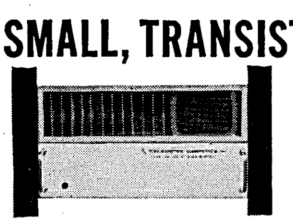
Research & Engineering

page 7 **DATA RETRIEVAL... ONE SOLUTION**



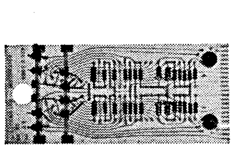


A SMALL, TRANSISTORIZED UNIT FOR SYSTEM COMPATIBILITY IN: data processing, computing and automation systems.

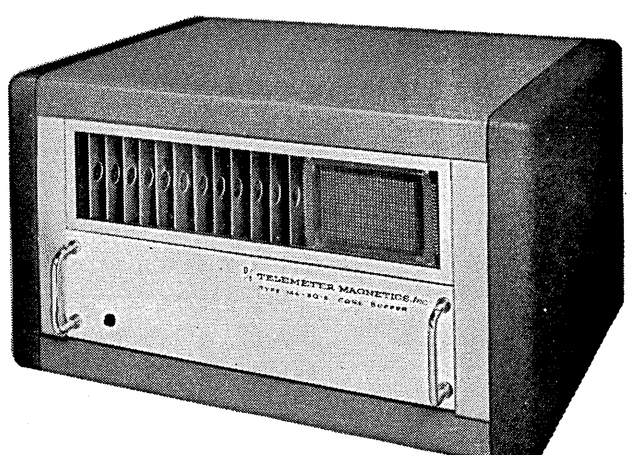


Another member of Telemeter Magnetics' growing family of coincident current magnetic core storage buffer units, this neatly designed package containing storage capacity for 1152 binary digits, switching and driving circuitry to load and unload information and a self-contained power supply, measures only 8¾ inches high and 14 inches deep in standard relay rack mounting. Like the larger Telemeter Magnetics buffers, it is designed to provide compatibility between two data systems having different operating characteristics. Pioneer work in the development and manufacture of magnetic core storage buffers has made Telemeter Magnetics a specialist in this field. Call them in to solve any memory or buffering problem, or for specific information regarding the 144-BQ8 or the 1092 series of buffers, write:

TELEMETER MAGNETICS *Inc.* 2245 Pontius, Los Angeles 64, California



For use as: delay, temporary storage or buffer, specify the **144-BQ8**



SPECIFICATIONS: Number of characters: 144; Number of bits/characters: 8*, loaded or unloaded simultaneously; Loading or Unloading Speed: 14 μ sec/character; Solid state components only. Signal Amplitudes: Input: ZERO—5 Vdc, ONE+5 Vdc, Output: Pulse: ZERO—5V, one +5v. Load Sync: +10v, Unload Sync. +10v. Power: 1 amp at 115v, 60 cps.

**Available in 4 bit model, specify 144-BQ4*

Circle 1 on Reader Service Card

DATAMATION 58

the automatic handling of information

volume 4, number 1

FEATURES

ARTICLES

DEPARTMENTS

OVER 23,000 CIRCULATION

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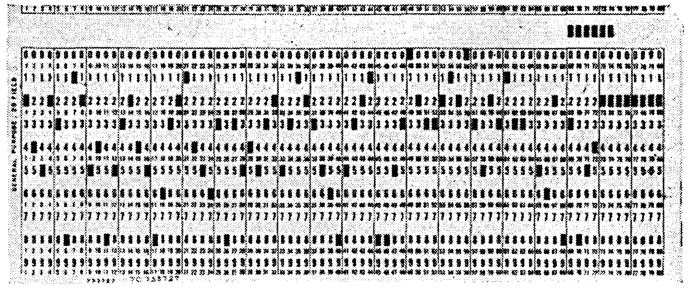

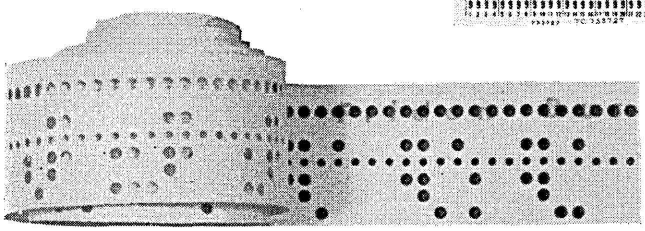

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Circle 2 on Reader Service Card

DATAMATION in business and science

NEW SERVICE BY RAMO-WOOLDRIDGE

A Computation and Consulting and Service Bureau for business and industrial organizations has been established by the Ramo-Wooldridge Corp., Los Angeles, Calif. It will be operated as part of the company's digital computing center headed by Dr. Walter F. Bauer. Consulting in computer applications and digital computing services including numerical analysis, programming, and equipment rental, will be offered.

WJCC THEME: CONTRASTS IN COMPUTERS

When the 1958 Western Joint Computer Conference convenes at the Ambassador Hotel in Los Angeles on May 6, the first national symposium on modern computer design methods and application techniques will take place. Leading authorities in the field will argue the relative merits of various systems and components under the general theme of "Contrasts in Computers."

IBM, TI IN TRANSISTOR AGREEMENT

Texas Instruments, Inc., Dallas, has signed an agreement with International Business Machines Corp. under which both companies will work together in the area of transistors for data processing machines. The pact is expected to expedite progress in the area of computer development through the exchange of technical information pertaining to transistors.

The agreement provides that IBM will purchase from TI a substantial portion of its expanding future commercial transistor needs. This places no restrictions on either company's present or future relations with other customers and suppliers.

COMPANIES JOINTLY OPERATE CENTER

Twelve tenants of Westbury Industrial Park at Westbury, L.I., N.Y., have come up with what might be the answer to the large initial outlay for computers by medium and small-sized firms. In the first known experiment of its kind, these companies are sharing use of data processing equipment at a center operated by Scientific Tabulating Corp. The center features $160,000 in Rem Rand equipment and cost approximately $320,000.

MONSANTO INSTALLS ANALOG SYSTEM

Monsanto Chemical Co., St. Louis, Mo., has completed installation of a large scale analog computer system. To be operated by the company's research and engineering div., the computer is expected to be a valuable tool in helping to solve mathematical equations arising from Monsanto's study of automatic control systems for its chemical plants. A special facility of the computer is the solution of differential equations found in studying automatic control and process dynamics problems.

305, 608 NOW IN OPERATION

First production models of two new IBM computers, the 305 RAMAC and the 608, have been delivered to customers.

A pair of 305s, developed and manufactured at the IBM plant in San Jose, Calif., were installed at the Denver operational headquarters of United Airlines. They are speeding the processing of thousands of ticket reservations made daily by the airlines' many ticket offices across the country. Another 305 is being employed in electronically controlled warehousing and distribution at Factory Motor Parts, Inc., San Francisco, Calif.

Nuclear Co., Div. of Union Carbide Corp. in Oak Ridge, Tenn., now has a 608 in use. It operates with over 3000 transistors but without a single vacuum tube. The 608 is being used to prepare payroll and accounting reports for all three of Union Carbide's Oak Ridge plants.

G-T BEGINS COMPUTER DIODE OUTPUT

Production of germanium and silicon computer diodes and silicon rectifiers has begun at a new General Transistor Corp. plant in Richmond Hills, Queens, L.I., Rudolph Sachs, formerly with CBS-Hytron and Clevite Transistor, is v-p in charge of the diode div.

POTTER CITES PATENT INFRINGEMENT

Notice to cease infringement of his patent rights has been sent to leading manufacturers of digital computers and data processing systems by John T. Potter, president of Potter Instrument Co., Inc., Plainview, N. Y. Patent number 2,624,786, held by Potter since 1953, will affect the manufacture of approximately $100 million worth of computer apparatus now being produced. This figure could increase to about $200 million in 1958.

The originality of the patent is indicated by the fact that the patent examiner allowed its broad claims in the first action. Briefly, the patent covers the use of magnetic cores for storing and retrieving data, a method employed by most major computer and data processing equipment manufacturers.

EDP HELPS ELECTRON TUBE BOOM

The data processing industry is expected to account for a substantial increase in the use of electron receiving tubes during 1958, according to estimates disclosed by Robert B. Sampson, a research director for RCA. Sampson predicted a demand in the electronic industry of 490 million units, an increase of 4 percent over last year. Factory value of this market, he said, would be $430 million.

AUTOMATE — OR DIE, SAYS MORAN

"Automation is coming as rapidly to the office and to the credit department as to the production end of business. It may not come upon us all of a sudden, but we cannot presently ignore it with the mistaken thought that it is 15 or 20 years hence.

"The concern that is not alert to increase automation in every applicable area of its operation is flirting with commercial suicide. If a company does not keep awake to these aggressive changes, it will have no jobs left."

—Edwin Moran, Financial Management

DATA-CONTROL FORMED BY JEFFRIES

Formation of Data-Control Systems, Inc., Danbury, Conn., has been announced by Dr. Robert J. Jeffries, the company's first president. Data-Control will develop, manufacture, and sell equipment in the broad field of instrumentation.

The new company's technical program will include development of products and sponsored research in four principal areas: measurement, computation and data handling, telemetry, and control. The company's program, Jeffries said, has been geared to increasing commercial and government interest in the development and procurement of complete data and control systems for defense, research, and production.

Each of the company's four technical areas will be under the direction of a nationally recognized authority in the field.

BURROUGHS HAS BUSY DECEMBER '57

In December 1957, Burroughs Corp. shipped nine Datatron data processing systems and other computing equipment, valued at $3,600,000, from its ElectroData Div. in Pasadena, Calif. Burroughs has installed 245 computer systems nationwide.

One of these, a desk-size E-101, is being used in Cincinnati by the U. S. Army Corps of Engineers' Ohio River Div. to evaluate the effects of rainfall. Precipitation data is automatically analyzed and necessary flood control measures initiated.

CLARY INTRODUCES NEW ECS LOW-PRICED COMPUTER

CLARY Corp., San Gabriel, Calif., has introduced a new electronic computation system, the *ECS*, that performs many of the functions of the complicated computer while offering simplicity of operation.

The completely-transistorized unit, built into a standard office desk so that it takes up no extra space and can be moved about easily, is priced at $15,000 F.O.B. San Gabriel. It can be operated from any ordinary 110-volt wall plug outlet.

"The *ECS* has simplicity built into it," says Hugh L. Clary, president of the business machine manufacturing company. "Many of the common repetitive problems of business such as payroll computation, billing, production control, interest computation, marketing research, load formulas, and insurance rates can be programmed into *ECS* in minutes by office personnel. In fact, programs used often can be pre-set into a program cartridge and plugged into the program panel in seconds."

In addition to its many commercial uses, the new multipurpose computation machine will solve many scientific problems and all straight arithmetical calculations. In the latter applications, the unit functions as an electronic calculator requiring no programming and leaving undisturbed pre-set programs.

The system uses electronic means to perform all basic types of computations. Figures are entered into it by an adding machine-type keyboard mounted in the top of the desk. The computations are performed by an electronic unit stored in the drawer section of the desk, and results are printed automatically on an adding machine-type print unit mounted flush with the desk unit.

The unit adds or subtracts amounts from immediate or successive computations. It multiplies and divides, performing these operations repetitively or in combination as required. Information can be keyed in from source documents, such as time tickets and billings, and stored in the electronic unit until it has served its purpose in the computation. Multiple results may be computed and held in the unit until they are printed.

Group multiplication can be performed with either the multiplier or multiplicand as the group factor. Other group operations can also be accomplished, such as the accumulation of figures from a group of source documents, and the printing of summarized results at the end of the last transaction. All programs can be visually checked and quickly corrected, if need be, to insure positive accuracy.

The *ECS* consists of 4 desk-mounted units connected by electrical cables: (1) key entry unit, (2) electronic computation unit, (3) programming unit, and (4) printing unit. The entry unit has a standard 10-key keyboard along with function and operation keys for manual operation. Factors keyed into the entry unit are transferred to the designated memory locations in the electronic computation unit's magnetic drum storage.

All operations are performed by the computation unit either under manual or program panel control. Results are then transferred back to the printing unit under print-out control. Negative results print in red, and positive in black. The unit prints up to 18 digits and as many as 3 identifying symbols.

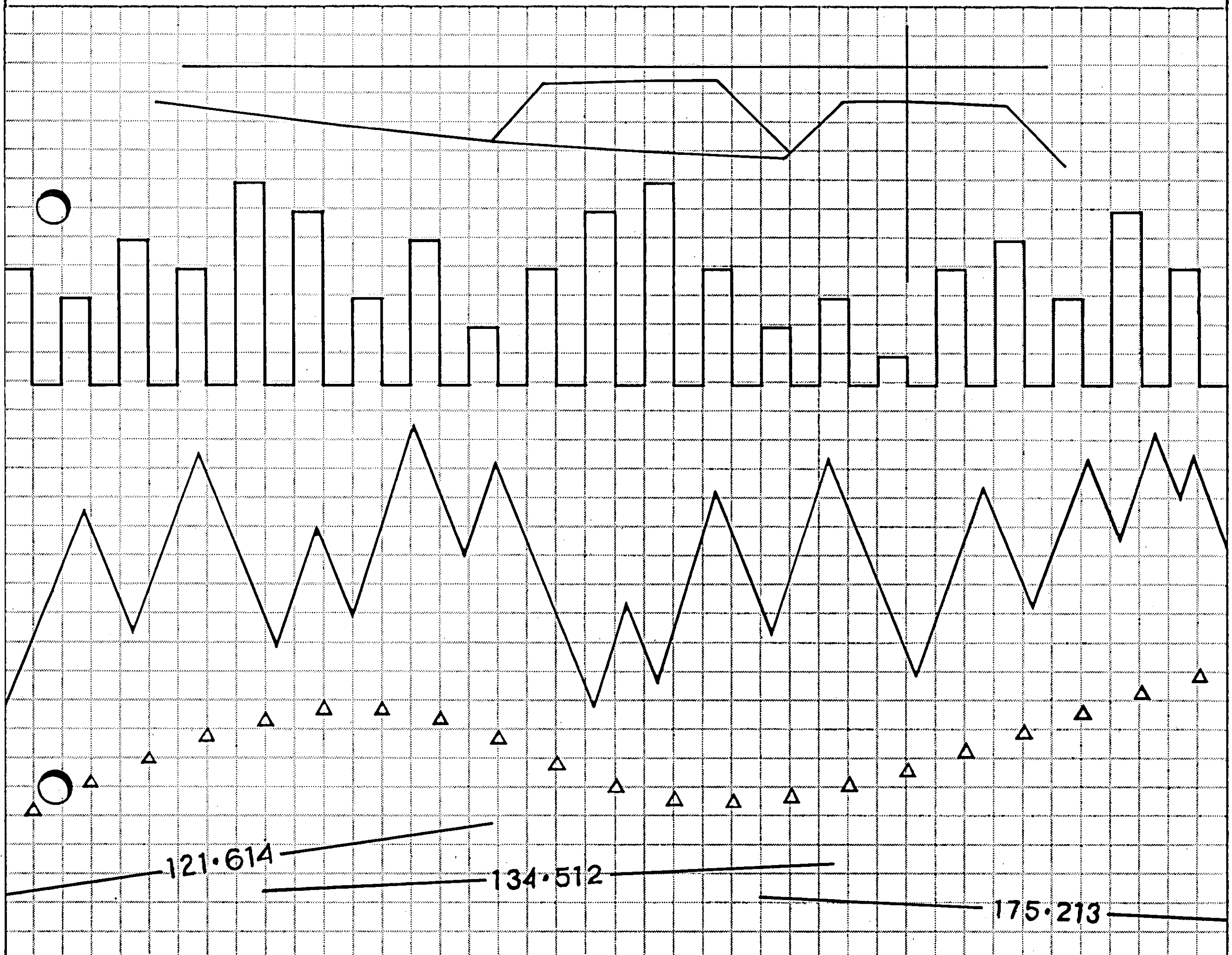
A magnetic drum memory storage is used in developing results of a computation, storing constants, or storing the results of a calculation for later use in developing computation. A program unit supplies electronic impulses which control the predetermined sequence of steps during an operation. Present models provide for 30 program steps.

A decimal selection unit permits figures transferred from an accumulator location to other locations to be shifted as many as 8 decimal positions. Delivery time for the unit at present is under 6 months.

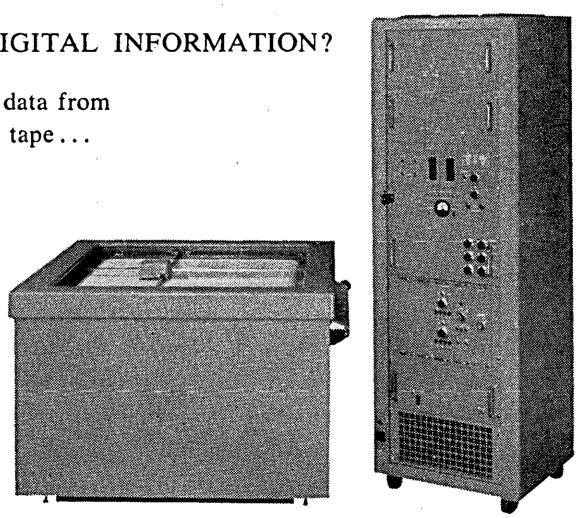
Specifications: weight, approx. 200 lbs.; size 30″ high, 30″ wide, 45″ long; power requirements, 110 AC; air conditioning, normal room temperature; memory, magnetic drum memory capacity of 100 words (each word 18 digits, plus sign); arithmetic unit, 4 arithmetic processes of add, subtract, multiply, and divide (11 additional command functions, decimal point selection from zero to five places); input, manual keyboard; output, printed adding machine tape; programmer, external plugboard wiring or pre-programmed cartridges.

Patricia Ronning enters figures into ECS through special keyboard as Hugh L. Clary, president of Clary Corp., points to pre-set program cartridges that can be plugged into program panel in seconds.

Circle 101 on Reader Servive Card



121·614
134·512
175·213



Data retrieval . . . one solution:

THE SEARCHING SELECTOR OF WESTERN RESERVE UNIVERSITY

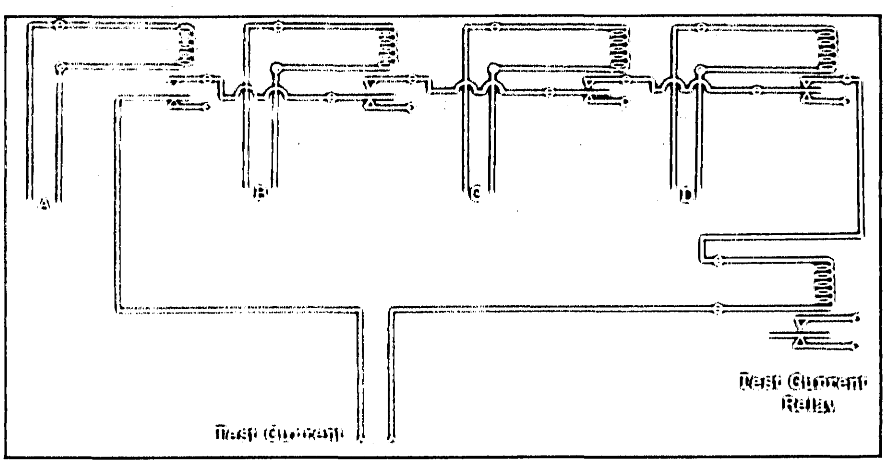
SINCE the close of World War II, it has become increasingly evident that new techniques for efficient use of ever-expanding accumulations of recorded knowledge are of vital importance to scientific research, technical development, and other areas of professional activity such as law and medicine.

Efforts to ensure ready access to recorded knowledge and to facilitate its correlation have involved the application of a wide range of devices as exemplified by hand-sorted punched cards, automatic card-operated accounting machines, electronic computers such as *Seac* of the Bureau of Standards.[1]

All of these devices, despite diversity in design and capabilities, select pertinent documents on the basis of characteristics of their subject contents. The various devices differ with regard to the types of characteristics that may be recorded at reasonable cost to serve as the basis for selecting operations.

Excerpted, with permission, from a book to be published by Western Reserve University (Cleveland, O.) in mid-1958.

Figure 1. Circuit diagram to illustrate detection of logical product, A . B . C . D.



With hand-sorted punched cards, for example, it is so difficult as to be impractical to record relationships between entities, attributes, processes, conditions, and the like. Furthermore, the various devices differ with regard to their searching and selecting operations.

Thus, the manual manipulations required for sorting of handsorted punched cards have tended to limit their practical application to relatively small files. At the other extreme of the equipment scale, the design of commercially-available electronic computers has been and continues to be such that highly-complex programming is required to conduct relatively-simple searching and selecting operations.

The development of equipment specifically designed to perform searching and selecting operations can do much more than simplify both the programming of such operations and their accomplishment. Appropriate equipment design makes possible a wide extension in the range of characteristics that may be recorded as reference points for defining the scope of a search.

In addition, appropriate equipment design can permit the processing of information to be streamlined. As a consequence, it becomes possible to hold at a low level the costs involved (1) in the consistent analysis of the subject contents of documents, and (2) in the encoding and recording of the results of such analysis preliminary to automatic searching and selecting.

More specifically, the range of characteristics available for defining the scope of a search may be extended in two respects, while maintaining low costs for information processing. First, the relationships between entities, attributes, processes, conditions, etc., may be recorded as characteristics which may be taken into account in conducting searching operations. (To achieve this purpose, abstracts written in English or other natural language are edited into a stylized, standardized form.)

Second, generic concepts related to specific entities, attributes, processes, conditions, etc., may be recorded as characteristics for defining the scope of searches and, especially, for extending the possibilities of achieving correlations. (The cost of making generic concepts available is kept at a low level by automatic procedures for the encoding of words and terminology.) These two procedures accomplish the encoding of abstracts for machine searching.

The design of automatic equipmet must be based on a clear formulation of the purpose to be served and a detailed analysis of the operations to be performed. As a first step in such formulation, we observe that our purpose is to identify, within a collection of documents, those that are of interest to a given problem or situation.

Such identification may be facilitated to varying degrees by the use of a variety of devices such as alphabetized subject indexes, conventional classification based on compartments, or by searching methods employing equipment such as the Western Reserve University (Cleveland, Ohio) *Searching Selector*. Regardless of the device, this type of identification operation involves the following general steps:

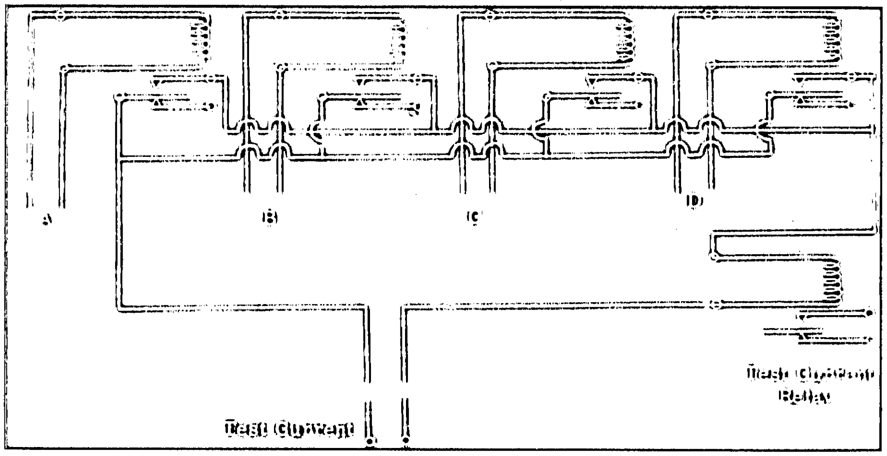


Figure 2. Circuit diagram to illustrate detection of logical sum, A + B + C + D.

(1) Characterization of subject contents of documents, and recording of results of such characterization, e.g., by compiling an alphabetical index, by grouping in a classification system, or by recording characteristics in an appropriate medium for machine searching.

(2) Analysis of information requirement in terms of same characteristics as used for analysis of subject contents of documents.

(3) Identification of documents of interest by determining which of the documents were found on preliminary analysis of their subject contents to be characterized in the same way as the information requirement to be serviced. (This identification step consists, therefore, of a matching operation directed to the characteristics of documents, on the one hand, and the characteristics of an information requirement, on the other hand.)

This general outline of the steps involved in the identification of documents is, however, insufficient for the detailed design of automatic equipment and for the design of electrical circuits.

As a further step toward such design, it is essential to recognize the fact that the selection of documents on the basis of characteristics may be formulated on the basis of the theory of class definition.[2] Thus we may specify that we wish to select only those documents, each of which is characterized by all of several characteristics.

Such a search requirement would correspond to a logical product which may be symbolically exemplified by:

A . B . C . D . E

Another possibility is that we may wish to select all documents that are characterized by any one of several characteristics. Such a search requirement would correspond to a logical sum which may be symbolically exemplified by:

A + B + C + D + E

Another possibility is that we may wish to select all documents that are characterized by the presence of some specified characteristic and by the absence of another. Such a search requirement would correspond to a logical difference which may be symbolically exemplified by:

A — B .

Finally, we may wish to select all documents that are characterized by a set of characteristics interrelated in such a fashion that two or more of the basic relationships (product, sum, and difference) are involved. Such complex logical relationships may be symbolically exemplified by:

(A + B) (C + D)
A . B + C . D
A — B . C
(A . B + C) (E — D)

The three basic logical relationships and their complex combinations, as exemplified above, are of basic importance to a wide range of searching and selecting devices. Such logical relationships underlie, the searching and selecting operations performed with the aid of hand-sorted punched cards.

This fact, although helpful in planning the use of hand-sorted punched cards, is of fundamental importance in designing automatic searching and selecting equipment. To understand why this is true, it is necessary to consider how the logical relationships may be detected with the aid of very simple electrical switching circuits.

A particularly-simple example of an electrical switching device is provided by an electro-magnetic relay. Figs. 1 thru 4 illustrate how combinations of relays may be wired so that the types of logical relationships mentioned above may be detected by the closing of a single test relay.

The circuits shown in Figs. 1 thru 4 are of basic importance in the design of the WRU *Searching Selector*. To provide background for detailed discussion of how these basic circuits are worked out and applied in the searching selector, attention is next directed to certain structural features of the encoded abstracts which the machine is designed to search.

The basic units in these abstracts are individual symbols, namely letters, numbers, and special symbols such as punctuation marks. Significance of one type or another is attached not only to certain individual symbols but to combinations of symbols, as typified by *kej* to designate "material processed" and, also, role indicators, e.g., by semantic factors, e.g., *m-ch* for "machine." Here the dash indicates any one of a group of letters used to denote certain relationships between the semantic factor and encoded term.

Thus, *mach* is used to encode a term which designates a machine or a kind of machine. By combining code elements, such as *mach* together with arbitrarily assigned numerals, codes for specific terms are built up. Thus, the code for "clock" is *mach.musr.twmm.*[1] which indicates a device for measuring time.

In the encoded abstracts, the codes for individual terms are combined with role indicators to form "phrases," and the latter, in turn, are organized into "sentences" which may be organized into larger groups analogus to "paragraphs." Several such may be required onoccasion to record the important characteristics of an encoded abstract.

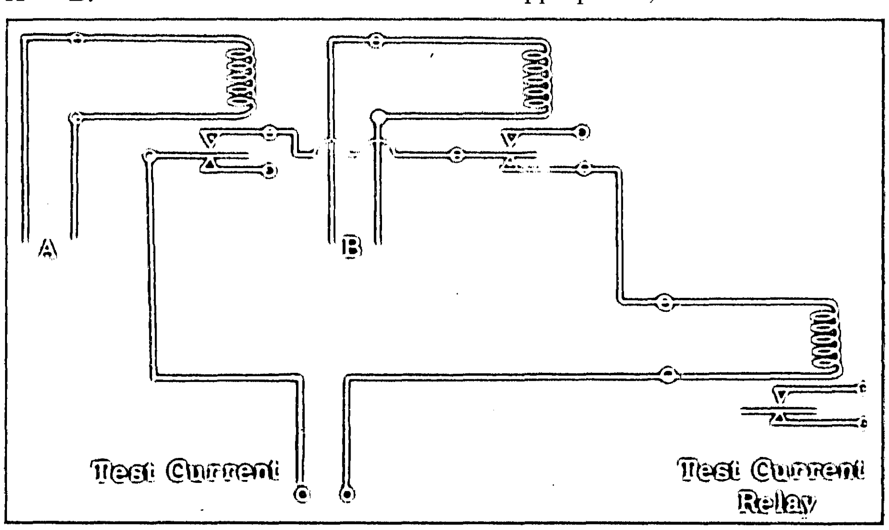
This ability to organize characteristics into successive levels of higher order analogous to "words, phrases, sentences," etc., is important in preventing false association of characteristics when searching. For example, by proper "phrasing," it is possible to prevent the properties of one chemical being incorrectly attributed to some other compound.

Detailed rules for such use of "phrases, sentences, paragraphs," etc., hav been recently written up in the form of a manual.[3]

The WRU *Searching Selector* has been designed to perform the following operations:

(1) Record sequences of symbols by punching paper tape. In this way, the characteristics of documents may be recorded one after another for subsequent search by the selector. (Individual symbols and combinations of symbols may be used to record the characteristics of documents in the same way that individual letters and combinations of letters are used to denote words in ordinary writing. It should also be noted that meaning may be assigned to any single symbol or to any combination of symbols as may be appropriate.)

Figure 3. Circuit diagram to illustrate detection of logical difference, A − B.



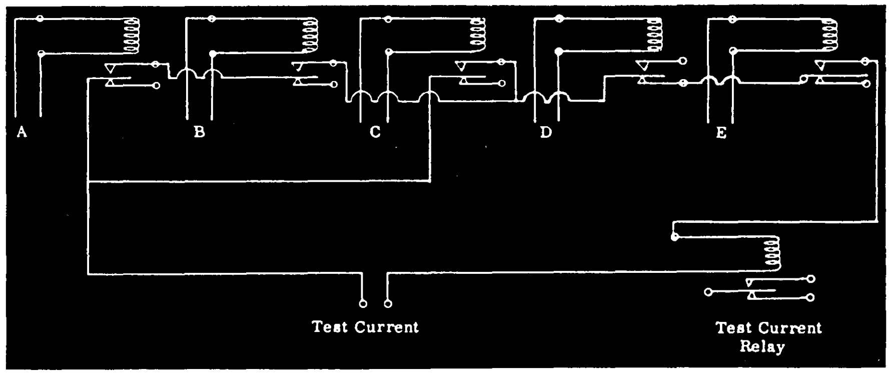


Figure 4. Circuit diagram to illustrate detection of logical relationship, (A . B + C) (E − D).

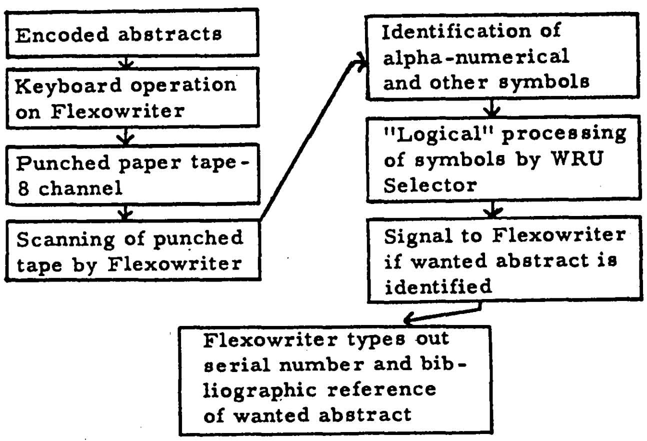
(2) Read the punched paper tape and convert the patterns of holes used to record successive symbols into corresponding pulses of electronic pulses which then activate the discriminating unit.

(3) Detect those characteristics and combinations of characteristics which typify the subject contents of documents that are of pertinent interest. The discriminating unit is conditioned to detect such characteristics by appropriate wiring of a plug board prior to initiating a given search.

(4) Type out automatically the serial numbers of those documents whose characteristics correspond to the requirements of a given search. The scope of a search will be expressed by specifying that the documents of pertinent interest shall have some one characteristic or some combination of characteristics as outlined above.

These four functions are performed by four interacting major units. One of these is the paper tape which is punched to record sequences of symbols appropriately organized to express various characteristics of the subject contents of documents.

The second unit scans punched paper tape—the recording medium—and converts each recorded symbol, in turn, into a characteristic combination of electrical pulses. The third unit receives these combina-



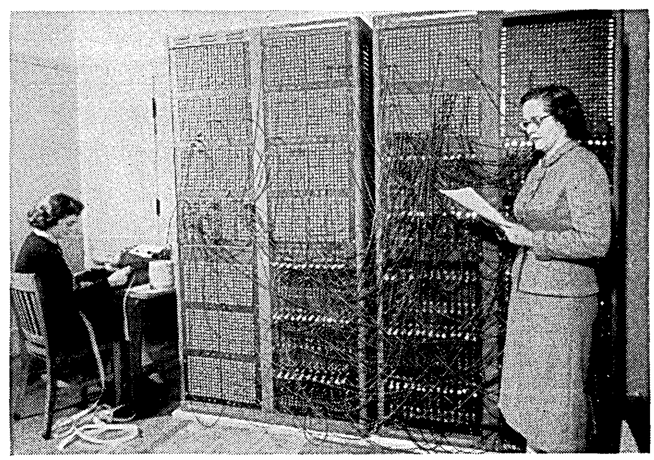


Figure 5. Selector operations.

Figure 6. WRU's Searching Selector.

tions of pulses, and conducts various detecting and discriminating operations to identify those encoded abstracts that are of pertinent interest with a search directed to a given information requirement.

This unit is conditioned with regard to the information requirement by appropriate wiring of its plugboard. When an abstract of pertinent interest has been identified, the searching unit provides certain signals as its output. The fourth unit is an automatic typewriter activated by the output signals originating in the other units.

This fourth unit produces a listing of those abstracts or documents that have been identified as pertinent. Such listing is accomplished by causing the automatic typewriter to print out a list of serial numbers of the identified abstracts or documents.

In addition to the serial number, the bibliographic reference may also be typed. A block diagram of operations is given in Fig. 5.

When conducting simultaneous searches, each is assigned a different number which is automatically typed immediately following the serial number of each abstract or document whose characteristics are found to correspond to the search requirement in question.

If a given document fulfills the requirements of several simultaneously-conducted searches, all of the latters' identifying numbers are typed immediately following the serial number of the abstract or document in question.

The *Selector* is shown in Fig. 6. The operator at the left is preparing to insert "encoded abstracts" into the reading unit of the Flexowriter; the operator at the right is programming the WRU *Searching Selector* to "ask" 10 questions of the encoded "library."

Information requests originating within the metals industry are now being searched automatically on a pilot operational basis by the Center for Documentation & Communication Research. In this work, the WRU *Searching Selector* is programmed to search the file of encoded metallurgical abstracts generated for Amer. Soc. for Metals.

The *Selector* has been designed so that 10 searches may be conducted simultaneously. Such searches may be interrelated as to scope or completely independent.

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DATAMATION *abroad*

NATIONS FORM IFAC IN PARIS

Scientists from 19 nations have formed the International Federation of Automatic Control (IFAC) in Paris. France, Germany, Russia, Italy, Poland, England, and the United States are among countries represented. Harold Chestnut of General Electric is president.

International meetings will be scheduled every three years (the next is set for Moscow, 1960). Smaller meetings are planned before them. Papers will be solicited from persons working in automatic control anywhere in the world with special emphasis on current interest papers.

Other IFAC officers include Alexander M. Letov, Russia, 1st vp; Victor Broida, France, 2nd vp; George Ruppel, Germany, secretary. Executive council consists of these officers, a treasurer, and six ordinary members.

> W. Schweisheimer, Russian-to-English application of IBM 701 computer in September, 1957 issue of "Australasian Engineer," Vol. 50, page 112. Title: "Russian Is Turned Into English by Electronic Translator."

ENGLAND WILL OPERATE EMIDEC

First units of the EMIDEC 2400, a transistorized data processing system, will soon be operated in England by EMI Electronics Ltd., Hays, Middlesex. EMI is sponsored in this work by the National Research and Development Corp.

Standard processing units will soon be available. Transistor diode logic with germanium junction transistors and point contact or gold bonded diodes form the main circuit elements. The components are assembled on plug-in printed circuit panels. Three forms of storage are used: magnetic tape, ferrite core storage, and diode capacity storage.

BRUSSELS GETS COMPUTER CENTER

Belgian Minister of Foreign Trade Henri Fayat and C. L. Adamson, vp of Electronic Associates, Inc., Long Branch, N.J., have officially opened the U.S. firm's first overseas operation, the European Computation Center in Brussels.

The center is equipped with two expanded analog computer systems and provides education to engineers in analog technique, consultation service, and rental time on center machinery.

> Recent achievements of the machine translation research group of the Russian Academy of Sciences discussed by I. K. Belksaja. The paper: "Machine Translation of Languages" — pages 383 to 389, "Research," Vol. 10, October 1957.

RUSSIANS WORK WITH BESM, M2

Approximately 40 BESM digital computers were reportedly in operation in Russia last year, according to information reaching New York. Authoritative sources spoke of "giant strides" in computer development and production in the Soviet Union during 1957.

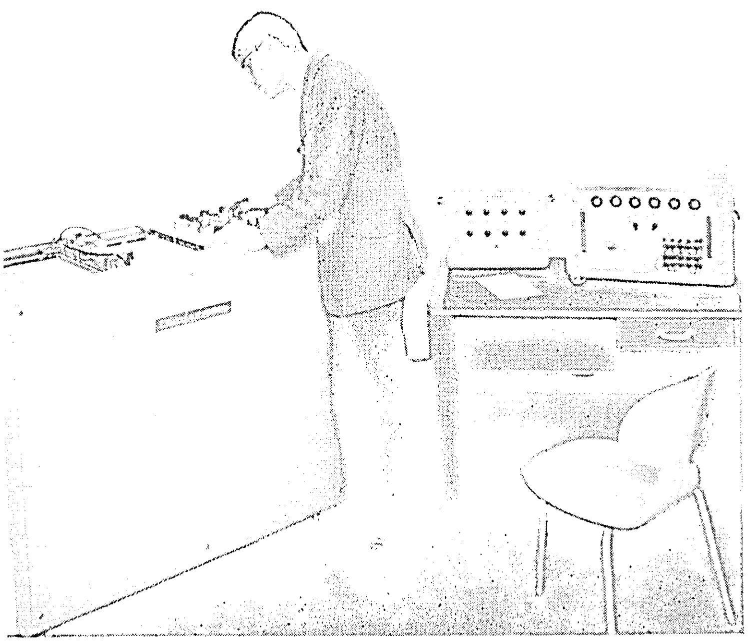
BESM, used primarily for research and design problems, was developed in 1951 at the Russian Academy of Sciences and originally had 7,200 tubes.

Russia's newest computer, the M2, is said to have a memory of parallel design with a capacity of 512 double figures. Impulses are stored on oscillographic tube screens and it reportedly has an arithmetical unit of parallel action with four static trigger registers. Assembly supposedly permits operation with both fixed and floating points.

DISPLAYS FOR DECISION –

an evaluation of automatic plotters

THE graphic display of data is one of the basic methods used to expedite the assimilation of information by groups engaged in the analysis of test results, highway or bridge design, checking financial trends, etc. The widespread use of electronic digital computers has brought about a need for replacement or manual methods of graphic displays by more automatic machine techniques.



Dobbie-McInnes 1018/1P1G automatic graph plotter.

The machine techniques in use break into three groups: (1) electro-mechanical plotters, (2) high-speed cathode ray tube displays, (3) machines which are primarily alpha-numeric tabulating machines that print lines, symbols, letters, and numbers on pin-fed rolls of paper. This article is primarily concerned with developing an outline for evaluation of the electro-mechanical plotters.

The high-speed cathode ray tube type of device, such as the IBM Type 740 Cathode Ray Tube Output Recorder, the Stromberg-Carlson Charactron Computer Readout Unit, and the Laboratory for Electronics' SM Generator and Viewer, will be covered in a future article in *Datamation*. Plotting techniques using tabulating devices have been discussed in some detail in recent issues of *Computing News.**

If you are considering the purchase of an automatic plotter, the following list may be useful as a guide in helping you to compare available equipment with your requirements. *Datamation's* list of criteria breaks into three main areas: the machine itself, the machine-operator relationship, and the supplier.

The Machine

Plotting Surface

(1) What are the largest size plots you will need to produce?

(2) Ninety-five percent of your plotting will be on what size paper?

(3) If an automatic paper hold-down system is used, how efficient is it?

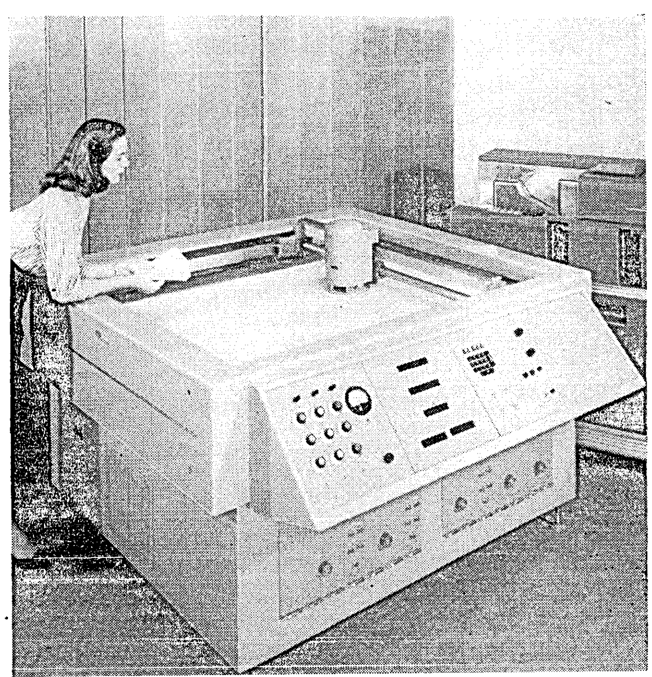
(4) Is a horizontal plotting surface or a vertical plotting surface needed for your application?

Positioning Mechanism

(1) Accuracy.† How accurate is the plotter from numeric input to the symbol position on the paper? What is the linearity of the positioning mechanism? How accurate and how linear is the graph paper which will be used?

(2) Scale (counts per inch) changes with time. What is the maximum percentage scale change (drift) that you can tolerate between one and two hours after

Benson-Lehner Electroplotter Model S with input from an IBM punched-card reader.



**Computing News,* "Plotting on the 407 Continuous Read on the 1103A," Vol. 5, No. 9, May 1, 1957; "Plotting on Univac Printer," Vol. 5, No. 13, July 1, 1957.

†Because each manufacturer expresses accuracy in a somewhat different manner, it is important to define your own needs and then check whether or not a given manufacturer can meet those needs. Keep in mind that all of the following contribute to the total system accuracy: quality of graph paper, mechanical linkages in the unit, potentiometers, positioning mechanism, the print mechanism, and the digital-to-analog converter.

switching the machine on? How does the machine meet your requirement?

(3) What affects do line voltage changes have on the accuracy, scales, and performance?

(4) Can the plotter handle all scale ranges that will be used? Are there any "blank areas" which cannot be covered?

(5) When checking plotting repeatability (having the plotting head approach a given X-Y position from all four diagonal directions), what is the maximum circle of error that can be tolerated?

(6) What is the plotting speed when using a punched paper tape reader? A serial type punched card reader? A parallel type punched card reader?

Plotting Mechanism

(1) What is included with the plotter at the standard price?

(2) What are the various symbols offered? If special symbols are required, what are the physical limitations? Cost?

(3) How easy is it to change symbols manually? Is automatic sequential symbol change offered or needed? Is automatic random symbol selection offered or needed? Is it desirable to have numeric information printed next to the symbol?

(4) What is the method of printing, i.e., ink, carbon ribbon, etc.? Will it reproduce when using standard copy machines such as Ozalid, Bruning, etc.?

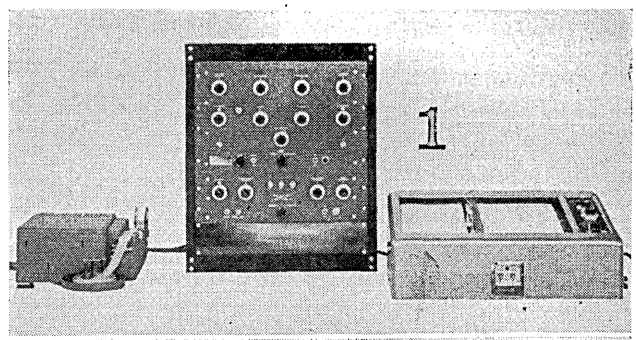
(5) Is multi-color plotting offered or needed?

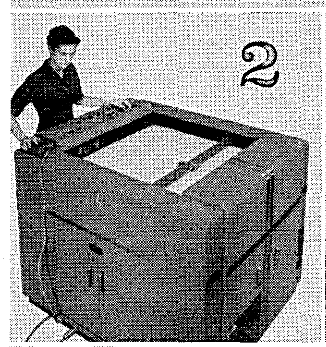
Inputs

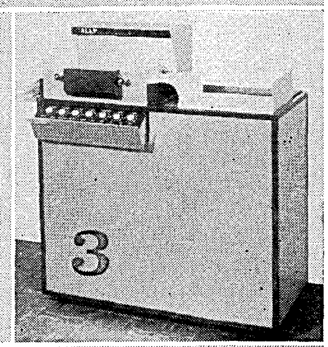
(1) What input media are needed (tape, cards)? What count range is needed, i.e., 000 to 999 or -9999 to 9999?

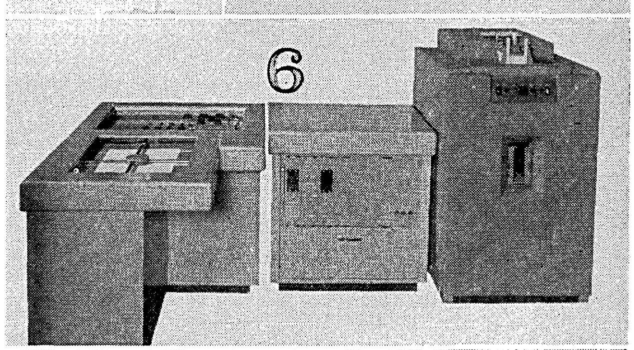
(2) What accessory equipment is necessary for each media—tape reader, card reader, extra electronics, etc.? What are the additional costs?

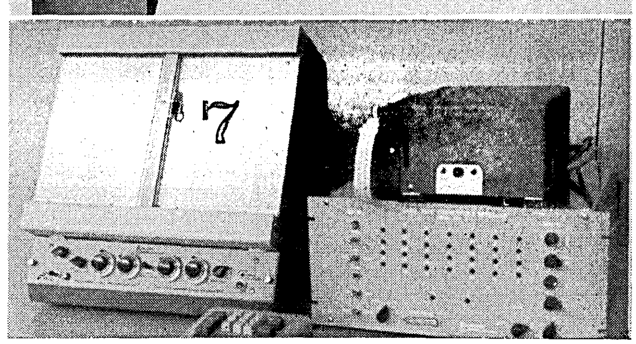
(3) What is the standard format required for each











1. F. L. Moseley, Inc., Autograf plotter Model 2 operating from a Commercial Controls punched paper tape reader.

2. Electronic Associates Dataplotter Model 3033B for line drawing or point plotting from either punched-card or punched-tape input.

3. Tally Register Model 201 plotter.

4. Tally Register Primary buffer and tape recorder for use with Model 201 plotter.

5. Benson-Lehner Electroplotter Model H draws lines as well as plotting points.

6. Benson-Lehner Electroplotter Model E with input from Remington-Rand card reader.

7. Electro-Instruments Model 200 recorder operating with their Model 275 card-tape converter.

input media? How much flexibility in format and tape codes does the manufacturer provide without factory of field machine modifications, or additional cost?

Machine-Operator Relationship

Paper Change & Positioning

(1) How easy is it to handle sheet paper? Roll paper?

(2) How quickly can an operator align the plotter and the grid lines on a sheet of paper and initiate the paper hold down?

(3) Is it possible to change sheets of paper and re-index the next sheet accurately and quickly?

(4) How simply and quickly can an operator set up an origin of 000,000? An origin where the 000,000 coordinate is positioned off the paper? Does changing the origin position upset the scale setting?

Scale Setting

(1) How quickly, easily, and accurately can scales be set up and changed?

(2) How much interaction is there between scaling controls? (Does changing the full scale setting change the origin position? Check this by making large changes in origin and scales and set-up from one scale to the other.)

(3) How easy is it to change symbols?

(4) How easy is it to change the print ribbon, or refill plotting ink?

(5) Are the controls laid out with the point of view of convenience and ease of operation in mind?

(6) When entering data manually, is it convenient, and what is the method of visual feed-back (checking)?

(7) How convenient is it for the operator to align the point at which the print head will plot with the grid lines on the graph paper?

Supplier

(1) What is the price of the unit as related to the features that you need vs. your budget?

(2) What is the manufacturer's quoted delivery and the reliability of this being correct?

(3) Is the installation of the equipment included in the base price? If not, what is the additional charge?

(4) Is operator training provided?

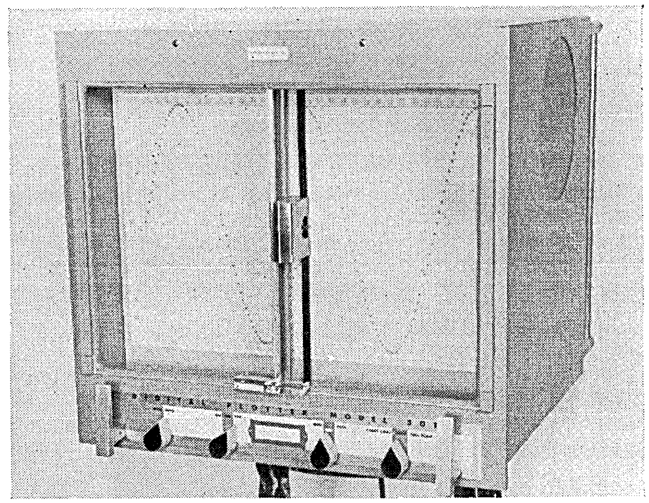
(5) What are the terms of the manufacturer's warranty?

(6) What is the availability of future service in case of breakdown—service plans, coverage, costs, etc.?

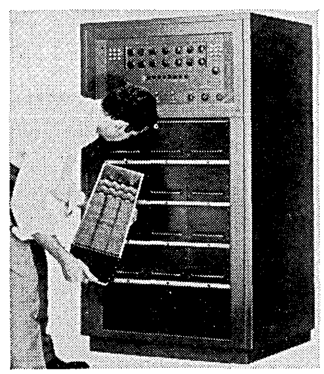
(7) How close is the manufacturer's nearest service center?

(8) How much other equipment from this manufacturer does your firm presently own?

(9) What quality of service and operation manuals are available?

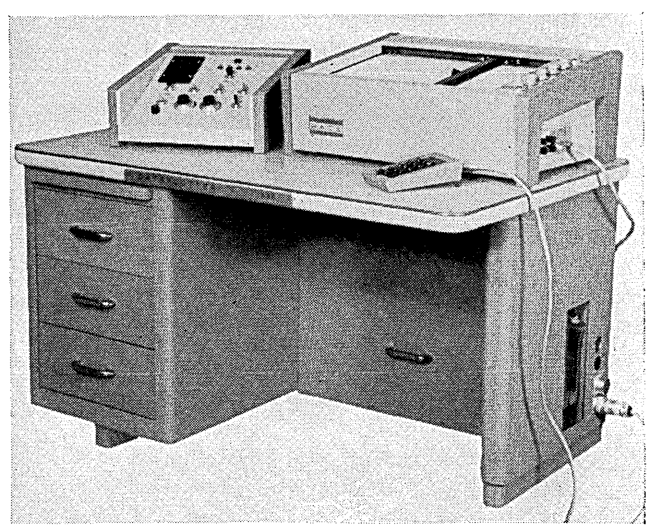


Scientific-Atlanta Model 501 plotter operating from ERA 1102 punched paper tape.



(left) Beckman/Systems tape-to-curve converter.

(right) Librascope rack-mounted X-Y plotter.



Electronic Associates Dataplotter Model 1133B.

Firms known to be currently manufacturing electro-mechanical plotters include the following: Beckman/Systems Div.; Benson-Lehner Corp.; Dobbie McInnes (Electronics), Ltd.; Electro-Instruments, Inc.; Electronic Associates, Inc.; Librascope, Inc.; F. L. Moseley Co.; Scientific-Atlanta, Inc.; Tally Register Corp.

All accept input from either punched paper tape or punched card readers. Machines manufactured by these firms, however, may differ in size of plotting surface, ability to draw straight lines between points, accuracy, input range and scaling flexibility, computer codes and format flexibility, price, etc.

Two of the machines, the Benson-Lehner Electroplotter Model H and the Electronic Associates Dataplotter, have a point-to-point line-drawing feature allowing for graphing of highway cross-section data, profiles, statistical charts, bar graphs or applications where the display is made up of a series of points connected by straight lines.

One of the machines, the Benson-Lehner Electroplotter Model S, contains circuitry and a complex printing mechanism for producing graphic displays containing symbols and numbers printed at specified X-Y locations. This machine has application where it is desirable to flag the plotted symbols with numeric or other identifying information, as in the plotting of exploration gravity survey data, topographic plots showing elevations, etc.

Most of the manufacturers listed above show their equipment at either trade shows such as the I.S.A. National Conference, or the I.R.E. National Conference. In most cases, it is possible to visit operating equipment installations where you will not only be able to see and try the machines, but will have a chance to talk with the user to get his reactions, estimates of down time, etc.

We hope the above will be of use to you in selecting the electro-mechanical plotter that will best suit your needs. Let us have your comments so that at a later date we can summarize these for our readers.

Electro-Mechanical Plotter Manufacturers

Beckman/Systems Div.
325 N. Muller Ave.
Anaheim, Calif.

Benson-Lehner Corp.
11930 W. Olympic Blvd.
Los Angeles 64, Calif.

Dobbie-McInnes, Ltd.
33 Tangier Rd.
Guildford, Surrey, Eng.

Electro-Instruments, Inc.
3794 Rosecrans St.
San Diego 10, Calif.

Electronic Associates, Inc.
Long Branch & Naberal Ave.
Long Branch, N. J.

Librascope, Inc.
808 Western Ave.
Glendale, Calif.

F. L. Mosely Co.
409 N. Fair Oaks Ave.
Pasadena, Calif.

Scientific Atlanta, Inc.
2162 Piedmont Rd., N.E.
Atlanta 9, Ga.

Tally Register Corp.
5300 Fourteenth Ave., N.W.
Seattle 7, Wash.

Circle 102 on Reader Service Card

GM Computer-Simulator permits Car Stability & Control Study

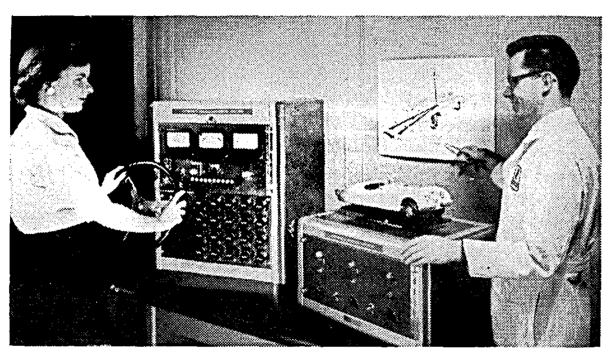
A STEERING wheel attached to an electronic analogue computer enables General Motors Research Staff engineers to study car stability and control with a miniature automobile in the laboratory. The computer is linked with an automobile handling simulator. On the simulator stands a miniature car controlled by servo mechanisms. It responds to various steering "inputs" at the wheel, just as a full-size vehicle would respond to driver motions or "inputs" at the business end of the steering gear.

According to Joseph B. Bidwell, head of Research Staff's Engineering Mechanics Department at GM Technical Center, this computer-simulator combination resembles in principle the technique aircraft designers use to "fly" synthetic airplanes mathematically. From their computations, aircraft designers can predict how control systems will operate before an airplane reaches the blueprint stage.

The same general type of information can be computed for an automotive steering and control system before it reaches the early design phase, Bidwell explained. In short, the system works this way:

An automobile moving down a highway performs certain lateral motions—yawing, rolling, or side-slipping—as distinguished from its straight-ahead motion. These lateral motions result from steering wheel torque and displacements applied by the driver. The resulting car motion is dependent on the car's speed, wheelbase, steering gear ratio, weight distribution, tire properties, and suspension geometry. So-called equations of lateral response relating to all these variables have been developed.

These describe mathematically how the entire steering or car handling system will respond to driver reactions—whenever the driver adjusts his steering to maintain a straight-ahead course, when he veers from his path to pass another car, when he rounds a curve, etc. The electric analogue computer continuously solves these equations for any steering wheel input. Adjustment of controls on the computer permits changes in all of the car and tire characteristics. It can, thus, represent cars of shorter or longer wheelbase, different weight distribution, or different suspension properties.



Circle 103 on Reader Service Card

This system is in the final stage of check out prior to delivery to Thompson Products, Inc., Inglewood, Calif.

A DATA PROCESSING SYSTEM FOR LOW-LEVEL SIGNALS

A NEW data processing system has been developed by Arnoux Corp., Los Angeles, Calif., which is designed to accept low-level dc signals in the 0-20 mv. range.

Called *Madis I* (Millivolt analog-digital instrumentation system), the basic system is a high-capacity, medium-speed data system consisting of a 675-channel commutator, an electronic analog-to-digital converter, a control and timing unit, a digital tape recorder, and a novel test and monitoring system.

The output from the new system is in digital form recorded on an output tape in a format compatible for direct input to such computers as IBM's *650, 701, or 704,* as well as Remington Rand's *1103A.*

Figure 1 shows the complete system. The equipment contained in the five relay racks on the left comprises the input system, while that contained in the five racks on the right comprises the digital system. The center rack contains terminal strips for connecting the two.

Figure 2 is a block diagram of the input system. Several types of transducers are used, all of which have output signals in the 0-20 mv range to feed directly into the data processing system without prior amplification.

This particular version of *Madis I* monitors and records the outputs of 576 thermocouples. Each thermocouple is connected to a reference junction maintained at 250° F. constant temperature for maximum stability. When the temperature of the parameter being measured requires a different base reference, this reference is established by voltage-biasing circuits on the output side of the reference junction.

When other than standard ranges are required, potentiometer gain circuits in conjunction with the bias circuits extend the range to that necessary to monitor a particular parameter. Each bias and gain module controls 72 data channels.

Provision is made on the temperature monitor unit for monitoring bias voltage at each of the eight bias and gain modules. Provision is also made for monitoring reference junction heater temperature.

A number of dc strain gage type transducers with output voltages in the same 0-20 mv range are used to provide pressure data. Later this pressure data can be correlated with temperature and flow data to give a complete picture of the process or operation monitored.

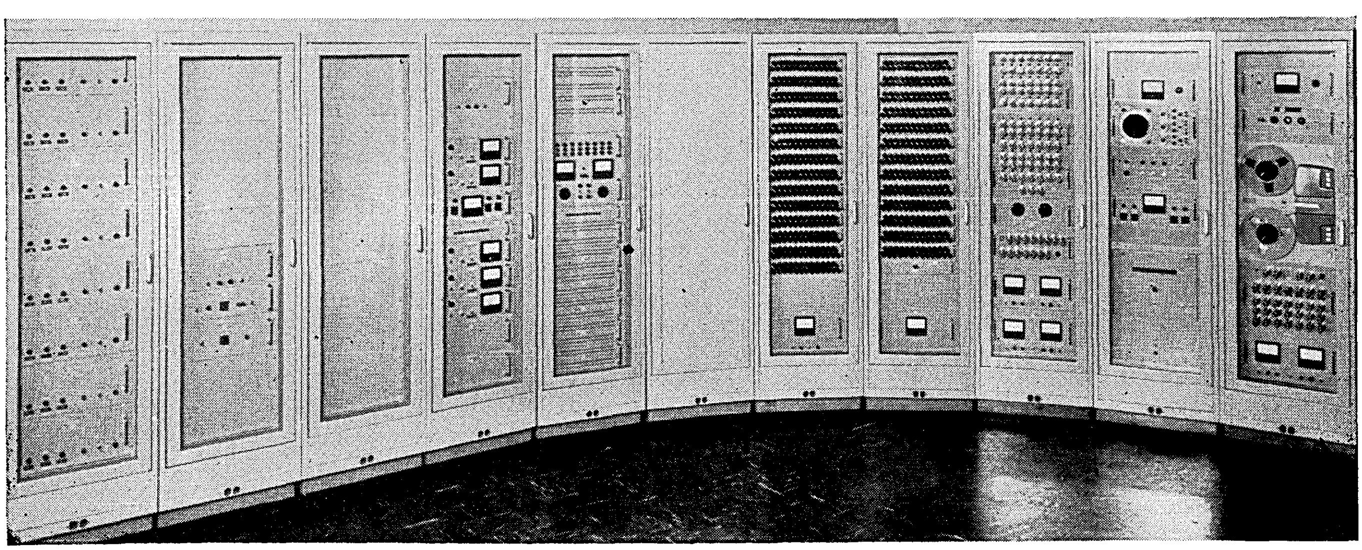
Mass flowmeters or volumetric flowmeters of the Waugh type give continuous flow indications on the function measured. Some ac and dc voltage measurements are also made. AC signals must, of course, be rectified and attenuated to bring the values down to the required 0-20 mv range. DC signals go through a voltage divider network to provide necessary attenuation.

Each of the signal outputs are brought to a three-terminal output connection in the terminal rack. Here is where connections between the input system and the output system are made. Any input signal can be routed in such a manner that the output signal will appear as a specific output sample of the commutated information, i.e., input signal no. 17 can be made to appear as output sample no. 435 or any other number.

The digital system (see Figure 3) consists of a commutator that can be operated in a manual or automatic mode, a control and timing unit, an elapsed-time generator, analog-to-digital converter, remote data code indicators, digital storage register, digital magnetic tape recorder, and a system monitor.

The heart of the *Madis I* digital system is the commutator which is basically a relay matrix driven by a ring counter. It contains a total of 675 relays that operate sequentially at a rate of 125 per second. The modular concept employed throughout the system provides for addition or subtraction of relays in multiples of 25. Where higher sampling rates are desired, the relay

Figure 1. Complete Madis I data processing system.



switching rate may be increased to 800 per second.

Circuitry developed in conjunction with the commutator permits direct commutation of dc signals at the level of 0-20 mv, with an over-all stated system error of less than 0.15% and, at the same time, gives good common mode rejection. Commutation of millivolt signals in the presence of 50 volt rms common mode voltages is possible. Common mode rejection of dc, 60 cps, and 400 cps voltages is essentially infinite. In addition, a low-pass filter is also used at the commutator input to eliminate unwanted voltages generated by power or switching frequencies.

Commutator switching synchronization, as well as synchronization of all components of the system, is obtained from the control and timer unit.

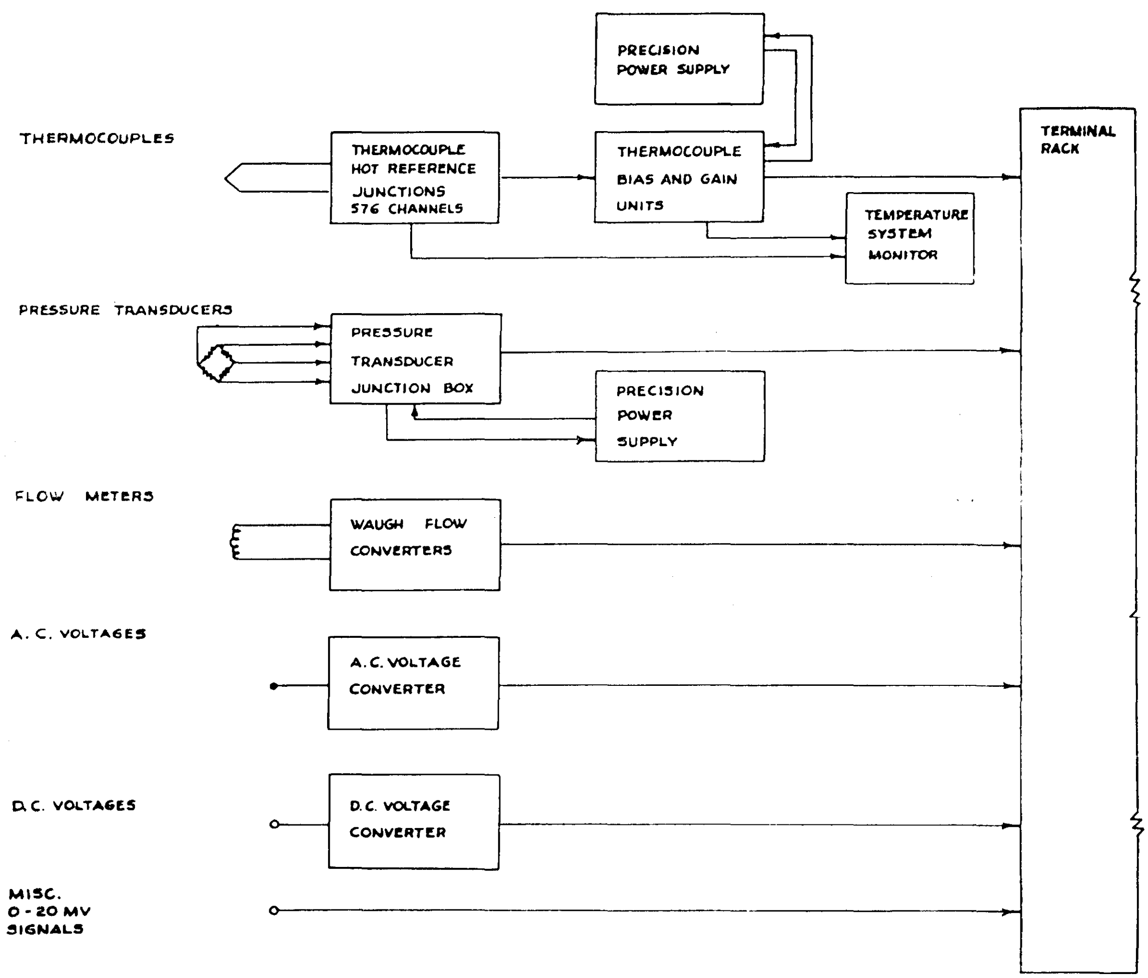
Elapsed-time indications are generated at the beginning of each commutation cycle and are given in hours, minutes, and tenths of minutes. Time correlation to a millisecond can be provided where the transient nature of the data requires more accurate time indications.

Three channels of information are available for insertion of such fixed parameters as test numbers. Time insertion into the system is controlled by the relay matrix in such a manner that the signal does not change during its sampling period. Time is inserted at the beginning of a sampling cycle, and event time for a particular channel function is then calculated from the original time and the known switching rate.

The remote data code indicator shows in binary form the output of the analog-to-digital converter. A remote data code indicator is located wherever transducer output scaling is required. The data code indicator is used with commutator operation in the manual position to permit monitoring of any selected channel.

Analog-to-digital conversion is accomplished by an

Fig. 2. Block diagram of input system.



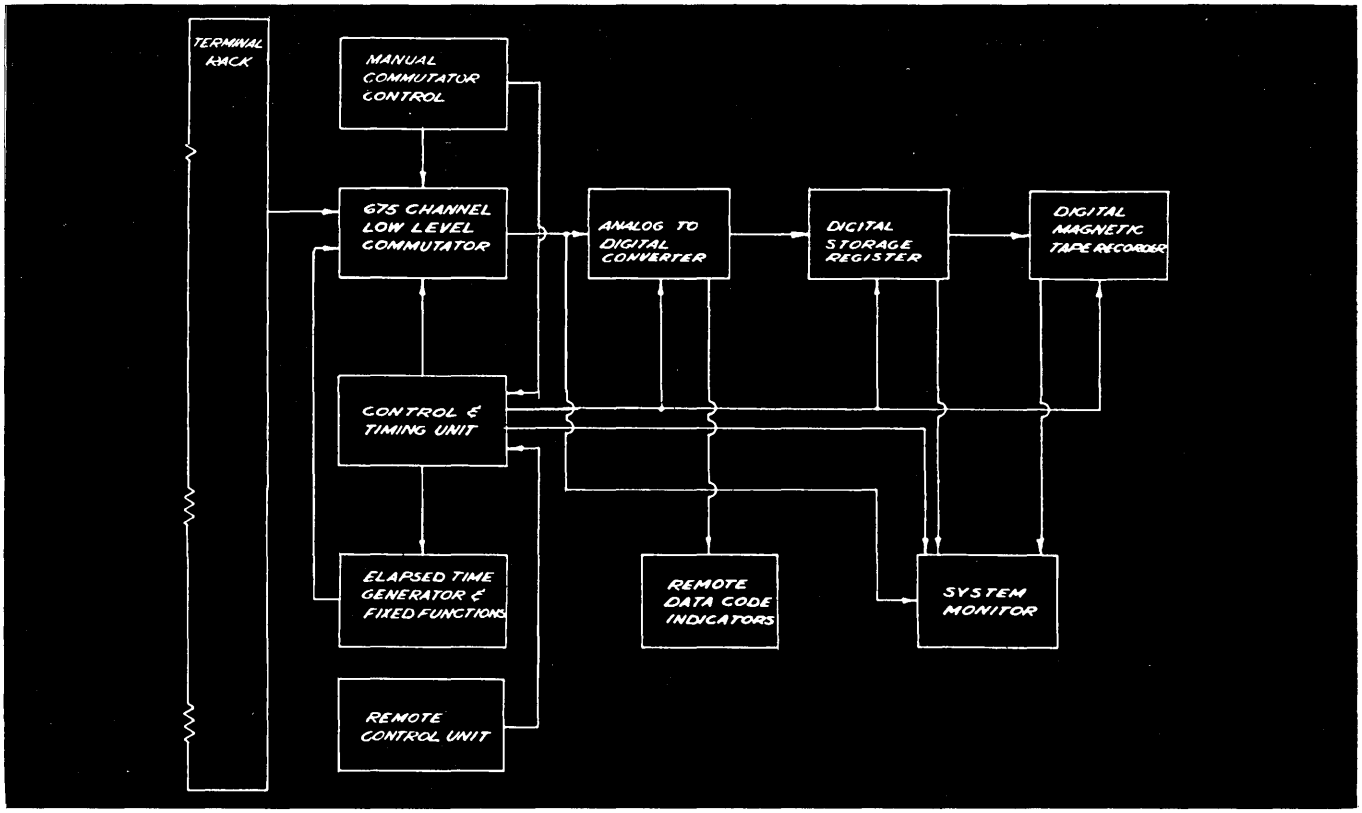


Figure 3. Block diagram of digital system.

Epsco *Datrac Model B* high-speed converter. This converter consists of a high-speed digital-to-voltage converter, a high-speed low-level digital voltage comparator, a digital storage register, and a programmer. When the converter is used as a voltage-to-digital translator, the digital-to-voltage converter is employed as part of a closed-loop nulling system.

Operation is based on a programmed successive approximation technique. During the voltage-to-digital encoding process, a rapid series of decisions is made, controlled by a comparison of the input voltage and the voltage generated internally by the digital-to-voltage converter. Each binary decision is completed within two microseconds with a stated accuracy of 0.05%.

This high digitizing rate produces excellent signal-to-noise ratios during conversion. The output code is an 11-bit straight binary signal which goes to the digital storage register and to the remote data code indicator.

The storage register unit provides digit storage of the 11-bit code and the correct output density for recording on the magnetic tape of the recorder. This, of course, is necessitated by the compatibility requirements of the computer input. Parity marks for the tape are also provided by the storage register.

This controlled recording density, together with the insertion of required gaps and parity marks, assure complete compatibility to the computer input requirements. No additional processing is necessary prior to feeding the computer; however, outputs for punched card data can be supplied for card input computers or X-Y plotters or other special equipment.

Magnetic tape recording and playback equipment utilizes an Ampex *FR-207*. IBM hubs and reels are supplied to simplify still further data input requirements of IBM computers. The IBM *704* reduces the data by performing, scaling, linearizing, and arithmetic functions on each data point in a fraction of the time required for recording. Final data is presented on tabulated sheets.

Another feature of *Madis I* is the system monitor by which system operation can be monitored at almost any step in the processing. Commuator output waveforms, timing pulses, storage register information, or tape monitoring can be presented visually.

Accessory equipment can be used to adapt the *Madis I* to almost any data processing application. These accessories may include such features as special recorders, mobile input adapter carts for transducers and associated conditioning equipment, automatic bridge balancing, remote reference junction and bias units, special precision power supplies, or remote read-out indicators. Channels may vary from 100 to more than 1000, with sampling rates up to 800 per second.

Circle 104 on Reader Service Card

CORE BUFFERING:

an aid to balanced data flow

by Ernst Jacobi
Telemeter Magnetics, Inc.
Los Angeles, Calif.

WHAT happens to the efficiency of a million-dollar computer operating at near astronomical speed when its output is presented to a 10-character/sec. Flexowriter of a 60-character/sec. paper punch? Or, what becomes of that portion of a continuous stream of input data that cannot be accepted by a magnetic tape while required "inter-record gap" blank space between 2 blocks of information is being generated?

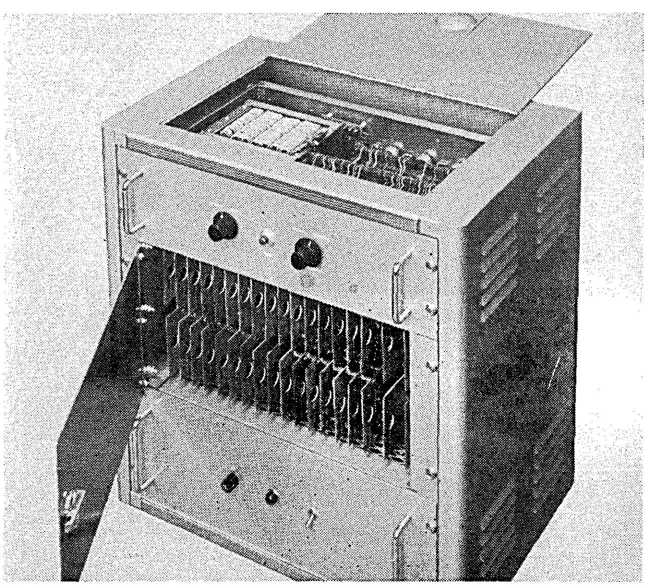
Both examples represent typical situations in which buffering is needed. In the first, an output buffering system is required in order to smooth the flow of data without forcing the computer to slow down to the operating speed of the output equipment. Second, an input buffering system is needed to avoid loss of data.

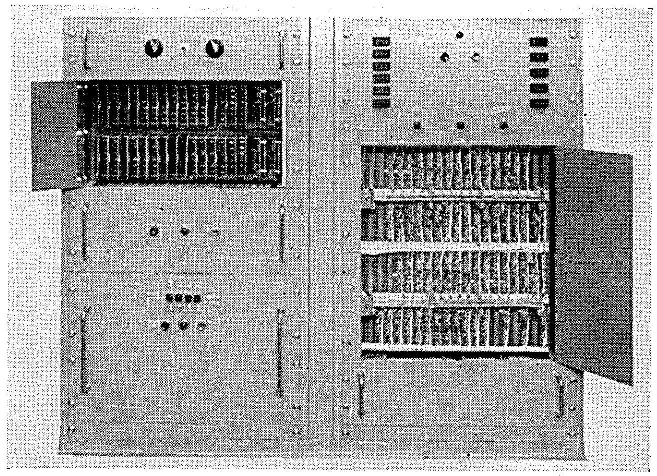
While most buffering systems still have to be tailored to specific needs, a standard buffer storage unit around which such systems can be conveniently designed is being manufactured and marketed with considerable success by Telemeter Magnetics, Inc. of Los Angeles.

The unit contains all solid state components and has a memory with a capacity of 1,092 characters. Two models are available for storage of characters that are either 7 or 8 binary digits long. Characters are loaded sequentially, unloaded in the same order as stored; bits forming each character are handled in parallel.

Operating speed is approximately 10 microseconds/character. Loading and unloading operations may be interlaced, and no delay is involved in switching from one mode to the other. Full and Empty signals, as well as electronic clearings, are features provided by one of the two models.

A coincident current ferrite core memory with a capacity of 1,092 characters either seven or eight binary digits long, this standard storage unit forms the heart of many buffer systems.





Designed for the Florida Automatic Computer, FLAC high-speed output buffer system will accept information at rates from 6 to 8 kc, make it available to any 1 of 6 punches at rate of 60 characters/sec.

All logical circuits are mounted on printed circuit plug-in assemblies. A compact, completely-transistorized unit that weighs less than 100 lbs. including a power supply, the buffer may be installed in a standard 19″ rack with the power supply either mounted below or as a separate chassis. The unit is cooled with ambient air from the sides and the back in order to facilitate the installation of other equipment above and below it, and has a satisfactory operating range from 65 to 105° F.

The unit requires a 115 volts, 60 cps, 2 ampere, single-phase power source. Sync pulses must rise between 10 and 20 volts in not more than 1 microsecond. Input levels may be between —5 volts to —30 volts for a Zero, and from +5 volts to +30 volts for a One.

The buffer is essentially a coincident current ferromagnetic core memory. Its basic storage device is a bi-stable ferrite core with a rectangular hysteresis loop, a switching speed of approximately 5 microseconds, and power requirements of .370 ampere turn. The cores are mounted on matrices at the intersections of 28 rows (X lines) and 39 columns (Y lines), and will be turned to one or the other of their two states by the coincidence of two half currents pulsed through the lines linking them.

The memory consists of 8 matrices. Each matrix stores 1 digit of a character. In the 7-digit model, the 8th matrix is a control matrix whose function is to detect the full or empty state of the buffer and to generate the corresponding signal.

Each X line and each Y line is common to all 8 matrices, traversing them in series. When a Zero is to be written, a negative input signal will activate a digit driver causing it to switch an inhibit current to the relevant matrix in order to prevent the selected core from being turned over to the One state.

Stepping up the addresses of both switches simultaneously by one will result in the sequential selection of all 1,092 storage addresses of the memory (because the numbers 28 and 39 are mutually prime).

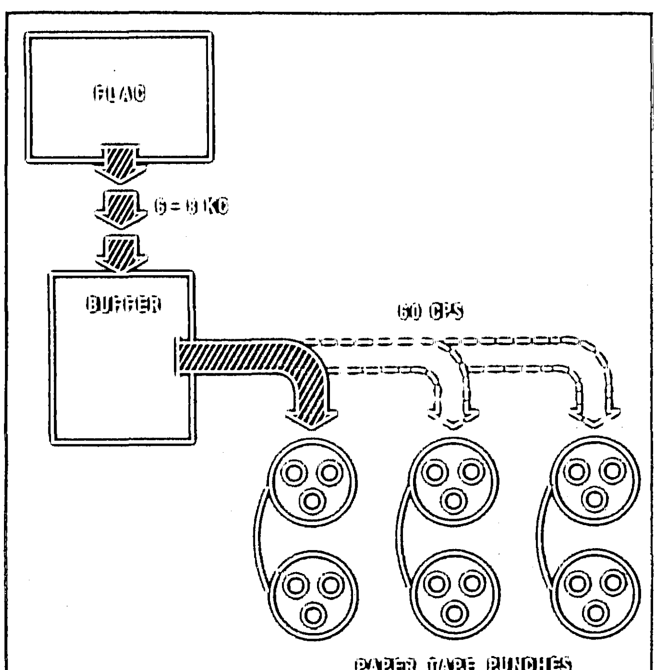
Each load sync sent to the buffer will cause a One to be written in the control matrix. Each unload sync will cause a One to be erased in the control matrix. In this manner, the control matrix keeps track of whether the buffer is full or empty. Either state will be detected by means of re-entrant X and Y lines which "see'" the core ahead of the selected one with currents flowing in a direction opposing a given mode.

Thus, working into a field of Zero's during loading, the selected lines will turn each selected core *(n)* over to the One state while the re-entrant lines will leave core $n + 1$ in the Zero state. When the re-entrant lines finally "see" a One core, this will indicatae that the buffer is full.

Since the current through the re-entrant lines is in a direction tending to set a loaded core to the Zero state, the $n + 1$ core will be turned over and generate a signal which, by means of the appropriate gating, becomes the "Full" signal. This procedure is reversed during unloading.

One example of the many possible uses of the buffer is the FLAC high-speed output buffer system. Designed for the Florida Automatic Computer of Patrick Air Force Base at Fort Canaveral, Fla., the system accepts data from the computer at rates from 6 to 8 kc and makes them available to any 1 of 6 paper punches at their operating speed of 60 characters/sec.

FLAC output buffer.



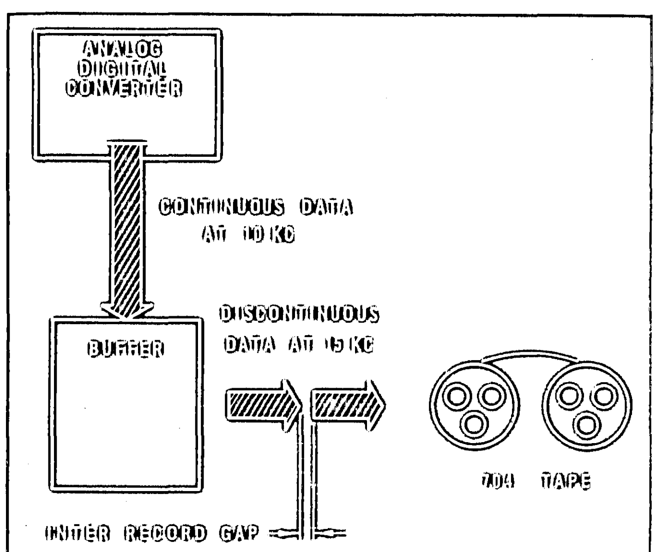
By interlacing load and unload operations, it is possible to keep the punches operating steadily one at a time while permitting the computer to unload data to the buffer in quick, short bursts compatible with its own mode of operation.

An example of input buffering is the Format control buffer that is marketed with great success by the Electronic Engineering Co. of Calif. This, also, is a system which uses the Telemeter Magnetics' standard buffer storage unit. One of the principal functions of the system is to accept a continuous stream of data as, for instance, from an analog-to-digital converter and to generate the inter-record gap required by the IBM 704.

In order to avoid loss of information during the time of the inter-record gap, all data is stored in the buffer before it is put on the tape. Here, too, load and unload operations are interlaced, loading proceeding at a rate of 10 kc and unloading at 15 kc. In this operation, unloading must be faster than loading, otherwise accumulating data would soon exceed the capacity of the memory (since loading is continuous).

These examples represent two relatively-simple applications of the buffer. When it is necessary to manipulate data with respect to their physical format or code—as is usually the case in computer language and media translations—the systems become more complex, but the need for buffer storage remains the same as in these simpler illustrations.

Format control buffer.



people moving up in DATAMATION

Helmut Kuerschner has been appointed Chief of the Computer Operations Projects Office in the Air Force Missiles Dept. of Aerophysics Development Corp., Santa Barbara, Calif., a subsidiary of Curtiss-Wright. . . . Midwestern Instruments, Inc., Tulsa, Okla., has purchased the Data Storage Devices Co. of Van Nuys, Calif. F. A. Oliver, formerly owner of the Calif. company, has been elected a vice-president of Midwestern, and will head up the new Data Storage Devices Div. with headquarters in Tulsa.

Heading the recently-formed Auerbach Electronics Corp., Narbeth, Pa., is I. L. Auerbach, former Director of the Special Products Div. of Burroughs Corp. Paul Winsor will head the systems engineering staff, and A. B. Shafritz is responsible for industrial product development.

E. D. Zimmer, formerly with Remington Rand Univac and Engineering Research Associates, has joined the staff of Control Data Corp., Minneapolis, Minn., as a Sr. Engineer.

ElectroData Div., of Burroughs Corp., Pasadena, Calif., has announced the following appointments: A. W. Swan as Central Regional field engineering manager, M. C. Camp as Philadelphia District manager, R. V. Airhart as a field engineering supervisor in the San Francisco District, and E. M. Offinger as Detroit District manager.

H. L. Stout has been promoted to Ass't Manager of the Engineering Div. of Midwest Research Institute, Kansas City, Mo. . . . Consolidated Electrodynamics Corp., Pasadena, Calif., has announced the following appointments: A. W. Brandmaier as Manager of the European regional sales office, with offices in Frankfurt, Germany; D. H. Montgomery as Senior Supervisory Development Engineer of the Transducer Div., and R. E. Hadady as Sales Manager for DataTape products.

B. V. K. French has been appointed Sales Engineer of Circuit Instruments Inc., St. Petersburg, Fla.

J. M. Embree has been named Applications Manager and Ass't. to the President of Mid-Century Instrumatic Corp., N.Y.C. . . . Autonetics, Div of North American Aviation, Inc., Downey, Calif., has established a Computers & Control Engineering Dept., with D. L. Williams as Mgr.

G. G. Hoberg has been appointed Manager, Special Data Processing Equipment Engineering, Radio Corp. of America, Camden, N. J. . . . Bendix Aviation Corp. Computer Div. (Los Angeles, Calif.) has opened a new and expanded office at 1000 Connecticut Ave., N. W., Washington, D. C., directed by R. A. Sweet, Eastern Regional Mgr.

L. H. La Motte, executive vice-president of International Business Machines Corp., and general manager of its Data Processing Div., White Plains, N. Y., has been elected President of the Office Equipment Manufacturers Institute.

Battelle Memorial Institute, Columbus, Ohio, has announced the following appointments: Dr. H. S. Kirschbaum as Consultant in Systems Engineering Research, and Alexander Finley as Chief of the Electrical Engineering Div. . . . Joseph O'Reilly has been appointed General Manager of Ferroxcube Corp. of America, Saugerties, N. Y.

D. E. Laughlin has been appointed Manager of the Digimatic Marketing Section of Electronic Control Systems, Inc., Los Angeles, Calif.

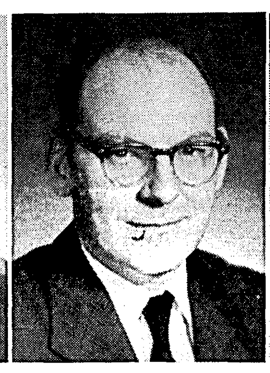
The Data Processing Div. of International Business Machines Corp., White Plains, N. Y., has announced the following appointments: M. S. Smith as Ass't General Manager, G. E. Jones as Manager of Marketing & Service, R. W. Hubner as Sales Manager, C. R. De Carlo as Director of Sales Service, R. T. Samuel as Director of Marketing Programs, and J. W. Haanstra as Ass't Manager of Product Development.

Dr. C. J. Savant, Jr., formerly with North American Aviation and Servomechanisms, has been appointed Director of Engineering for American Electronics, Inc., Los Angeles, Calif. . . . Beckman / Systems Div., Anaheim, Calif., has announced the following appointments: Carl Neisser, Manufacturing Manager; R. S. Rosenast, Production Manager; A. C. Knudsen, Product Line Mgr.

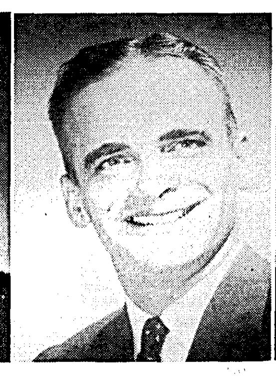
The Council for Economic & Industry Research, Inc., Arlington, Va., has changed its name to Corp. For Economic & Industrial Research . . . . Z. R. Smith, former Chief Engineer, has been elected Vice-President of Potter & Brumfield, Inc., Princeton, Ind., and has been assigned the duties and title of Director of Engineering.

Hoffman Semiconductor Div. of Hoffman Electronics Corp., Evanston, Ill., has announced the promotion of Dr. J. R. Madigan to the position of Chief Engineer, and establishment of an Application Engrg. Dept. headed by P. L. Toback.

I. L. Auerbach
Auerbach Electronics Corp.



J. R. Madigan
Hoffman Semiconductor Div.



R. S. Rosenast
Beckman/ Systems Div.

J. O. O'Reilly
Ferroxcube Corp. of America

DATAMATION on campus

ENGINEERS, UCLA AND THE G-15

UCLA has obtained a Bendix computer to assist engineers preparing for executive positions. The G-15 will be used as a decision making tool by engineers to solve complex industrial problems.

"We want engineers to be able to use computers with as much confidence as their slide rules. To achieve this, we are conducting special courses in computer use and application," said Dr. Morris Asimow.

In this four-semester Engineering Executive Program, approximately 60 engineers are being exposed to accounting, financial, personnel, labor relations, and other management problems. As far as possible, problems are solved by use of the quantitative approach. Applicants, preferably between 30 and 35 years of age, must have several years of experience in industry, an engineering degree, and a good academic record. The program is at the graduate level leading to a Master's degree.

Dr. Asimow stated that the G-15 is also used for large problems in undergraduate classes.

MIT COOPERATES WITH UNIV. OF VERMONT

The University of Vermont has no computer installation on campus but, as a cooperating university, it has the use of a 704 at the Massachusetts Institute of Technology. Vermont offers two courses on the theory of digital computers. One deals with mathematical theory, and the other with electronic functioning.

CARNEGIE TECH DEVELOPS DATA PROGRAM

Carnegie Tech's computer center, located in the graduate school of industrial administration, has acquired an IBM 650 for use in course work and research. A special research project is underway with the Rand Corp. using the Johnniac. One-year courses offered in Tech's mathematics department: Data Processing and Digital Computation, and Numerical & Graphical Analysis. A graduate course in Complex Information Processing is also conducted.

Top data men at the school are Herbert A. Simon, professor of industrial administration, and Alan J. Perlis, head of the computer center. Their research efforts cover automatic programming, the use of computers to solve management science problems, econometrics problems, the study of complex information processing systems, and a natural language translation.

BRIDGEPORT INAUGURATES EDP CLASS

The Bridgeport Engineering Institute in Connecticut reports it is now offering a special evening course in automatic data processing. The course is directed toward industrial and business management and is being conducted by Dr. J. P. Keuper.

SOUTH DAKOTA HANDLES WEATHER DATA

Now in operation at South Dakota State College is a 602A calculating punch. Research projects are currently in progress, the principal one dealing with weather data. Informal briefings on computers are held for students by Secretarial Science Dept.

TEXAS TECH INTRODUCES NEW COURSE

An introductory course in computer operation will begin at Texas Technological College with spring semester classes Feb. 3. Dr. William R. Pasewark stated that the course will be open to any student "because electronic computers are being used increasingly in business, industry, government, and social studies as well as science." Dr. Pasewark heads an interdepartmental committee on data processing at the school.

ILLINOIS ASSISTS IOWA, MICHIGAN STATE

At Iowa State College, $15,000 is available for the building of a digital computer, CYCLONE, a copy of Illinois' ILLIAC. With U. I. approval, Dr. R. E. Meagher, under whose direction ILLIAC was built, has agreed to release construction plans to Iowa State in the interest of getting new groups into the field. This will enable the college to build a copy for a fraction of the cost of the original. Dr. Meagher will provide teletype-tape copies of the ILLIAC library of codes, routines, and subroutines for problem solutions.

Michigan State University has completed building MISTIC, another ILLIAC copy, and faculty and graduate students are working on research projects. Chas. F. Wrigley, Dept. of Psychology, is advising psychologists and social scientists in MISTIC's use.

RUTGERS SET FOR 650 IN APRIL

Rutgers University expects to obtain a 650 in April. Plans call for establishment of the computer as a separate unit of the College of Arts & Sciences under the administration of math prof. Dr. F. G. Fender. The computer will be available to all university depts.

MISSISSIPPI STATE OPENS COMPUTER CENTER

A full-scale computer center was activated this month at Mississippi State College. The center is located on the entire second floor of the engineering building. An IBM 650, together with the college's GEDA computer, will be utilized for analog and digital work.

Harry Simrall, dean of the School of Engineering, said the center would enable campus research organizations and Mississippi industries to develop computer programs previously considered impossible because of the time and cost involved. The center will also train undergraduate students in computer use.

STANFORD USES 650, OFFERS FOUR EDP COURSES

Stanford University is now operating two data processing machines—a 650 in its computation center and a 407 in its business offices. Courses bearing on data processing include three presented by the Industrial Engineering Department and a mathematics course in the use of the 650.

Stanford also has a major data processing project now nearing completion in the Graduate School of Business. It involves a contract with the U. S. Army Transport Command utilizing EDPS in the handling of Army cargo in an overseas theater. In the undergraduate School of Business, Introduction to Electronic Data Processing, and Business Information Systems are taught.

UNIV. OF TEXAS ASSURES COMPUTER FUTURE

Science-math courses and research at the University of Texas will soon be bolstered by the addition of a computer to be located in a new computer center. The university has been authorized by the board of regents to establish the center as quickly as possible.

709 SCHEDULED FOR WESTERN DATA CENTER

Western Data Processing Center at UCLA will soon have a 709, given to the university by IBM. The corporation has agreed to share the cost of a $750,000 research building which will house the computer. Dr. George W. Brown, center director, said the building is in an advanced state of construction and is scheduled for completion in June.

Students at the WDPC will apply advanced computing methods to complex problems faced by business management in manufacturing distribution, raw material utilization, transportation, sales analysis, and clerical administrative work.

AN EXECUTIVE VOICE IN DATAMATION

JAMES R. BRADBURN belongs to a relatively new class of American business management—the "engineer-executive." At 47, this rangy (6′3″) Californian is vice-president of Burroughs Corp. and manager of its computer division, ElectroData, in Pasadena.

A graduate both of Caltech and Harvard Business School, Bradburn joined Consolidated Electrodynamics Corp. in 1945, following 6 years of prewar industrial experience and military duty as an Army major.

At CEC, he rose through a variety of management jobs—treasurer, marketing director, engineering vice-president—until in 1951 he got the assignment of his career. He was named head of a task-force to develop and produce Consolidated's entry in the computer market.

For less than $1-million, Bradburn's team of engineering talent produced a powerful new data processing system—*Datatron.* Because of this success, CEC spun-off the division in 1954 as an affiliate corporation, ElectroData, and Bradburn became its president.

By 1956, the corporal's-guard with which he started had ballooned to over 1,000 employees. Production capacity was tripled with a modern new plant, and an aggressive sales force placed 50 of the quarter-million-dollar *Datatrons* with business and science nationwide.

That year ElectroData merged with Burroughs Corporation—a move prompted by the financial pressures of growth and the natural alliance of their respective data processing machines. As Burroughs vice-president, Bradburn became manager of the first autonomous division in the company's history—paving the way for a corporate-wide decentralization program.

Last year the ElectroData Division (housed in a plant 6 times the original size) brought out a new computer system, *Datatron 220*—which has greatly enlarged Burrough's claim in the digital computer sweepstakes.

Bradburn foresees a solid advance for Burroughs in the new era. Well-planned growth to him is the key mark of a healthy organization. His business credo is straight and provocative: "Never let the urgent displace the important . . . if you want to touch the moon, learn first to develop your reach."

"THE electronic computer industry, like any industry you might name, is part of a larger economic conception. In our case, it might be called "datamation." Computers furnish not only the means to mechanize brawn, but to mechanize decision—without which the automatic age could not exist.

Of the many reasons why the new electronics technology is important to America, one often goes unnoticed. I refer to the latent ability of automatic data processing equipment to help reclaim our human resources in the long, hard marathon with Russia.

For all its benefits, "mass production" has tended to yoke millions of people to repetitive jobs requiring a fraction of their ability. Computers offer the hope of removing this corrupting influence on our national character. They can also help erase dangerous weak spots in our security caused by the waste of engineering talent on routine arithmetic and calculation.

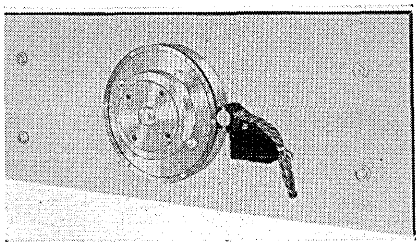
But the automatic age will not come easily, even to meet crisis demands. Data processing equipment is costly. To secure it, industry must have continual and life-giving injections of new capital.

Capital springs from two sources—personal savings (invested in industry), and retained corporate earnings. These sources dry up, of course, under a tax policy which doubly-penalizes investment and rewards extravagance rather than thrift. It is my opinion that our existing tax structure runs counter to the principles on which datamation's and America's future depends.

Ultimately I am confident our legislators will recognize the importance of datamation, both economically and militarily. Looking to that day, the computer industry will persist in developing the most advanced equipment it can . . . to spread the benefits of datamation to all."

new products in DATAMATION

Digital magnetic storage drum



MONROE CALCULATING MACHINE CO., Electronics Div., Morris Plains, N. J., has announced a Monrobot digital magnetic storage drum that permits different diameter surfaces to be affixed to a standard hub.

The entire unit, including motor, drive, mounting base, bearings, and a drum hub to which selected drum rims are attached, comes mounted on a sturdy aluminum plate ready for installation in any standard 19″ rack. Drum diameter, speed, read/record heads, and associated circuitry are selected by the systems designer to meet his individual requirements.

Circle 151 on Reader Service Card

A/D data processing system

ARNOUX CORP., 11924 W. Washington Blvd., Los Angeles 64, Calif., has developed a new analog-digital data processing system, the Madis (Millivolt analog-digital instrumentation system), whose relay matrix commutator accepts 0 to ±10 millivolt signals directly, entirely eliminating the need for pre-amplifiers.

Rejection of common mode voltages is so complete that the system is capable of handling 10 millivolt signals, with negligible error, in the presence of 50 volts of DC or AC common mode. Noise generated in the commutator is less than 2 microvolts. Sampling rates up to 800/sec. are available. The minimum number of input data channels available is 50, expandable in blocks of 25 channels to over 1000.

Modular commutator design also permits addition of more input channels after the system is installed. Recording is done in a format and code which permits direct play-in to the IBM 701 or 704 computers as well as the Remington Rand 1103A. A tape-to-card converter is also available to accommodate computers requiring card input which is directly compatible with card punching equipment such as that used by the IBM 650 computer.

The format compatibility is obtained without the use of intermediate buffer storage or handling equipment. Analog-to-digital conversion is accomplished with a high-speed electronic converter capable of converting at a speed of 2 microseconds per bit. Overall system error is less than 0.15 percent of full scale.

Circle 152 on Reader Service Card

Alphanumeric printer

POTTER INSTRUMENT CO., INC., Sunnyside Blvd., Plainview, L. I., N. Y., has announced a new alphanumeric printer, the Magnityper, that combines such mechanical and circuit features as integral housing of the mechanical printing assembly with the electronic storage and comparator system, input adaptability to any source of digital data, and solid state devices, both transistors and magnistors, with modular-type construction.

The new unit will find application in printing the output of digital devices such as computers and data handling equipment for business, governmental, and industrial use. Other input sources for conversion to print are magnetic tape handlers, perforated tape handlers, punched cards, and communications circuits.

The Magnityper includes a 120-column storage system, and is capable of printing 10 lines of 120 alphanumerical characters/sec. on multiple copy fanfold paper. Up to 63 different characters are available including alphabetical, numerical, and special symbols.

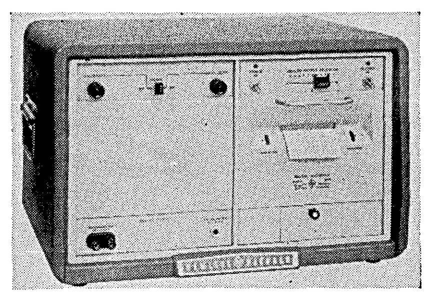
Circle 153 on Reader Service Card

Pulse transformer sample kits

ESC CORP., Electronics Components Div., 534 Bergen Blvd., Palisades Park., N. J., has announced the development and availability of 3 pulse transformer sample kits designed as an aid to the circuit designer. Each kit contains 6 different pulse transformers, in a plastic box. Transformers are supplied with 7-pin base to fit standard 7-pin miniature tube sockets.

Circle 154 on Reader Service Card

Digital recorder



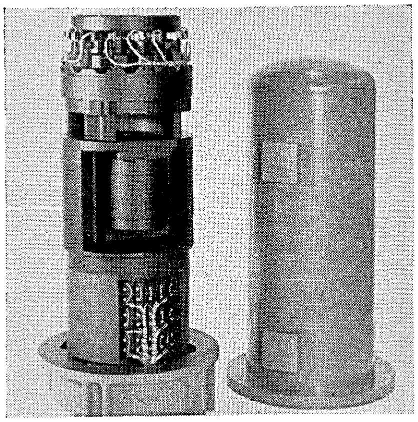
HEWLETT-PACKARD CO., 275 Page Mill Rd., Palo Alto, Calif., announces their Model 560A Digital Recorder that prints 11-column digital information at rates to 5 prints per second.

Designed to make a permanent record of electronic counter readouts, the unit can be used with 2 or more counters simultaneously, digital voltmeters, time recorders, flowmetering equipment and systems, such as telemetering installations, and engine test stands.

In addition to the printed tape record, the unit provides an analog current or voltage output to drive a galvanometer or potentiometer strip chart recorder or to provide a servo control.

Circle 155 on Reader Service Card

Multiplexer for pdm telemetry



Consolidated Electrodynamics Corp., Transducer Div., 300 N. Sierra Madre Villa, Pasadena, Calif., has announced a new device for PDM commutating and coding. Termed the Type 40-101 Plexicoder, the instrument commutates signals from up to 90 transducers at 112.5 samples per second and converts them into duration-modulated pulses suitable for telemetering or magnetic tape recording.

In the Plexicoder, low-speed magnetic switching at the input, with high-speed commutation and coding accomplished by interrupting a light beam, replaces rotating wiper-arm assemblies and wide-band chopper-stabilized amplifiers.

Designed for a service-free life of 1,000 hours, the new unit is compatible with low-output resistive-type transducers; its output can modulate a transmitter or subcarrier oscillator, and it can be used with standard magnetic tape recording equipment. It will accept single- or double-ended, high- or low-level inputs.

Circle 156 on Reader Service Card

A&D computer linkage

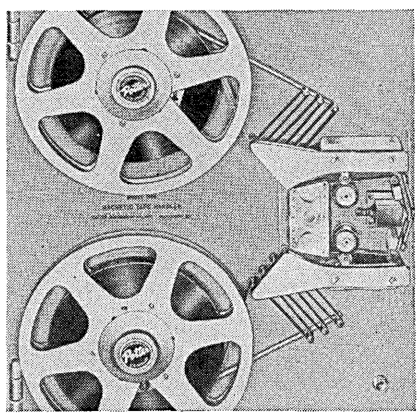
Epsco, Inc., 588 Commonwealth Ave., Boston 15, Mass., has announced a versatile, low-cost 2-channel analog and digital computer linkage—the Model B Addaverter—that makes possible the simultaneous operation of full-scale analog and digital computer facilities.

The new unit consists essentially of two Epsco Model B Type Datrac converters, one for analog-to-digital conversion, and one for digital-to-analog conversion. In addition, it contains control and synchronizing circuits to transfer data between the computers.

On command from the digital computer, an analog voltage is digitized within 26 microseconds. When conversion is completed, the digital computer is informed. On demand, the digital word is transmitted to the computer. The digital computer makes a computation and sends the digital resultant to the digital-to-analog converter where it serves as an input to the analog computer.

Circle 157 on Reader Service Card

Digital magnetic tape handler



Potter Instrument Co., Inc., Sunnyside Blvd., Plainview, L. I., N. Y., has announced a completely-transistorized digital magnetic tape handler, Model 906. Both high and low tape speeds are available in the new unit in ranges of 4 speeds forward and reverse up to 150″/sec. Rewind or search tape speeds are 400″/sec.

The machine is capable of continuous cycling at any frequency from 0 to 200 cps without flutter; start time is 3 milliseconds, and stop time has been reduced to 1.5 milliseconds. A vacuum loop device is used in conjunction with the tensioning system to provide proper tape tension at all times.

Circle 158 on Reader Service Card

Real-time digital computer

Packard-Bell Computer Corp., 11766 W. Pico Blvd., Los Angeles 64, Calif., has introduced a high-speed digital computer that provides for real-time computation and simulation of dynamic systems.

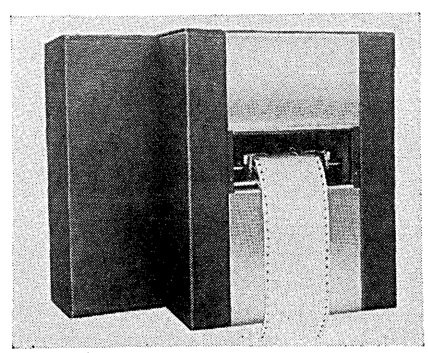
Called Trice (Transistorized real-time incremental computer, expandable), it is composed of independent computing elements that perform 100,000 complete computations each second. The basic pulse repetition rate is 3 megacycles.

Like the amplifiers of an analog computer, the individual computing elements of the new unit operate in parallel and are interconnected by means of a plugboard. Because of the parallel operating mode, the speed of computation of the computer does not vary with the size of the problem.

The initial conditions of all functions are stored within the computer and so facilitate parameter studies and the solution of mixed boundary and certain types of partial differential equation.

Circle 159 on Reader Service Card

Alphanumeric digital printer



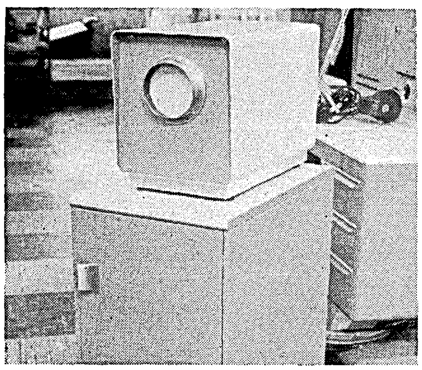
Potter Instrument Co,. Inc., Sunnyside Blvd., Plainview, L. I., N. Y., has announced a new high-speed alphanumeric digital printer, Model 3260, that can print more than 400 digits or characters per second, and may be connected to most data producing sources with little modification.

The printer can be supplied with up to 40 columns of numeric or alphanumeric characters, and is capable of printing at speeds of 20 lines per second for alphanumerical applications. Printing is normally on multiple-copy fanhold paper.

Use of stellite type faces assures maximum reliability in the printing mechanism. A selection of up to 63 characters is available including alphabetical, numerical, and special symbols in any desired combination. Standard teletype characters can be furnished..

Circle 160 on Reader Service Card

Symbol generator & viewer



LABORATORY for ELECTRONICS, INC., 141 Malden St., Boston 18, Mass., has introduced a symbol generator and viewer, the SM (symbol matrix), that translates coded data from data processing and computing systems and displays applications to a visual message for immediate viewing. The device converts input data at any rate up to 10,000 characters/sec., and displays data in blocks of 200 characters or less (20 per line in 10 lines) in alphabets of all languages, Arabic numerals, arbitrary or abstract symbols on the viewer face.

Circle 161 on Reader Service Card

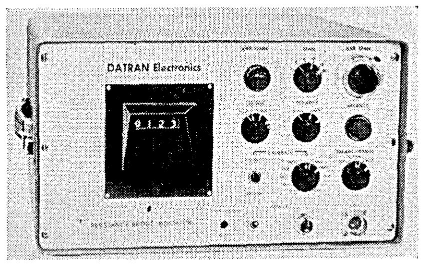
Electro-mechanical counters

DIGITAC, INC., 420 S. Beverly Dr., Beverly Hills, Calif., has developed a new line of electro-mechanical counters and counter-transmitters with counting rates to 40/sec. and a life span exceeding 10,000,000 counts.

The line includes both uni-directional and bi-directional units, the latter accepting both add and subtract impulses; functioning as efficient summation counters. Heart of all units is a dynamically-balanced incremental actuator.

Circle 162 on Reader Servcie Card

Digital strain gage indicator



DATRAN ELECTRONICS, 3615 Aviation Blvd., Manhattan Beach, Calif., has introduced a new instrument that accepts inputs from resistance-type transducers such as strain gages, load cells, resistance bulb thermometers, etc., via a null balance servo, and converts these analog signals to digital readout in true units of measurement.

For example, if the instrument is used for load cell measurement, the readout is in actual pounds. For strain gages, readout is in microinches per inch. The panel permits adjustment of controls to accommodate full or half bridge transducers with 1, 2, or 4 active legs, and to select the proper polarity.

Circle 163 on Reader Service Card

Mechanical amplifier-clutch

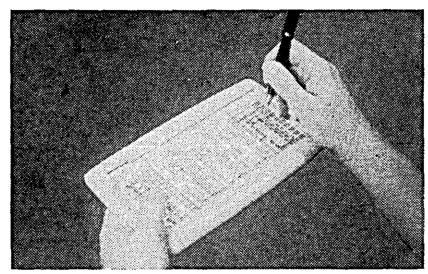
DIGITRONICS CORP., Albertson Ave., Albertson, L. I., N. Y., has introduced a new mechanical amplifier-clutch, the A-300, whose principle is the control of relatively large amounts of torque with very small amounts of clutch energizing torque or energizing force. The amplification factor is the ratio of the transmitted torque to the energizing torque at the clutch control lever.

The A-300 has an amplification of 200 X, whereby 10 inch-lbs. of transmitted torque are controlled with an energizing torque of 0.05 inch-lbs., which corresponds to a force of 3 to 5 ounces at the control lever. The response time of this device is only 0.001 sec., and tests have been performed up to 6300 rpm.

The entire clutch mechanism with the controls is extremely compact, being built into a cylindrical envelope of ⅞″ dia. and 1-13/32″ length. The clutch mechanism is supported by 3 ballbearings, and the input and output shafts are coaxially aligned; the cylindrical envelope has provisions for flange or cleatmounting.

Circle 164 on Reader Service Card

Pocket-sized card punch



IBM CORP., 320 Market St., San Francisco 11, Calif., has introduced a pocket-sized card punch, Port-A-Punch, that provides an effective and economical solution of most "on-the-job" recording problems. Consisting of a punching board, template, and punching tool, the unit uses pre-scored IBM cards designed to meet individual job requirements. Holes are manually punched in the card document much in the same way that chances are punched out of the familiar "lucky-number" type punch boards. After punching, the card is removed from the unit and is ready for machine processing.

Circle 165 on Reader Service Card

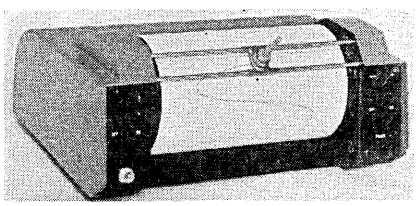
Tape-to-curve converter

BECKMAN / SYSTEMS DIV., 325 N. Muller Ave., Anaheim, Calif., announces a Tape-to-Curve Converter that makes high-speed X-Y plots directly from magnetic tapes containing raw digital data or computed output from electronic data computing machines. It makes up to 100 separate plots, 1000 points, in 30 minutes—9 plots per 30″ x 30″ sheet.

Cards are used for programming and control only. Separate cards for time and point address afford flexibility for plotting one channel against another, one channel against time, or one channel against an absolute nominal value.

Circle 166 on Reader Service Card

Digital X-Y recorder



California Computer Products, 3927 W. Jefferson Blvd., Los Angeles 16, Calif., announces their Model 650 Digital X-Y Recorder, an instrument for plotting one variable against another, capable of movement in both positive and negative directions on either axis. Both of the axis move in discrete increments of 1/100″ at a maximum speed of 200 increments per second.

While the recorder is intended primarily for use with a magnetic drum digital differential analyzer to give an immediate visual presentation of the output and a check on the computer's operation, it can be used to plot any two variables from a data source which is capable of supplying electrical pulses of a variable rate.

The unit can also be used to record one variable against time by introducing pulses at a uniform rate on one axis.

Circle 167 on Reader Service Card

Numerical read-out tubes

Burroughs Corp., Electronic Tube Div., Plainfield, N. J., has announced two new 10-digit, direct read-out tubes: the BD-206 (Type 7153), and BD-302 (Type 6844A). A new cup design provides a non-reflecting background.

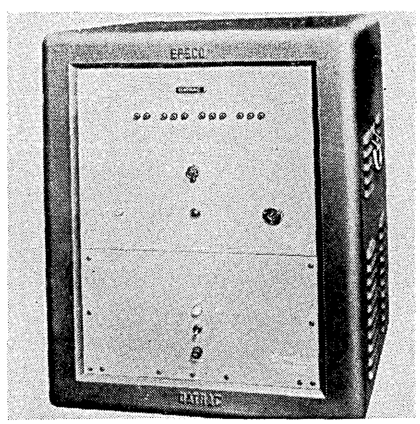
BD-206 has a bulk diameter of 1¼″ with increased viewing distance of 60 to 75 feet, more light output, and a wider viewing angle.

BD-302 is an improved version of the "Standard Nixie" (Type 6844), with a bulb diameter of 1″ and a viewing distance of approximately 35 feet.

Both types are gas-filled, cold cathode, numerical indicator tubes with a common anode, and use the standard Nixie socket; these simple plug-in tubes can operate directly from Beam Switching Tubes or directly from switches.

Circle 168 on Reader Service Card

Voltage-to-digital converter



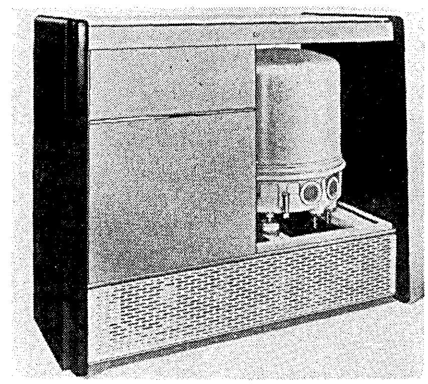
Epsco, Inc., 588 Commonwealth Ave., Boston 15, Mass., announces their Model K Datrac—a high-speed voltage-to-digital converter that makes possible high-speed, on-line entry into digital computers. A single conection to the cable (furnished with equipment) links the unit to the digital computer input register.

Upon computer command, the unit converts the analog signal, at its input, into digital form. Upon completion of a conversion (in approx. 26 microseconds) the computer is informed that a data word is ready. The digital data is transferred on demand.

The variety of external voltages possible as inputs to the new unit makes it possible to feed into the digital computer such information as thermocouples measurements, strain gage and accelerometer outputs, analog computer voltages, etc.

Circle 169 on Reader Service Card

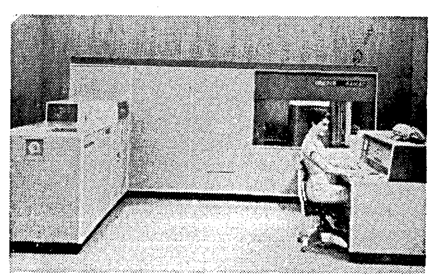
Magnetic file drum



Laboratory for Electronics, Inc., 141 Malden St., Boston 18, Mass., has announced a high-density magnetic file drum, the HD, that stores 1040 bits/in., has 320 tracks (20 tracks are spares), and stores a total of 15 million bits. Access time to stored data is 180 milliseconds (average). The unit consists of a file drum (15″ in dia. by 14″ tall), drive and lubrication systems, a 3 by 10 by 10 track-selection mercury relay matrix, a linear read-out preamplifier, and a final writing amplifier.

Circle 170 on Reader Service Card

Data processing system

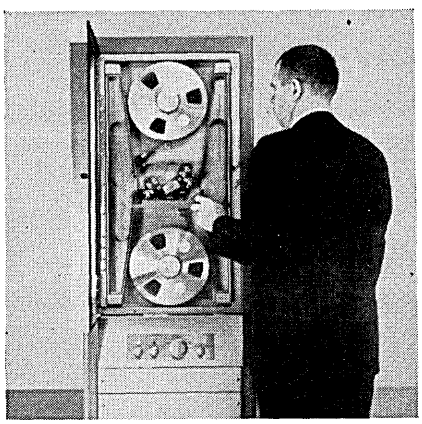


IBM Corp., San Jose, Calif., has announced a new data processing system, the 305 Ramac (Random access method of accounting and control), built around a disk memory unit having a storage capacity of 5 million digits. This unit consists of 50 magnetic metal disks arranged in a vertical stack, with data recorded on or read from each side of the disks by a rapidly-moving arm.

Ramac also has arithmetical and logical processing ability, punched card input, and both punched card and printed output. The machine makes available to business and industry a record-keeping concept known as continuous or "in-line" accounting. All affected records are adjusted immediately after a transaction occurs, rather than waiting until group is accumulated for processing.

Circle 171 on Reader Service Card

Digital tape system



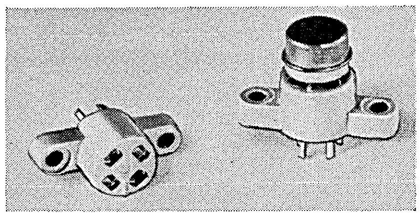
AMPEX CORP., 934 Charter St., Redwood City, Calif., has announced a new digital computer input/output system that offers rates as high as 90,000 6-bit characters per second. Known as the Ampex Digital Tape System, it consists of 4 interdependent items: tape handler, read/write heads, electronics, and a special magnetic tape.

To achieve the 90,000-character transfer rate, Ampex's FR-300 tape handler operates at 150 in./sec., and can record two 6-bit characters side by side on 1″ tape (½″ also available). Packing densities up to 300 bits per inch are a joint contribution of Ampex's head, amplifiers, and computer tape.

The company also claims greatly-reduced need for buffer storage, resulting from the tape handler's reliably-repeatable start and stop times of less than 1.5 milliseconds. Electronics are of all-transistor design for fail-free operation.

Circle 172 on Reader Service Card

Socket for jetec 30 transistor

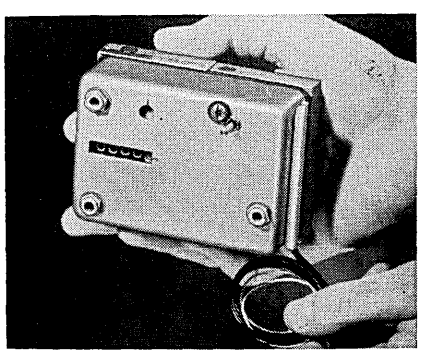


GRAYHILL, INC., 561 Hillgrove Ave., LaGrange, Ill., has announced a new socket for use with the new 3 and 4 Pin Jetec 30 transistors. The socket body is molded from mica-filled phenolic per MIL-M-14, Type MFE. The beryllium copper contacts are wrap-around style, silver-plated, and gold-flashed for contact and corrosion resistance.

Contact numbers, molded into the rear of the socket, make identification easy. Key mark is molded into the top of the socket for line-up with transistor case tab. Either rivets or No. 2 screws can be used for mounting.

Circle 173 on Reader Service Card

Linear integrator



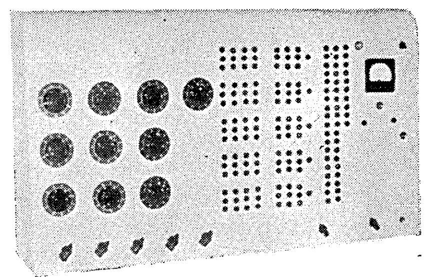
LIBRASCOPE INC., 808 Western Ave., Glendale, Calif., has developed a linear integrator, Model 25, that can be used to provide continuous integration in any instrument or system where integration, area of average computations, and a direct or remote reading is required.

Model 25 is a ball-and-disc integrating mechanism, assembled with a counter and an output pulse switch. Extremely compact, it can be adapted to strip chart recorders of all types and sizes and can be uesd wherever the variable to be integrated or averaged is presented as a shaft position or displacement.

Spring loading of input linkage eliminates backlash; results in immediate response. Because of the low torque requirement, this unit can accept the outputs of sensing elements directly, without the need of servos. Pulse output provides for convenient electrical transmission for use in data system or remote counter.

Circle 174 on Reader Service Card

Desk-top computer



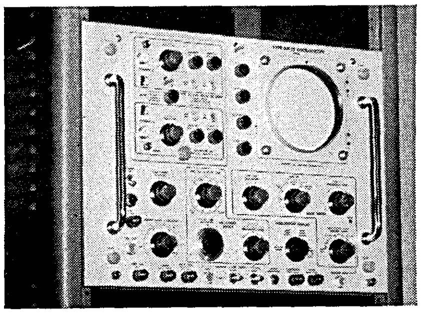
ELECTRONIC BRAIN ENTERPRISES, INC., 1015 Atkin Ave., Salt Lake City 6, Utah, has introduced a new desk-size computer, Minilog, that will add, subtract, multiply, integrate, differentiate, and solve algebraic, differential, and simultaneous differential equations.

Easy to work with, plug-in components enable any high school student with a knowledge of algebra to set up complicated equations. Yet, the new unit will solve many equations in advanced scientific or mathematical fields.

Some of the problems that can be solved on Minilog are: equations concerning automation and aerodynamics, electrical network problems, power equations, problems in mechanics, heat, light, sound, electricity and magnetism, chemistry, nuclear physics, statistics, astrophysics, biology, medicine, sociology, and psychology.

Circle 175 on Reader Service Card

Rack-mounting oscilloscopes



TEKTRONIX, INC., P. O. Box 831, Portland 7, Ore., has announced that all their Type 53/54 Plug-In Units can be used with the following new Tektronix rack-mounting oscilloscopes for complete signal-handling versatility:

Type RM45 (electrically identical to Type 545 oscilloscope), DC-to-30 MC vertical response, wide range of sweep delay.

Type RM35 (electrically identical to Type 535 oscilloscope), DC-to-11 MC vertical response, wide range of sweep delay.

Type RM41 (electrically identical to Type 541 oscilloscope), DC-to-30 MC vertical response.

Type RM31 (electrically identical to Type 531 oscilloscope), DC-to-11 MC vertical response.

Type RM32 (electrically identical to Type 532 oscilloscope), DC-to-5 MC vertical response.

The oscilloscope cabinets mount in a standard instrument rack, with chassis supported on slide-out tracks. Chassis can be pulled forward, tilted, and locked in any of 7 positions for servicing convenience. All 5 have the same dimensions: 14″ high, 19″ wide, 22½″ rack depth, 24″ overall depth.

Circle 176 on Reader Service Card

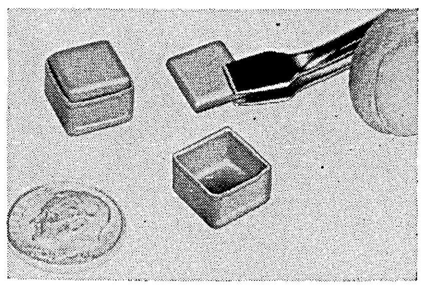
Pulse transformer

INTERNATIONAL RESISTANCE Co., Computer Components Div., 401 N. Broad St., Phila. 8, Pa., has announced a new pulse transformer for high-speed digital recording applications. The transformer, Series 70-3420, is suitable for high-current magnetic recording head drive circuits.

Primary and secondary, as well as two secondaries, are close-coupled to permit use as a read-write circuit. Packaging is designed for close stacking and for maximum utilization of space. The entire unit is potted in a special high-temperature moisture-resistant epoxy. Turns ratio of 1:2:1 can be modified to match circuits for various heads.

Circle 177 on Reader Service Card

Shielding capsules



PERFECTION MICA Co., Magnetic Shield Div., 1322 N. Elston Ave., Chicago 22, Ill., has developed a new line of subminiature Co-Netic magnetic shielding capsules designed for subminiature reactors and transformers used in transistorized and printed circuits and other miniaturized applications.

Virtually eliminated are hum and noise caused by low-level extraneous electromagnetic and electrostatic fields. Much closer grouping of components is now possible due to shielding effectiveness.

When required, shields can be pre-tinned for soldering without affecting magnetic shielding qualities. Shielding capsules may be produced in a variety of shapes and dimensions using standard methods or special techniques.

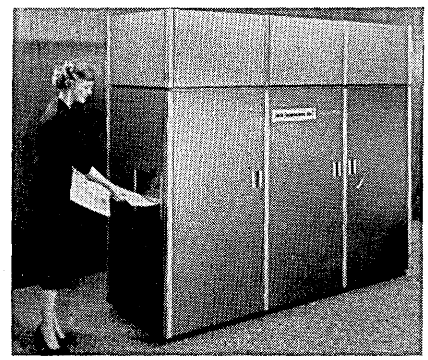
Circle 178 on Reader Service Card

Digital clock

CHRONO-LOG CORP., Box 4587, Philadelphia 31, Pa., has announced a digital clock, Model 2600, that produces multiple, digital representations of time to the nearest second, suitable for providing time data to logging systems, data handling systems, and computers. Up to 3 independent, parallel, decimal outputs are available in one unit, with time resolutions of seconds or minutes. Designed for standard relay rack mounting, the unit requires only 3-½″ of panel height.

Circle 179 on Reader Service Card

High-speed electronic printer



STROMBERG-CARLSON Co., Rochester 3, N. Y., has announced a new high-speed electronic printer, the S-C 5000, that will print the output of electronic computers at 4,680 lines (about 65′) per minute, and can be used in both the on-line method of receiving electronic data direct from the computer, and the off-line method of receiving data from magnetic tape.

A 7″ Charactron Shaped Beam Tube that can display one million characters a minute is used in the new machine. It reproduces 64 characters—the letters of the alphabet, 10 numbers, and 28 symbols of the user's choice.

The new unit will print-out on rolls of paper, or on sheets cut to desired size by an electronically-controlled cutter. Because the unit's Xerox printer can be used with any kind of paper, the S-C 5000 prints on all grades of stock, from thin tissues to punched cards.

Circle 180 on Reader Service Card

Reader-scanner

GERBER SCIENTIFIC INSTRUMENT Co., 162 State St., Hartford 3, Conn., has introduced a variable-speed, back-lighted oscillogram reader and scanner, the Data Reader. Its advantage lies in the combining of the scanner with a built-in reading head capable of reading the amplitudes of any number of channels, Vernier scaling small amplitudes, reading frequencies, linearizing non-linear records with any number of channels, and correcting each channel for reference line position and reference line drift.

Circle 181 on Reader Service Card

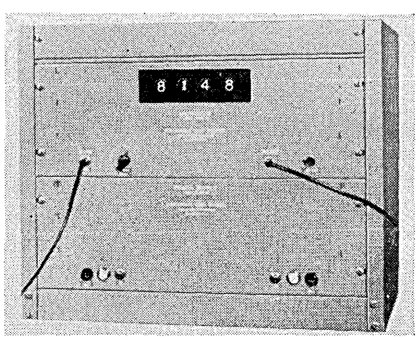
Magnetic shift register

EPSCO, INC., Components Div., 108 Cummington St., Boston 15, Mass., has announced a new series of transistorized magnetic shift registers, Type SR-60, designed to operate from 0 to 60KC. These magnetic elements have signal-to-noise ratios greater than 15 to 1, with voltage drops of 0.5V across drive windings.

Only one voltage source is necessary for both driver and shift register. The units are completely encapsulated for maximum resistance to shock, vibration, and penetration of moisture. Packaging is compact, the units measuring ⅞" sq. x ¾" high, equipped with a 9-pin base for standard tube socket or printed circuit mounting.

Circle 182 on Reader Service Card

High-speed electronic counter



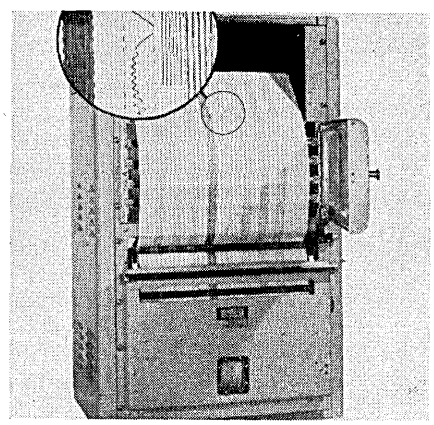
BURROUGHS CORP., Electronic Tube Div., Plainfield, N. J., has announced a 4-decade instrument, the Optimeter (Occurrences per time interval meter), which counts, samples, stores, and provides a working output without the need to stop the count in order to sample, and with no loss of time between samples.

Information is transferred from the counter to a storage output in less than 50 microseconds, while the counter resets automatically to accept the next sample. The storage output continuously displays the last count sampled. Provisions have been made for relays, "Nixie" numerical indicators, and printers.

The instrument is in a standard rack mount and has a maximum counting rate of 100 KC, with a 5 V input signal. A 40-volt, 2 microsecond transfer pulse is required for sampling. This storage readout feature will find application in machine and nuclear reactor control, automation, and telemetering.

Circle 183 on Reader Service Card

Multi-stylus graphic recorder



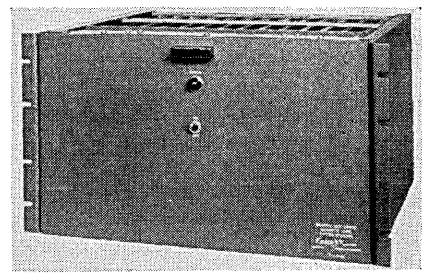
HOGAN LABORATORIES, INC., 155 Perry St., New York City 14, has announced a new 450-trace quick-look direct instrument recorder for use with digital data reduction, telemetry output recording, spectrum analysis work, and general off-on event displays.

Using low-cost, wide dynamic-range electrolytic Faxpaper, the multi-channel RX-48 produces 450 immediately - visable, black - on - white .015" traces across 14" of a 15"sheet, which advances at one of ten discrete speeds up to 12" per second.

The unit has a 400' continuous roll chart capacity which lasts about 6 months of operating time at maximum chart feed. Convenient record duplicates can be produced on standard drafting room copying machines.

Circle 184 on Reader Service Card

Magnetic core storage unit



EPSCO, INC., Components Div., 108 Cummington St., Boston 15, Mass., has developed and is now marketing a magnetic core buffer storage unit, Model CB-602/1000, that has a total storage capacity of 1000 bits of information. Construction is modular; assemblies of lesser storage capacity are available.

Due to the use of magnetic storage elements (shift registers), power is consumed only during the time of read-in and read-out commands. Storage is retained indefinitely, even in power failure.

Shift registers may be connected in various groups to achieve a total static capacity of 1000 bits, or in various combinations for special input and output capacities, e.g., up to 25 series words of 40 parallel bits; 50 series words of 20 parallel bits.

Circle 185 on Reader Service Card

D-C amplifier

DYNAMICS INSTRUMENTATION CO., 118 Mission St., S. Pasadena, Calif., has announced a d-c amplifier, the Model 1250, whose specifiications include voltage gain of 1000, 2 microvolt zero stability, and 100 K input impedance. Loss of data resulting from unexpected overscale input signals is avoided by a signal compression feature; low noise level of 3 microvolts rms for 30 kc bandwidth is achieved by the low-noise circuit.

Circle 186 on Reader Service Card

DATAMATION book capsules

THE PRIMER TO THE AUTOMATIC OFFICE, by William Eustis, with three contributors, 1957, Automation Management, Inc., Westboro, Mass., 93 pp., bibliographical references, paperbound, $7.50.

This book is based on an original work by seven Harvard graduate students, "The Automatic Office," written in 1952. A comparison of the two books clearly demonstrates the evolution of computer application to business and industry. Where the first book concerned itself primarily with large computers, "A Primer to the Automatic Office" covers more extensively the area of integrated systems or automation.

The author says in his introduction, "This book is concerned with all of the tools available to the office for fulfilling its mission. We hope we may show the reader how to select that combination of tools which best suits his particular business needs, and to do so with minimum changes in his established method of operation."

AN INTRODUCTION TO AUTOMATIC COMPUTERS, by Ned Chapin, D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J., 525 pp., illus., $8.75.

This work contains information, from a business point of view, that answers such questions as: "What is an automatic computer? What can it do? How does it function? How is it programmed and operated? How are computer applications prepared? How are they evaluated? How can the need for a computer be pinpointed? How can its use be justified?"

To know whether an automatic computer can be profitably used in your business, the computer's functions, uses, and limitations must be thoroughly understood. This book is intended to convey just such knowledge and to point out how to obtain profitable use of an automatic computer in business situations. Included are comparative data on available models, including costs, definitions of special terms as they are introduced, discussion of major analysis techniques, examples, and many helpful illustrations.

DIGITAL DIFFERENTIAL ANALYZERS (4th Edition, 1957), by George F. Forbes, industrial mathematician, 10117 Bartee Ave., Pacoima, Calif., $5.00.

Every attempt has been made to keep the material in this book as elementary as possible. A knowledge of the usual first course in calculus should suffice for the first part of the book. Much of the material in the latter part deals with somewhat advanced applications. Even here, however, the approach is based on machine capability rather than academic mathematical background.

The author opines that the scientific and engineering potentialities of the digital differential analyzer are not fully appreciated. There is, he says, a considerable lack of papers in the specialized scientific and engineering literature, and adds that much of the actual work done with this machine has not been reported.

For those interested primarily in mathematics, use of the machine has led the author to several novel approaches to mathematical analysis. This is due to the machine being basically a mathematical analogy.

DIGITAL COMPUTER COMPONENTS & CIRCUITS, by R. K. Richards, 1957, D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J., bibliographical references, $10.75.

Here is information engineers need to reduce ideas about arithmetic and logic to a working machine. A reasonable familiarity with electrical and electronic fundamentals is all the background a reader needs to understand the material in this book, although the basic principles of logical functions and mechanized arithmetic, such as Boolean notation and brief discussions of counters and adders, are included.

The author concentrates on digital concepts rather than design details because of the many swift changes in the computer art that almost overnight make some design details obsolete. Many of the topics included represent a wide range of components and circuits of an experimental nature, the basis for selection being generally its proven or potential advantages. Logical functions and digital storage, basic operations to be performed by a digital computer, are discussed at length.

INSTALLING ELECTRONIC DATA PROCESSING SYSTEMS, by Richard G. Canning, 1957, John Wiley & Sons, Inc., 440 Fourth Ave., New York City 16, $16.00.

This book deals with the important, high-cost aspects of installing electronic data processing systems, It covers the significant questions of fitting EDP into the organization, selecting and training EDP personnel, programming, physical installation of the system, and the early phases of operation.

The volume, written in non-technical language, explains the important and expensive factors involved in installing EDP systems, and tells how costs can be controlled effectively, based on actual cases. Studies of a number of companies in dissimilar fields have been systhesized into a single case history.

THE COMPUTING LABORATORY IN THE UNIVERSITY, by Preston C. Hammer, 1957, The University of Wisconsin Press, 811 State St., Madison, Wisc., 256 pp., $6.50

High-speed calculating and machines capable of doing this work have become a part of large modern research and laboratory installations and, with this in mind, the University of Wisconsin held a conference on computing in 1955 drawing together experts on various aspects of this work for discussions.

"The Computing Laboratory in the University" makes these talks available to all persons interested in potentialities of machine computing or in setting up a modern numerical analysis laboratory. Chapters in the book are authored by 31 experts in computing.

The book is divided into several sections, one devoted to general discussion of the place of the laboratory in the university research program; another to applications of computing to specific fields such as weather prediction, astronomical research, and research in such fields as engineering, chemistry, physics, the social sciences, and in industry and governmental enterprises. Sections on personnel, curricula, and organizing, equipping, and financing a lab are also included.

some features of . . .

THE CZECHOSLOVAK RELAY COMPUTER SAPO

by Jan Oblonsky
Prag/CSR

THE purpose of this communication is to present basic information about the Czechoslovak automatic computer *Sapo* (Samocinny Pocitac), a computer of moderate speed designed for reliable and economically-efficient solution of that large class of numerical and logical problems for which the maximum in speed and number of arithmetic operations is not a necessity.

The main effort in its design was devoted to the easy and quick preparation of problems for the machine, and to reliability of results obtained with its aid.

The first task was fulfilled by the choice of a 5-address instruction code.[1] This code, in connection with a number of arithmetical and other operations performed by the operation unit, random-access memory, and an elaborate technique of using prepared normalized subroutines,[2] makes it possible to prepare programs so easily that it does not seem to us necessary or even advantageous to seek for an automatization of the process by a programming machine.

The second task was fulfilled by careful design of error-detecting or error-correcting circuits in the memory and control of the computer, and by triplication of the operation unit. Every operation is performed in three identical but independent units.

The final result of this design is a computer which is absolutely safe against one error in any part of its equipment, and against coincidence of more errors in circuits where the probability of such coincidence was believed to be greater.

The project of the computer is a collective work under the leadership of Antonin Svoboda. The computer is in the process of being assembled and will be in trial operation during next year.

Sapo is a relay computer with magnetic drum memory.[3] The capacity of the memory is 1,024 words of 32 bits. The computer performs arithmetic operations on numbers in the binary system, but input and output in decimal system is also possible. The floating point representation is used in both cases.

The input and output is on the standard punched-card equipment of the firm ARITMA, which was adapted to the computer. The whole machine contains about 8,000 relays and 350 vacuum tubes. All tubes are in the circuits of the magnetic memory unit.

Numbers are coded in semilogarithmic form $\pm x \cdot 2^{\pm p}$, where is 0, $5 \leq x < 1$ and $0 \leq p \leq 31$. There are 24 digits plus one sign for x, and 5 digits plus one sign digit for p, altogther 31 binary digits. The 32nd digit of the word is reserved for the parity-check.

Reprinted, with permission, from *Nachrichtentechnische Fachberichte,* Beihefte der NTZ, Band 4 - 1956/Nachdruk 1957, pp. 73-75.

The instructions are of the 5-address type. Every instruction occupies two consecutive locations in the memory. It consists of 5 addresses, i, j, k, r, s, and two operation symbols, f_1 and f_2. During the operation of the computer, each instruction controls one operation cycle. In one operation cycle, the operation described by the symbol f_1 is performed on words from memory locations i and j and the result is put into the memory location k.

If the result is negative, the next instruction is taken from the memory locations s, $s + 1$; if the result is non-negative, the next instruction is taken from the memory locations r, $r + 1$. The symbol f_2 controls the input and output units of the computer.

The adopted way of writing instructions when a program is prepared is, for example, AA $<i> + <j> \rightarrow <k>$ AB AC, which represents an instruction at memory location AA, $AA + 1$. Add numbers at memory locations i and j, and put the rounded off result into the memory location k. If the result is non-negative, take the next instruction from addresses AB, $AB + 1$; if the result is negative, take the next instruction from addresses AC, $AC + 1$.

The operation unit of the computer is a universal one. It is designed in such a way that the same circuitry, with only little modification, performs all basic arithmetic operations, i.e., addition, multiplication, and division with rounding off or without, binary-decimal and decimal-binary conversion, operations with signs, many non-arithmetic operations on numbers and instructions.

Non-arithmetic operations on numbers include conversion of the exponent to a number, conversion of the sign digit to a number, substitution of a number for an exponent, or a sign digit of another number. Non-arithmetic operations on instructions include conversion of any address in the instruction into a number, addition of a number to any address, and substitution of a number for any address in the instruction.

The operation unit also performs logical operations union, intersection, and complemetation.[4] By highly-economical design of the relay circuitry, it was achieved that the whole unit has only a little more than 2,000 relays. It may be interesting to note that the operation unit was designed originally as a division unit and the other operations were included by modifications of this basic unit. Every operation is performed by the operation unit in 160 msec.

The magnetic memory is formed by a vertical drum with a diameter of 14 cm and length of 16 cm, on the surface of which is wound an ordinary magnetophone plastic tape. The drum is equipped with 32 heads, each with one writing and one reading winding.

The memory works in a quite standard way. The tape is premagnetized in one direction. Zeros are written by a magnetization in the same direction, ones are written by a magnetization in the opposite direction. The neces-

SLOVENSKA

sary change of the direction of the current in the writing windings is performed individually for each winding by one relay. The contacts of these 32 relays connect the individual windings in series to the generator of the writing pulse. The reading winding of each head is connected to an amplifier.

The output circuit of this amplifier is a bi-stable multivibrator which feeds an output relay. From the bank of 32 output relays, the read information is transferred to the proper place in the relay part of the machine after which the multivibrators are reset and new information may be read from the drum.

The exact time of writing or reading is given by the coincidence circuit based on the modified Korobov sequence of zeros and ones.[5] We can form an infinite periodical sequence with the period of 2^n bits with such a property that, if we read n consecutive bits of the sequence, there are exactly 2^n different readings in one period of the sequence.

For example, with $n = 3$, such a sequence is OOOIIIOIOOOIIIOIOOOIIIOI... and the readings are OOO, OOI, OII, III, IIO, IOI, OIO, IOO, altogether all 8 possible different readings. In the computer, the sequence of 1,024 bits is slightly modified in such a way that we do not read 10 adjacent bits, but 10 bits which are 101 bits apart.

The sequence is located on a metal disc rotating with the drum in the form of holes and is read by 10 photocells. These photocells are connected to an electronic coincidence circuit which sends a pulse at the proper time either into the writing pulse generator, or into the reading amplifiers where it opens the gates and initiates the proper action. This organization of the memory eliminates the necessity of synchronization between the revolutions of the drum and the relay part of the machine. It must be assured that the drum rotates above a certain minimum speed.

The control of the computer controls the selection of the operands and instructions from the memory, the operations of the operation units, and writing of results into the memory. Besides these functions, the control checks the functioning of the memory circuits, of the operation units, and of its own circuits. The memory is checked in two ways. Reading is checked by the parity-check. Writing is checked by immediate re-reading and by checking of the read result digit by digit with that originally written.

The whole computer is designed in such a way that each step is allowed to begin only after the previous step has been found to be correct. In the case of an error, there are three possible reactions of the computer. If the error is such that it can be corrected by the corrector circuit without the repetition of the whole operation cycle, the error is corrected and the computer goes on without any loss of time.

The second case occurs when the error cannot be corrected by the corrector circuit. In this case, the whole operation cycle of the computer is automatically repeated and, if the new operation cycle gives the right answer, the computation goes on again.

The third case occurs if there is an error in a repeated operation cycle. This case indicates the probability of a systematic error and, therefore, the computation is automatically stopped. The faulty part may then be repaired and, after that, the computation may proceed without any loss of work already done, since the error-hunting circuits of the computer are designed in such a way that no wrong result is allowed to destroy the original information from which it was gained.

Every error detected by the circuits is automatically printed so that the operator always has up-to-date information about the state of the individual parts of the computer. The speed of the computer results from the instruction code and the way in which the magnetic drum memory is used. In fact, there are 7 readings and 1 writing necessary for the execution of one instruction.

Every communication with the memory needs two drum revolutions, one for the address selection and one for the communication itself. From the period of 1 drum revolution, which is kept below 20 msec, the period of 320 msec for a operation cycle results. This is twice the time needed by the relay circuits of the operation unit. The final speed of the computer is a little more than 10,000 operations in an hour or 3 operations/sec.

The speed of the input and output equipment is adapted to this standard. The whole memory is filled with data from punched cards in about 10 minutes. The same time is necessary for punching the contents of the whole memory into blank cards. The input and output is arranged in such a way that punched results may be directly used either as the input data of another problem to be solved by the computer, or printed by the adapted page-teletype-writer.

Both units, input and output, may be controlled either manually by the operator, or automatically by the computer itself. This feature may be used by proper programming to expand the capacity of the internal memory of the computer to any practical extent.

The utilization of the computer is hoped to be simple and straightforward. After a new problem is received, there are two possibilities: either there is a program from some problem previously solved with different numerical material, or there is no such program.

In the first case, the old program on punched cards may be taken from the stock cards with the new material added, and the whole problem may be solved by the computer with a minimum of intelligent effort.

In the second case, the new program must be constructed; but this also is not a difficult problem, due to subroutines which may be prepared for a large variety of problems occurring.

Although the computer is not yet finished, several programs for solving different kinds of problems both from science and industry have been prepared and the time required for the solution by the computer itself predicted.[1,6] It was found that the time required for problem preparation is in a favorable proportion to the time required by the computer for the solution.

These studies have pointed out that a computation center equipped with an automatic computer like *Sapo* will be able to solve most problems encountered in its work in a time period extending from several hours to several days, this including problems preparation, program design, input, solution by the computer, output, and printing of results. In some cases, it may even be shown that this period does not depend very much upon the period spent in actual computation by the machine.

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(2) Pokorny, Z., "Setting Up Instruction Nets from Prepared Units," Ibid., Vol. 2, 1954, pp. 99-102.

(3) Cerny, V., Marek, J. M., Oblonsky, J., "The Czechoslovak Automatic Computer SAPO," Ibid., Vol. 2, 1954, pp. 11-92.

(4) Cerny, V., "Logical Operation Codes of the Czechoslovak Automatic Computer SAPO," Ibid., Vol. 2, 1954, pp. 93-97.

(5) Svoboda, A., "Application of the Korobov Sequence in Mathematical Machines," Ibid., Vol. 3, 1955, pp. 61-76.

(6) Pokorny, Z., "Instruction Nets for the Transformation of Numbers in the Automatic Computer SAPO," Ibid., Vol. 2, 1954, pp. 103-110.

BENDIX completes 100th G-15 COMPUTER!

BENDIX Computer Div., Los Angeles, Calif., has reached a milestone in the history of the computer industry. The 100th G-15 medium size, general purpose computer rolled off the assembly line the week of January 12th. To mark the centennial machine, all exterior metal fittings were gold-plated.

"In the electronic computer manufacturing business, such a milestone compares with the one-millionth automobile pulled off an assembly line in Detroit," said General Manager Maurice Horrell.

Dr. R. F. Hays accepted the computer for delivery to The Dow Chemical Co., Textile Fibers Department in Lee Hall, Va. It will be used for development of the new fiber Zefran. The 100th computer will be the third G-15 in use in Dow's fiber development operations.

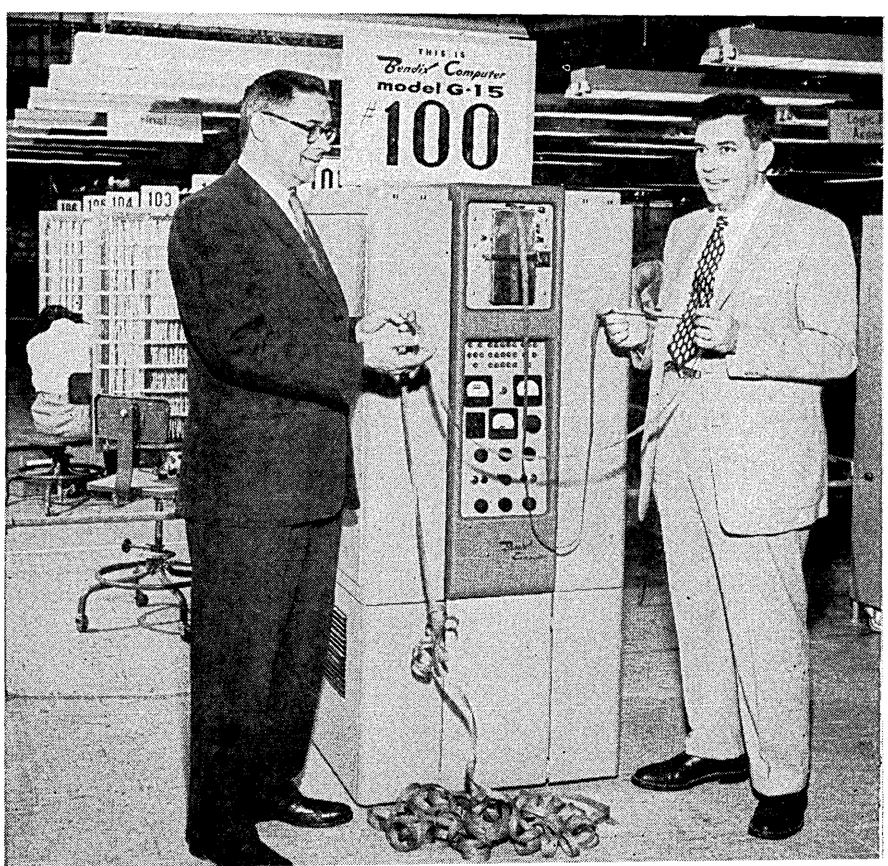
Bendix Aviation Corp, formed the Computer Div. in 1952 for the development and manufacture of commercial computers and their supporting equipment. Original group was 39 employees with rented office space in Hawthorne, California.

The current expansion phase is almost complete with 60,000 sq. ft. in the Los Angeles plant. Regional offices are in Washington, D. C., Chicago, Dallas, and Los Angeles, with a district office in New York.

The production applications for the computer at Dow are data reduction of single fiber and fabric test results. The data is taken off the test equipment and a special analog-to-digital device automatically records it on punched paper tape for processing in the G-15.

The computer is available for the use of all Dow research personnel for special applications. Development is in progress for G-15 process control of actual fiber production. Zefran has been in the research and development stage for more than 7 years. It will be launched in men's, woman's, and children's apparel in the fall of 1958.

Circle 106 on Reader Service Card



R. F. Hays (right) accepts 100th Bendix G-15 computer from M. W. Horrell for delivery to Dow Chemical.

Important dates in DATAMATION

JAN. 20-31, *Course:* "Operations Research — A Short Course," sponsored by Case Institute of Technology, Cleveland, Ohio.

JAN. 22-24, *National Conference on Automation Systems,* theme: "The Place of Automation Systems in Business & Industry," sponsored by EIA (formerly RETMA), Arizona State College, Tempe (Phoenix).

JAN. 27 to FEB. 6, *Course:* "Engineering & Management," sponsored by University of California, Los Angeles.

FEB. 3-4, *ISA Symposium on Progress & Trends in Chemical & Petroleum Instrumentation,* co-sponsored by Wilmington Section and Chemical & Petroleum Div. of ISA, Hotel duPont, Wilmington, Dela.

FEB. 10-14, *Workshop:* "Highway Engineering Applications of Automatic Computers," sponsored by Battelle Memorial Institute, Columbus, O. (For further information, write: J. J. Stone, BMI, 505 King Ave., Columbus.)

FEB. 12-14, *High-Speed Computer Conference,* University of Louisiana, Baton Rouge.

FEB. 17-21, *EDP Course #20:* "Installing an Electro
Data Processing System," sponsored by Canning, Si
& Associates, Sheraton-Blackstone Hotel, Chicago
(For further information, write: CSA, 1140 S. Robe
Blvd., Los Angeles 35, Calif.)

FEB. 20-21, *Conference on Transistor & Solid-Stat
cuits,* sponsored by IRE; University of Pennsylv
Sheraton Hotel, Philadelphia, Pa.

MARCH 3-5, *AMA Electronics Conference & EDP
ment Exhibit,* Statler Hotel, New York City. (F
ther information, write: AMA, 1515 Broadwa
York City 36, N.Y.)

MARCH 29, *Symposium on Recent Advancement
gramming Methods,* sponsored by Central Oh
for Computing Machinery, Ohio State Unive
lumbus, O. (Write: B. L. Schwartz, Battelle
Institute, 505 King Ave., Columbus.)

APRIL 14-18, *EDP Course #10:* "Electronic Da
ing for Business & Industry," sponsored by Ca
son & Associates, Hotel Biltmore, N.Y.C.

APRIL 21 & 22, *Conference on Automation,
Research & Business Planning,* sponsored by
of Chicago Downtown Center, Morrison Hot
Ill. (Write: UoCDC, 19 S. LaSalle St., Chica

APRIL 22-24, *Electronic Components Confer
sored by AIEE, IRE, EIA (formerly R
WCEMA, Ambassador Hotel, Los Angeles,

MAY 6-8, *Western Joint Computer Confere
"Contrasts in Computers,"* sponsored by IR
AIEE, Ambassador Hotel, Los Angeles, Cal

MAY 9, *Symposium on Small Automatic Computers & Input/Output Equipment — A Report from the Manufacturers,* (to be held in conjunction with the WJCC), sponsored by Los Angeles Chapter of ACM, Los Angeles, Calif. (For further information, write: F. Gruenberger, 1700 Main St., Santa Monica, Calif.)

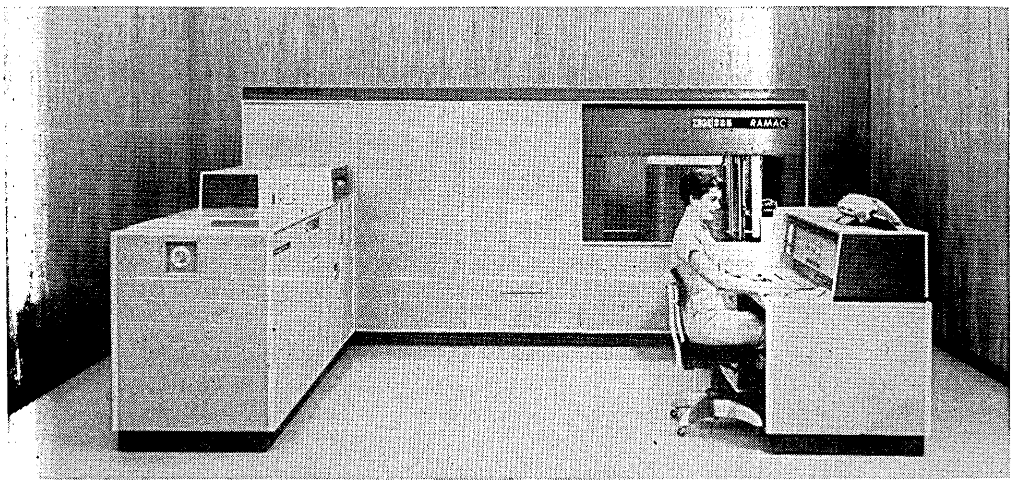
MAY 12-16, *EDP Course #20:* "Installing an Electronic Data Processing System," sponsored by Canning, Sisson & Associates, Hotel Roosevelt, New York City.

JUNE 2-4, *National Telemetering Conference,* sponsored by AIEE, ARS, IAS & ISA, Lord Baltimore Hotel, Baltimore, Md. (For further information, write: W. J. Mayo-Wells, 3830 Beecher St., N.W., Washington, D.C.)

JUNE 2-13, *Course:* "Operations Research in Production & Inventory Control," sponsored by Case Institute of Technology, Cleveland, Ohio. (For further information, write: R. L. Bell, CIT, 10900 Euclid Ave., Cleveland.)

JUNE 9-13, *International Automation Congress & Exposition,* Coliseum, New York City.

IBM RAMACADE TAKES TO THE ROAD



305 RAMAC (Random Access Method of Accounting and Control).

RAMACADE, a nationwide traveling business show featuring IBM electronic office equipment, is off on a 4-month swing across the nation. Originating on the West Coast at Portland, Denver, and San Francisco, the show will make a 10,000-mile tour of 24 cities across the country in 3 specially-equipped 35′ trailer trucks painted blue, gold, and white.

Drivers of the trucks are uniformed in white, and each unit of the show is accompanied by a crew to install and display the equipment.

Stellar attraction of the touring electronic troupe is IBM's *305 Ramac* data processing system, a computer with a memory storage capacity of 5,000,000 characters. The new unit was developed and is manufactured at IBM's new plant at San Jose, Calif.

Other products on display include a new desk-size computer; the *IBM 632* electronic typing calculator which performs as a combination computer-typewriter; a new pocket-sized card punch known as the *Port-A-Punch,* and the *8200* time punch which automatically punches IBM cards during the recording operation.

Ramac (Random access memory accounting and control) makes available to business and industry a record-keeping concept known as continuous or "in-line" accounting. All affected records are adjusted immediately after a transaction occurs rather than having to wait until the group is accumulated for processing.

The *305* will be one of the features of the IBM exhibit at this year's World's Fair in Brussels, Belgium, and was also the winner of an award for outstanding design from the International Design Institute.

The *IBM 632* electronic typing calculator is a $5,600 computer designed primarily for the important business application of invoice and

A 305 magnetic disk.

IBM ramacade 58

order preparation. Simplicity of operation and ease of training operators are two of the most important advantages of the new machine. Typists can operate the new computer with only a few minutes instruction.

The *632* consists of a computer unit with a magnetic core "memory," a 10-key companion keyboard, a program reading device, and an electric typewriter which automatically types out the computed results. The typewriter unit can also be used for general typing purposes.

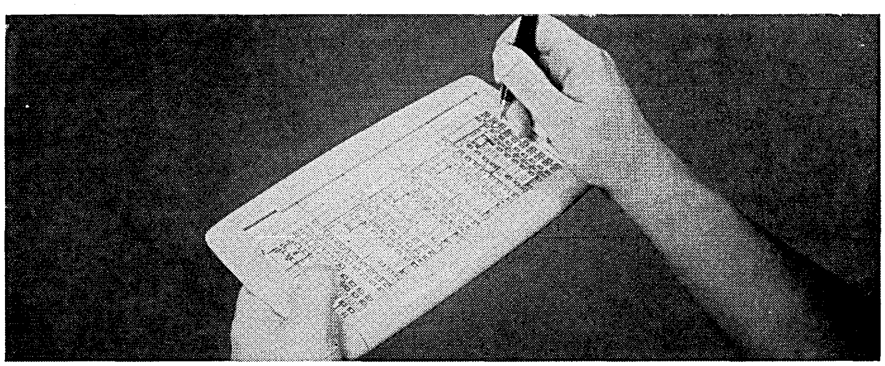
The new *Port-A-Punch* provides an effective and economical solution to most "on-the-job" recording problems. Consisting of a punching board, template, and punching tool, the unit uses pre-scored IBM cards designed to meet individual job requirements. Holes are manually punched in the card document much in the same way that chances are punched out of the familiar "lucky number" type punch boards. After punching, the card is removed from the unit and is ready for machine processing.

Also being demonstrated is IBM's recently-developed *8200* time punch. The *8200* automatically punches employe attendance time or job cost data in IBM cards at the source of these operations, enabling the punched card record to be processed directly by the machine accounting equipment. It is estimated that the unit can save a time clerk as much as 10 hours a week processing the attendance for 1200 employees.

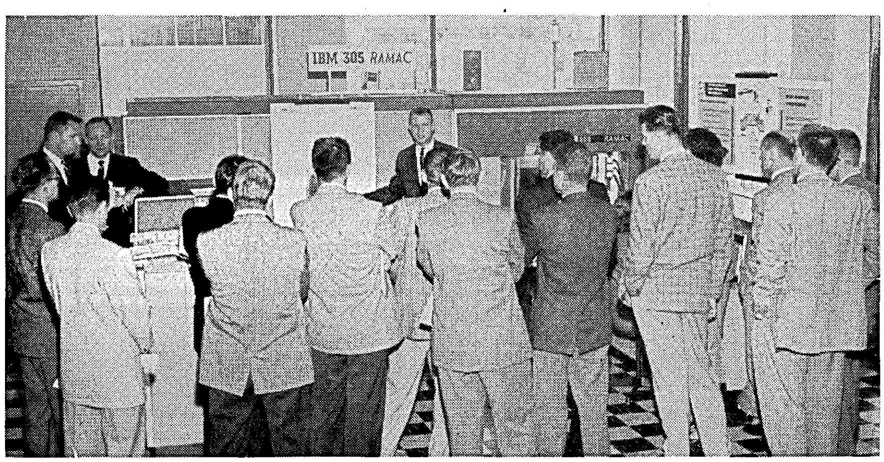
Ramacade's itinerary includes Portland, Denver, San Francisco, Los Angeles, Seattle, Kansas City, San Diego, St. Louis, Oklahoma City, Minneapolis, Washington, D.C., Milwaukee, Dallas, Baltimore, Chicago, Philadelphia, Houston, Detroit, Boston, Cleveland, Atlanta, Buffalo, Pittsburgh, and Cincinnati.

Circle 107 on Reader Service Card

The IBM 632 Electronic Typing Calculator.



Port-A-Punch for on-the-spot recording of info in punched hole form.



L.A. press views the Ramac 305.

MINIATURE/PORTABLE MAGNETIC TAPE RECORDERS

by Eugene Bollay
President & Technical Director
Northram Electronics, Inc.
Altadena, Calif.

PORTABLE magnetic tape recorders are used to record instrumentation data in the field under actual conditions of operation, as opposed to laboratory measurements under idealized conditions. This technique of field recording necessitates use of data recorders which are able to operate under all the extremes of environmental conditions encountered in field usage.

Automatic remote operation, particularly in hazardous or remote locations, is desirable in any portable piece of equipment. Among the various ways in which this can be provided is to build self-contained recorders operating from batteries contained within the unit.

Acceleration, vibration, and impact forces encountered in field handling of any data recording instrument, as well as the ever-present problems of space limitation, weight, signal amplitude, and data recovery, all combine to present a difficult instrumentation data problem.

Northam Electronics, Inc., Altadena, Calif., has solved this problem by developing a line of miniature magnetic tape recorders which will withstand the rugged use and extreme environmental conditions required of portable field instruments and, at the same time, protect the instrumentation information recorded on the tape.

The *MR* series of recorders, one of which is shown in Figure 1, were originally developed for rocket flight testing. Over-all size of the unit is 4″ in diameter by 5″ in length, complete with all accessories including batteries. Total weight is 4½ lbs. with protective armor, and only 2¼ lbs. without armor. Eight information channels are recorded simultaneously on ½″, 1-mil, Mylar-backed magnetic recording tape.

Satisfactory performance is obtained under accelerations up to 500g along the longitudinal axis and 250g transversely. Angular accelerations up to 200 radians/second/second and axial spin rates up to 3000 rpm have no deleterious affect on performance.

Storage temperatures in the range from —40 to 150° F. over a period of one week cause no deterioration of performance. Temperatures up to 700° F. can safely be withstood for periods up to two minutes; however, the operating temperature range is normally limited to 40 to 150° F. in order to assure optimum operation.

All phases of aeronautical flight testing have been successfully recorded using airborne recorders. Ionospheric, stratospheric, and tropospheric studies have been made using balloon-borne instrumentation. A number of uses have been discovered in the petroleum industry. Oil well field exploration crews using recorders in conjunction with microphones and small explosive charges determine underground strata formations.

Potential sources of oil are rapidly and readily located by this means. Oil well drilling operations may take place many thousands of feet below the surface of the earth. Drill bit temperature, pressures, and angular velocities are easily monitored by installing a recorder together with the instrumentation directly on the drill shaft.

Petroleum pipe lines like the "Big Inch" normally handle a variety of products in addition to crude petroleum. Temperatures and pressures along the pipeline vary greatly with the type of product in that particular line segment. Steel plugs called "pigs," containing miniature, self-contained recorders, forced through the pipe line readily record these variations.

Another use is to record flow data at remote points

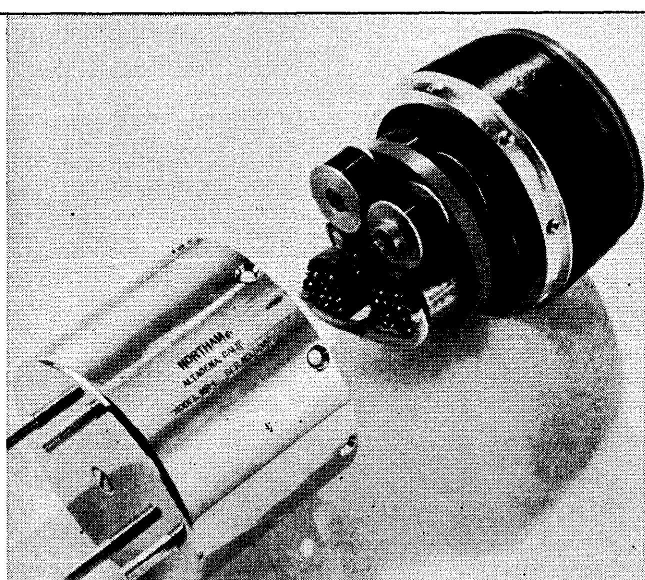


Fig. 1. Model MR-1 magnetic tape recorder.

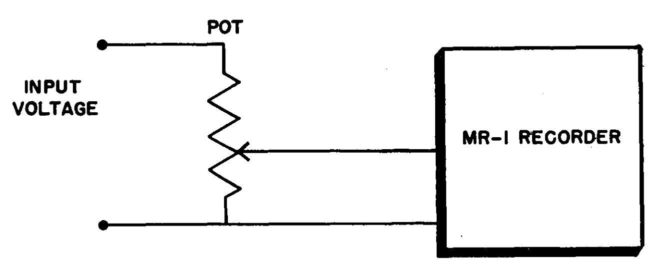


Fig. 2. Typical potentiometer transducer connection.

in the pipe line or during processing operations. Information can be sampled periodically; for example, once an hour. Playback of the tape will then show flow rates over an extended period of time.

Large-scale batch mixing operations like those of the plastics industry, chemical industry, and even in the baking of bread, use mixers or agitators to blend ingredients. Each new type of batch consisting of different ingredients, unless a great deal of care is exercised, may place unduly-severe stresses on the blades of the impeller. To monitor stresses encountered when batch mixes are changed, miniature recorders and associated transducers are mounted directly to shaft or blades of impeller.

Normally, conventional recording techniques are utilized for remote recording systems. Direct recording is used where wideband or high-frequency information is desired; AM, FM, PDM, or PWM modulated systems are used for recording information from DC through low-frequency AC.

A technique has been developed by Northam that permits remote recording to be done with simple accessory equipment. The technique consists of erasing a pre-recorded saturation signal from the tape in proportion to the amplitude of the signal received from the transducer. After being erased, the amplitude of the residual signal is essentially a linear function proportional to the amplitude of the phenomena measured by the transducer.

Carrier frequencies used to pre-record the tape are selected so that they are at least six times the highest frequency to be recorded. An advantage of this system is that signal levels as low as 20 microwatts can be successfully recorded.

Simple data reduction equipment is used because no compensation is required to correct recorded data. Variation of tape speed does not affect calibration. Timing signals or reference traces are recorded on each tape. Reference signals are provided by self-contained transistor oscillators. No external power connections to the recorder or oscillator are required.

Accessory equipment required when using the carrier erase technique is quite simple. All that is required, in addition to the recorder itself, are transducers to generate the electrical signals and, in some cases, preamplifiers for increasing signal strength prior to recording.

Any type of transducer instrumentation can be used with these magnetic tape recorders. In some instances, accessory equipment is necessary in order to modify the signal before it can be recorded. Major types of transducers used are: potentiometers, thermocouples, strain gages, piezoelectric, variable relutance.

The above list is by no means complete; only the major types in common use are listed. Other amplitude or frequency sensitive types could be used. Application of the major types to airborne recording is briefly outlined below.

Potentiometer-type transducers derive sufficient output to operate directly into the recorder signal input. Figure 2 shows a typical connection. Thermocouples, being low-impedance devices, may operate directly into recorders, provided low-impedance recording heads are used to obtain correct impedance-matching characteristics. Figure 3 shows a typical thermocouple circuit.

Strain gages are divided into two general types: bonded and unbonded. Unless additional amplification is provided, bonded strain gages do not deliver sufficient output to operate recorders. In some instances, successful operation may be obtained by operating gages in series-parallel combinations to provide increased output.

Unbonded strain gages derive sufficient output to directly drive recorders, provided the criterion of im-

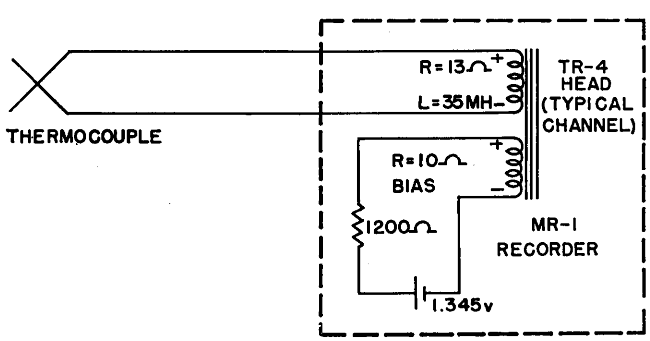


Fig. 3. Typical thermocouple circuit.

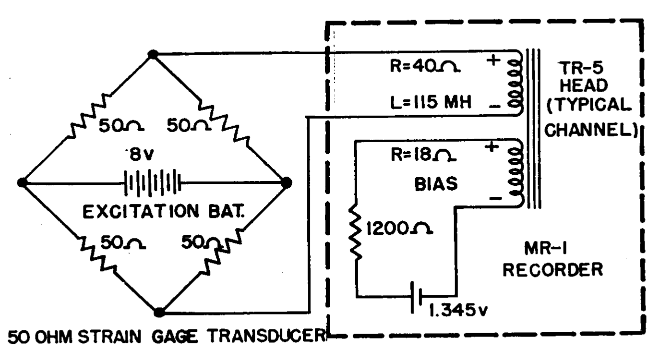


Fig. 4. Typical strain gage circuit.

pedance-matching of the transducer and the recorder head is maintained. Fig. 4 shows typical strain gage circuit.

Piezoelectric transducers invariably require amplification prior to being recorded. Figure 5 shows a typical connection of a crystal transducer to a recorder through an amplifier. Variable reluctance transducers are used where alternating current excitation is available. Today all aircraft and most missiles have 400-cycle power sources which may be used to obtain the necessary excitation. Figure 6 shows a typical diagram of a variable reluctance transducer.

Critical components of any recording system are the recording heads, sometimes called the write head. Sensitivity, noise level, frequency response, and impedance are all factors critically affected by head design. Since magnetic heads are inductive devices, the characteristics vary with frequency, length of air gap, laminations, and coil windings. Spacing between adjacent recording elements of the head affect noise level and cross-talk. Tape speed across the head, and distance of the head from the tape, seriously affect frequency response characteristics.

One critical area where response is impaired is the range in which the wavelength of the frequency being recorded approaches the gap spacing of the head. Other factors affecting frequency response are head alignment with respect to the magnetic tape, biasing voltages, and thickness of the magnetic coating. Figure 7 shows a typical frequency response curve obtained using heads with a 1-mil gap spacing.

Progress in the design of magnetic tape recording systems, more than any other factor, has enabled the art of data recording to advance as rapidly as it has. Continuous data flow is an essential requirement of present data handling systems. Magnetic tape recording meets this requirement.

Multiple-channel recording with as many as 8 data tracks per ½″-tape width is possible today. Multiplexing of these channels makes possible the acquisition of 2, 3, 4, 5, or even more times as many information samples.

As mentioned earlier, the Northam recorder is a self-contained unit. In order to prepare the recorder for remote recording, it is only necessary to pre-record a saturation signal on 7 of the 8 information channels. The eighth channel is used for the timing or reference trace provided by a battery-powered transistor oscillator.

Each data track is calibrated with 10 incremental values of current between zero and saturation. Figure 8 shows typical calibration information, including a timing trace. Saturation level for a given tape will vary with the type of head, tape speed, and frequency. Standard recording speeds of 1⅞, 3¾, 7½, and 15″ per second are available in standard equipment.

Standard playback tape transports and associated equipment are used to prepare the recorded information for analysis. Magnetic playback heads must be compatible with the heads used to record the data.

Conventional data reduction techniques are used with remote recorded tapes. Constant tape speed is provided by the capstan motor drive to hold flutter and wow to a minimum. The method of recording used will dictate the type of amplifiers required: AM, FM, or PDM. Discriminators, demodulators, or other accessory equipment may also be necessary.

Visual readout equipment may be an oscilloscope, strip recorder, or an oscillograph. Oscillographic methods are generally recommended for several reasons. All data tracks as well as the timing track can be viewed simultaneously. Oscillographic paper contains timing marks which aid in determining the time at which various events took place. Calibration marks transcribed to os-

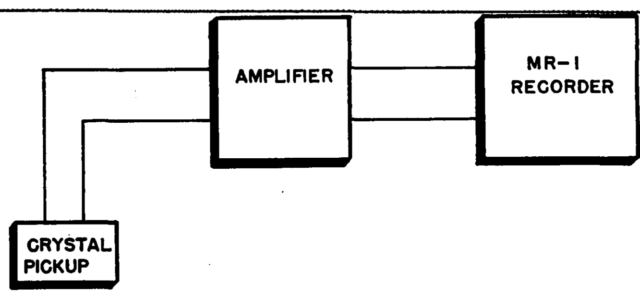


Fig. 5. Typical connection of piezoelectric transducer through amplifier.

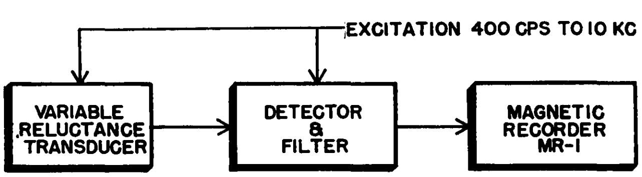


Fig. 6. Typical variable reluctance transducer circuit.

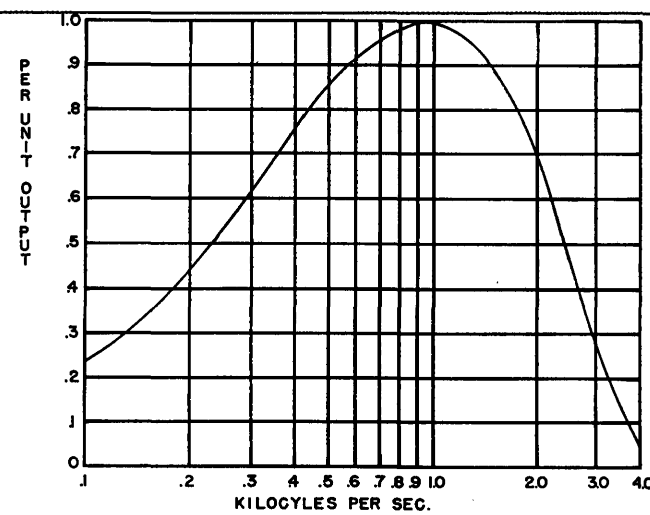


Fig. 7. MR-1 system frequency response with 1-mil gap heads (direct recording only).

cillograph paper simplify measurement of amplitudes.

When thin paper is used, it can be processed directly on ozalid machines, providing any number of inexpensively-reproduced copies together with penciled notations which may have been made. There is no need to re-run the tape to obtain additional copies, with attendant possibilities of becoming damaged, dirty, or broken, with consequent loss of information.

Evaluation of FM recording system accuracy from transducer through recorder to playback and data processing equipment, has consistently yielded results with an average system error of less than 1%. Maximum system error is less than 2% for quasi-static data and with wow and flutter compensation in the playback system.

AM recording systems using the erasure technique described, yield results with a maximum error of 5%. This higher value is due to the increased noise in the system, but is somewhat offset by the much simpler circuitry involved. Comparison to test data obtained by other methods reveals similar results. While such a comparison is not a measure of accuracy as such, because neither method can be considered as a standard, the results are of interest.

Noise in a system is important as a determinant of accuracy. Since low noise level and wide bandwidth or high-frequency response are basically incompatible, some compromise must generally be made in order to obtain desired results.

Noise level of Northam FM remote recording systems have an RMS value of less than 1.5% when used with a filter that effectively eliminates noise above six cycles per second. AM systems made by Northam have a 5% peak noise level over the range from zero to 250 cycles. In both cases, compromises have been made to obtain a usable bandwidth with the degree of accuracy required.

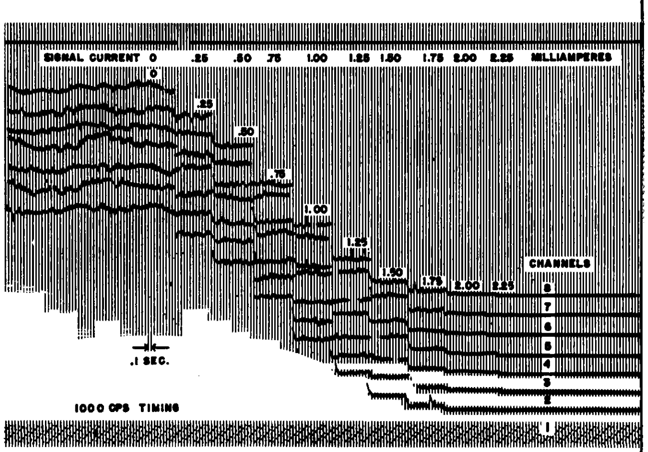
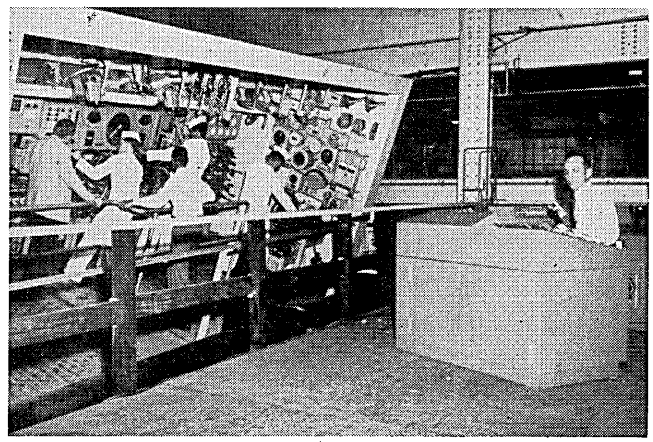


Fig. 8. MR-1 recorder typical calibration curves.

Computer-run Submarine Simulator provides new Dockside Training

WITH the application of nuclear energy, Navy submarines have become even faster and more difficult to handle than before. To help cope with this problem, and give new sailors the best possible dockside training, the Electric Boat Div. of General Dynamics Corp. built an electronic training device called the *Universal Submarine Simulator* from engineering specifications provided by the Naval Training Device Center.



Signals are fed to oscillograph through amplifiers from ancillary computers and from analog computer.

The trainer, now installed at the U. S. Submarine Base at Groton, Conn., is run by a roomful of electronic computers which act as its engine room, diving planes, ballast system, and ocean. During the conceptual phases of planning, General Dynamics engineers decided that some means of accurately evaluating the progress of student crews would be needed, something more accurate than visual observation by an instructor. For example, a method was needed to compare certain elements of a dive, as performed by a student crew, to the same elements performed by an experienced crew.

This had to be a means of instantly and permanently recording the reactions of the student crew during the dive, a record which could be comparative without interpolation. To satisfy these requirements, a direct-writing 6-channel oscillograph manufactured by Brush Instruments Div. of Clevite Corp. was selected. Signals are fed to the oscillograph through Brush amplifiers from ancillary computers and the analog computer.

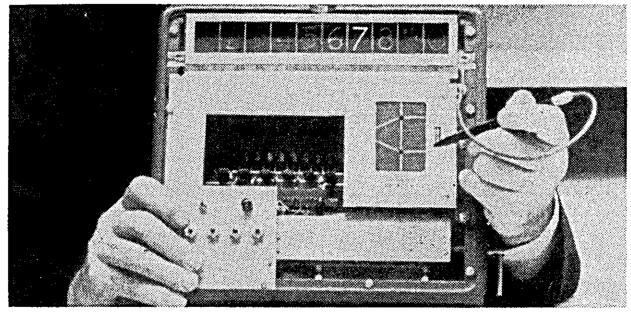
At the direction of an instructor, the *Simulator* dives, turns, climbs, runs into rough weather, fires torpedoes, develops leaks or engine failure. Steering and diving controls, switches and lights, operated by students and instructors, feed signals into the simulator's computers which figure out what a submarine would do under the circumstances. By adjustment of its computer system, the simulator can be made to duplicate control characteristics of all the various types of submarines now in action, plus those still on drawing boards.

EXPERIMENTAL DEVICE reads handwritten numerals

AN experimental device the size of a portable typewriter that can read handwritten numerals or identify numerals as they are being written was demonstrated at the recent Eastern Joint Computer Conference. Invented by Tom L. Dimond of Bell Telephone Laboratories' System Engineering Dept., the machine may become a valuable addition to telephone offices. It could be important in any situation where it is necessary to write and identify large quantities of numerals.

The machine recognizes numbers as they are being written and indicates the numeral by lighting up the correct digit on a numbered panel. The writing is done with a metal stylus on a specially-prepared writing surface. Two dots, one above the other, are used as reference points. Seven sensitized lines extend radially from these two dots. Numerals are recognized by the machine, depending on which lines are crossed. To clear the device, the writer touches the stylus to a special plate which causes the previous number to be "erased."

To recognize previously-written numerals, such as those on a long distance ticket, it is necessary to write with a pencil containing a conductive lead. The ticket is then inserted in the machine into a special slot under a plate that has seven sensitized lines. The machine then uses the same principle for recognizing numbers already written as it does for the ones written on the machine with the stylus. It determines which sensitized lines have been crossed, and indicates the proper number by illuminating a numeral on a lucite panel. This information could be transferred to an accounting machine, computer, or other data processing device.



Experimental machine can recognize numerals as they are written on special writing plate on right; it will also read numbers after they have been written.

new DATAMATION literature

AMPEX DIGITAL TAPE SYSTEM, a 16-page illustrated brochure, describes a new magnetic-tape input/output system for digital computers and related equipment. Manner of achieving buffer-storage reduction, fail-free operation, and transfer rates up to 90,000 characters/sec. is explained. Individual items of equipment are completely illustrated and described. Extensive specifiications are given and alternative equipment choices are compared in tabular presentation. A special magnetic tape for digital use is among the new items introduced. (AMPEX CORP., 934 Charter St., Redwood City, Calif.)

Circle 201 on Reader Service Card

DIGITAL MODULES (16 pp.), Catalog T, provides descripitive information and technical specifications on the new, transistorized T-pac 1-megacycle digital modules. (COMPUTER CONTROLS CO., INC., 92 Broad St., Wellesley 57, Mass.)

Circle 202 on Reader Service Card

PARALLEL-ENTRY NUMERICAL DATA PRINTERS (8 pp.), Brochure No. S-101, describes new stock models of Clary parallel-entry numerical printers for computers, production testing, data reduction systems, weighing applications, laboratory instrumentation, and process control logging systems, and gives complete technical information on 3 read-out machines with 5 decades of input capacity, 8 decades, and 11 decades, respectively, to handle 85% of data printing requirements. (CLARY CORP., 408 Junipero St., San Gabriel, Calif.)

Circle 203 on Reader Service Card

TRANSISTORIZED EQUIPMENT, a 14-page folder-type catalog, covers ERA's complete line of products: transistorized inverters and converters, transistorized high-current power supplies, transistor test equipment, transpac miniaturized power packs, transistor-regulated dc power supplies, transamp package circuits, transistor application power supplies, and price sheet. Technical descriptions, specfications, application notes, and model numbers are included. (ELECTRONIC RESEARCH ASSOCIATES, INC., 67 Factory Pl., Cedar Grove, N. J.)

Circle 204 on Reader Service Card

S-C 5000 TECHNICAL DESCRIPTION (12 pp.), Brochure No. B-103, provides a technical description of the S-C 5000 high-speed electronic printer designed for rapid printing of volume information. The standard S-C 5000 printer output format consists of 4 to 6 lines/in., each line composed of 100 to 150 characters, printed on paper 11″ wide. Untreated paper of virtually any quality may be used. (STROMBERG-CARLSON, Div. of General Dynamics Corp., Marketing Dept., Box 2449, San Diego 12, Calif.)

Circle 205 on Reader Service Card

THE GERBER DERIVIMETER, a 4-page brochure, describes the Gerber derivimeter — a simple, inexpensive, mechanical desk computer designed to read the slope directly from a curve. Featuring a flexible metal strip forced at 5 points to assume the shape of the curve on which the derivative is to be taken, it makes possible the rapid, direct, and accurate reading of the slope or the normal at any point on a given curve. (THE GERBER SCIENTIFIC INSTRUMENT CO., 162 State St., Hartford 3, Conn.)

Circle 206 on Reader Service Card

TYPE EP AUDIOTAPE, a 4-page brochure, describes the physical characteristics, base material, relative strength of base materials, and magnetic properties of standard EP ("extra precision") Audiotape for use in telemetering, electronic computers, and other specialized applications. (AUDIO DEVICES, INC., 444 Madison Ave., New York City 22.)

Circle 207 on Reader Service Card

HOW NOT TO USE TRANSISTORS (4 pp.) cartoons in detail how not to use a transistor. GENERAL TRANSISTOR CORP., 91-27 - 138th Pl., Jamaica, New York.)

Circle 208 on Reader Service Card

AUTOMATION CONTROLS, a new catalog, groups together a wide selection of automatic controls most commonly used in designing automatic systems. Included are such items as counting devices, switches, electric valves, actuators, relays, limit controls, time switches, and a host of accessory equipment which the engineer can use as building blocks in selecting the components for an automated system. (GENERAL CONTROLS CO., 801 Allen Ave., Glendale 1, Calif.)

Circle 209 on Reader Service Card

AVCOM COMPRESSOR-EXPANDER (4 pp.), Bulletin No. 1, describes the Avcom communication compressor-expander that provides a means for the transmission of information either at 1/50th or 1/20th of the time required to record the information. This system can be used for the transmission of voice, digital, teletype, punch card, and all other data, limited only by the upper frequency of the base band width. (AVCO MANUFACTURING CORP., 20 S. Union St., Lawrence, Mass.)

Circle 210 on Reader Service Card

COMPUTER LANGUAGE TRANSLATOR for DATA PROCESSING SYSTEMS (4 pp.), Brochure ZA100, describes the Computer Language Translator, a unit that provides facilities for direct tape-to-tape translation between digital computers, eliminates punched card operations from computer-to-computer translations, and provides for translation between all commonly-used digital computers and related data handling devices. (ELECTRONIC ENGINEERING CO. of CALIF., 1601 E. Chestnut St., Santa Ana, Calif.)

Circle 211 on Reader Service Card

1958 TRANSISTOR DATA CHART, an 8-page brochure, features complete, up-to-date technical specfications and application data for almost 500 transistors now available, and includes over 170 new types introduced during recent months. (KAHLE ENGINEERING CO., 1313 Seventh St., N. Bergen, N. J.)

Circle 212 on Reader Service Card

THE COMPLEAT PROGRAMMER (published monthly), a handbook of programming and coding techniques for the Datatron 205, Datatron 220, and ElectraData 101, is designed to serve as an intimate reference text for both the student and the experienced programmer-coder. Contents include programs, flow charts and coding sheets, even tips on the use of symbols and similar standardized procedures. Readers wishing to add their own programming techniques are supplied with blank forms in the book. (ELECTRODATA, Div., of Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif.)

Circle 213 on Reader Service Card

MAGNETIC TAPE RECORD INTERROGATOR (3 pp.), Spec No. I-UV9157, covers the purpose and functional description of the Digitronics magnetic tape record interrogator designed to eliminate costly computer search operations. (DIGITRONICS CORP., Albertson, N. Y.)

Circle 214 on Reader Service Card

SM GENERATOR & VIEWER (4 pp.), Bulletin No. SM-1, describes the SM symbol generator and viewer that translates coded data into the written word for immediate viewing or to photographs for permanent record. Viewer can be remotely located away from symbol generator. Input is 5-, 6-, or 7-bit coded data, parallel by bits, serial by character. Output is any symbol or character which can be formed on a 5-column 7-row dot matrix. (LABORATORY for ELECTRONICS, INC., 141 Malden St., Boston 18, Mass.)

Circle 215 on Reader Service Card

MANUFACTURING THE GERMANIUM ALLOYED JUNCTION TRANSISTOR, an 8-page illustrated brochure, shows the step-by-step operations in the production of the transistor from raw material to finished product. (GENERAL TRANSISTOR CORP., 91-27 - 138th Pl., Jamaica, N. Y.)

Circle 216 on Reader Service Card

S-100 AUTOMATIC DATA HANDLING & RECORDING SYSTEM for ENGINE TEST FACILITIES (4 pp.), Application Bulletin No. 58-112, describes the S-100 automatic data handling and recording system for engine test facilities. Designed to measure and record sequential information from various points during the test of jet and rocket engines, certain reciprocating engines, and similar applications, the complete system comprises two major subsystems: measurement, and data recording. The system as described and block-diagrammed in the bulletin will measure and process up to 500 test variables at sampling and readout rates to 100/sec. It may be modified to meet particular engine test program requirements. (BJ ELECTRONICS, Borg-Warner Corp., 3300 Newport Blvd., Santa Ana, Calif.)

Circle 217 on Reader Service Card

TAPE RECORD TESTER (2 pp.), Spec. No. RT-UV9157, covers the purpose, functional description, and operation of the Digitronics tape record tester designed to provide a low-cost "good recording" test independent of the computer. (DIGITRONICS CORP., Albertson, N. Y.)

Circle 218 on Reader Service Card

DAYSTROM SYSTEMS TECHNICAL BULLETIN (8 pp.), Bulletin Nos. 103 and 104, cover (1) "Daystrom Operational Information Systems," a concept incorporating a solid-state digital computer with magnetic core memory designed specifically for industrial data processing and 'on stream' computation," and (2) "Daystrom Transistorized Magnetic Core Memory Systems." (DAYSTROM SYSTEMS, DIV. of DAYSTROM, INC., 5640 LaJolla, LaJolla, Calif.)

Circle 219 on Reader Service Card

CLARY DIGITAL RECORDING EQUIPMENT (6 pp.), Brochure No. SA-81, describes the complete line of Clary digital recording equipment including the tape punch, print-punch, scanning printer, printer-perforator combinations, time data printer, printing timer, printing input keyboard, and standard data printer machines. (CLARY CORP., 408 Junipero St., San Gabriel, Calif.)

Circle 220 on Reader Service Card

TYPE 104 (2 pp.), Catalog Sheet No. DT-104, describes the Deltime Type 104 fixed delay line that is available in a wide range of fixed time-delay values and in corresponding lengths. It can be readily incorporated in an electronic assembly even where the space factor is paramount. While the standard construction is that of a straight tubular unit, it may be bent or folded if desired to fit the mechanical requirements of the application. (DELTIME, INC., 608 Fayette Ave., Mamoroneck, N. Y.)

Circle 221 on Reader Service Card

Electronic Tub File (3 pp.), Spec No. TF-GEN-11057, covers the purpose, general description, typical operation (in an order-filling application), and operating time of the Dykor electronic tub file designed to speed up order handling by replacing punched card tub file. (Digitronics Corp., Albertson, New York.)

Circle 222 on Reader Service Card

Bendix Computer Application Reports (28 pp.), Report Nos. 1 thru 7, embrace such topics as (1) "Bendix G-15 general purpose computer solves highway earthmoving problem of 230 cross sections in 45 minutes at a total cost of $38.80," (2) "Typical industrial situation is resolved using the Bendix G-15D at a cost saving of 900%," (3) "McCulloch Motors Corp. saves 2899 engineering man-hours on a typical problem with a Bendix Computer," (4) "Fellows Gear Shaper Co. integrates Bendix G-15 into its customer-engineering-manufacturing system," (5) "Time savings of 150:1 realized in design of complex cams with a Bendix Computer," (6) "On- line data reduction at M.I.T. Naval Supersonic Lab," and (7) "Bendix G-15s go to sea on the USS Compass Island — forerunner of ballistic-missile launching fleet." (Bendix Computer Div., Bendix Aviation Corp., 5630 Arbor Vitae St., Los Angeles 45, California.)

Circle 223 on Reader Service Card

Series 1200 Data Logger, a new catalog, describes Fischer & Porter's Series 1200 data logger that features "building-block" construction and flexible pinboard programming (Fischer & Porter Co., 464 Jacksonville Rd., Hatboro, Pa.)

Circle 224 on Reader Service Card

HD File Drum (4 pp.), Bulletin No. HD-1T, describes the HD file drum unit, a bulk storage device for use with data processing or computer systems, designed and built by Laboratory for Electronics, Inc. The unit consists of a file drum, driving and lubrication system, track-selection mercury relay matrix, linear readout preamplifier, and final writing amplifier. Random access time to any data is 180 milli-seconds (average). As storage requirements increase, additional file drums may be added without increasing the electronics. (Laboratory for Electronics, Inc., 141 Malden St., Boston 18, Mass.)

Circle 225 on Reader Service Card

Sanborn 150 Oscillographic Recording Systems, Accessories & Unit Instruments, a 16-page catalog, contains descriptions, specifications, and prices of all Sanborn 150 oscillographic recording systems and the full line of "150" accessories and unit instruments. Equipment described includes the 1-, 2-, 4-, 6-, and 8-channel systems; the 11 interchangeable, plug-in preamplifiers used in these systems; Model 150-3100 triplexer; portable "150" systems; and systems for analog computer readout, including the 2- to 8-channel "150" style and the new, compact 6- and 8-channel mobile consoles. (Sanborn Co., Industrial Div., 175 Wyman St., Waltham 54, Mass.)

Circle 226 on Reader Service Card

Circle 6 on Reader Service Card

Ramo-Wooldridge develops NEW MEMORY UNIT

LOW-temperature physics research work being conducted by The Ramo-Wooldridge Corp., Los Angeles, Calif., has resulted in the development of a very-high-speed computer memory element which makes use of low-temperature conductivity principles to achieve both storage of information and instantaneous switching.

The newly-developed device, called a *Persistor,* is a miniature bi-metallic printed circuit which operates at a temperature within a few degrees of absolute zero (—459.6° F). It requires very little power for operation, and has been designed with switching time as short as 10 milli-microseconds.

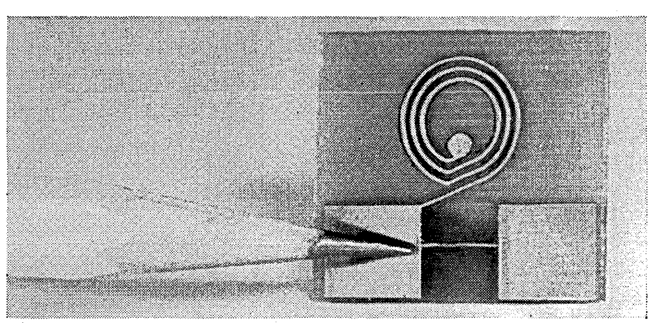
Developed in the Ramo-Wooldridge Aeronautical Research Laboratory headed by Dr. M. W. Clauser, the *Persistor* was invented by Dr. E. C. Crittenden, Jr.; research on the project was carried out by Dr. Crittenden and Dr. F. W. Schmidlin.

The new unit makes use of the superconductivity phenomenon exhibited by various metals at low temperature in order to achieve both the switching and signal storage functions required of a computer memory element. Essentially, the unit is a loop composed of segments of two metals, both of which are maintained in a superconductive state at a very low temperature.

One segment of the loop is of a metal so chosen that the passage of a small current (the critical amount depending on its temperature) through it causes it to change from its superconductive to its normal resistance state. A subcritical current is induced in this loop and continuously circulates around it for an indefinitely-long period, the direction of this current representing the information being stored.

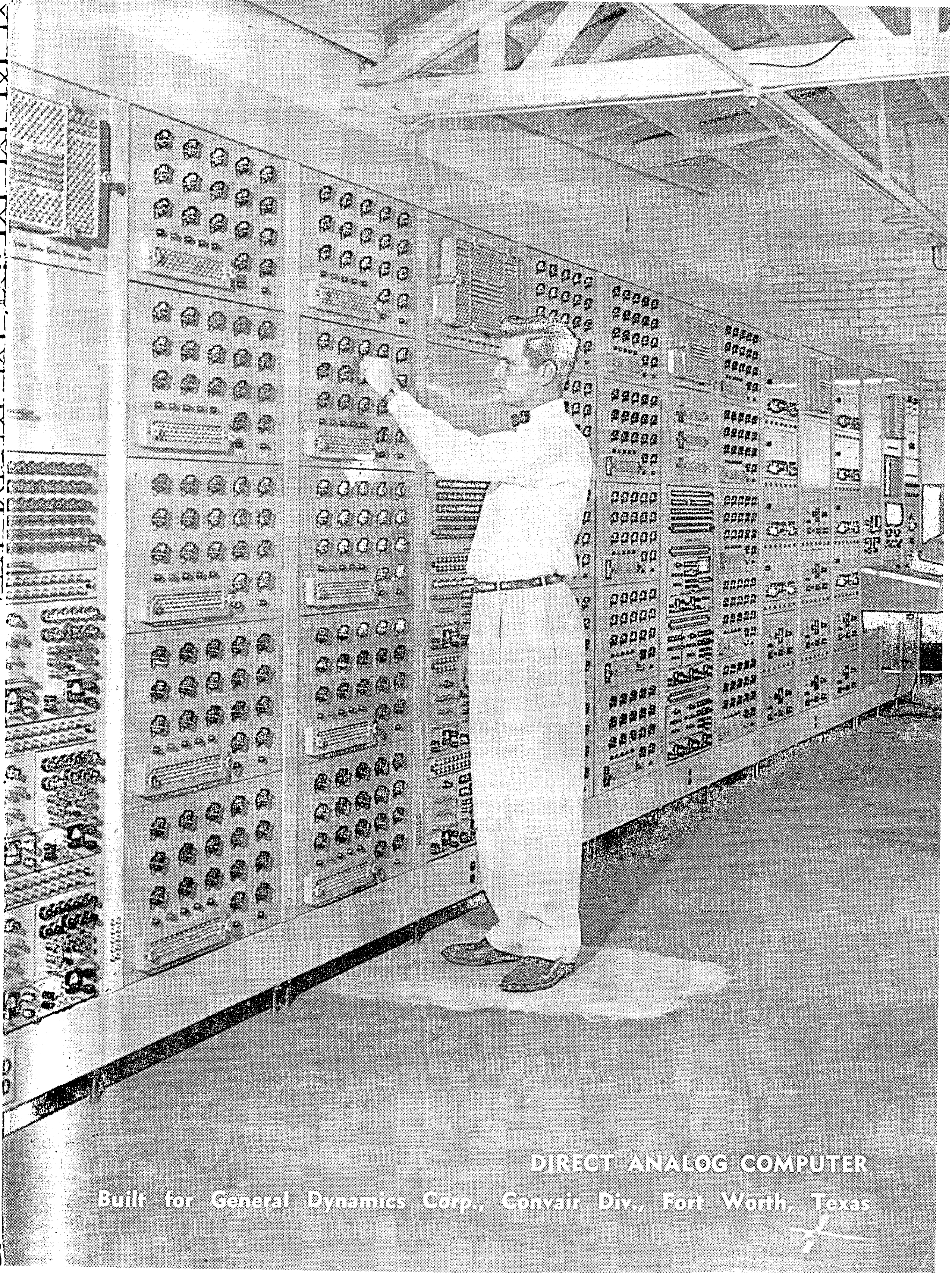
Direction of current in the loop is determined at any time by impressing an interrogating current pulse on the loop. Direction of current in unit is clearly indicated by presence of a voltage pulse upon interrogation.

"Maintaining the low temperatures required for *Persistor* operation offers no obstacle to their immediate use in computers," Dr. Clauser says. "Recent advances in helium liquefiers make it feasible to maintain low temperatures at a cost which can be considered a negligible part of the cost of operation of a computer."



Super-cold operating temperature of nearly absolute zero (—459.6° F) permits Persistor to carry out computer switching operations in 10 milli-microseconds.

Circle 110 on Reader Service Card



DIRECT ANALOG COMPUTER

Built for General Dynamics Corp., Convair Div., Fort Worth, Texas

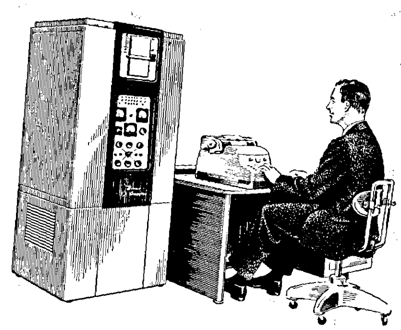
	BENDIX G-15	Computer B	Computer C	Computer D	Computer E
Photoelectric tape reader and tape punch as standard equipment?	yes	no	no	no	no
Punched Card input-output available?	yes	no	yes	no	yes
Auxiliary magnetic-tape storage?	yes	no	yes	no	yes
Operation by self-modifiable internally-stored program?	yes	yes	yes	no	yes
Equipment available for direct input of alphanumeric data?	yes	no	yes	no	yes
Digital differential analyser accessory?	yes	no	no	no	no
Computation proceeds during input and output?	yes	no	no	no	yes
Direct double precision arithmetic with ease of single precision?	yes	no	no	no	no
Arbitrary precision multiplication and division?	yes	no	no	no	no
True minimum access coding?	yes	no	no	no	yes
Block transfer and operation commands for any portion of a channel?	yes	no	no	no	no
Conditional transfer of control after overflow?	yes	no	yes	no	yes
Can break-points be added or removed from commands, at will?	yes	no	no	no	yes
Commands able to operate directly on any memory location?	yes	yes	no	yes	yes

The G-15 and Computers B, C, & D are low-cost machines. Computer E is a leading medium-priced machine.

ONLY THE BENDIX G-15 COMPUTER ANSWERS "YES" TO ALL OF THESE IMPORTANT QUESTIONS

Company after company has asked questions like those above. They've gotten the same decisive answers. Then they have discovered the ease with which the Bendix G-15 General Purpose Digital Computer could be used by their existing staffs, with only brief training...the low initial and operating costs on both purchase and lease plans...and the complete after-sales support for which Bendix is so famous. Aware that today's tough competitive markets will not permit indulgence in inadequate, inefficient, or unjustifiably expensive equipment, these companies have moved quickly. They are our customers.

We're proud of our computer customer list, which bears the names of firms large and small throughout the world. A set of reports on some of their typical applications is available, as well as complete technical data. If you have a specific problem in mind, tell us about that, too. Write to Bendix Computer, Dept. E-1, Los Angeles 45.



Bendix Computer DIVISION OF BENDIX AVIATION CORPORATION

Circle 8 on Reader Service Card