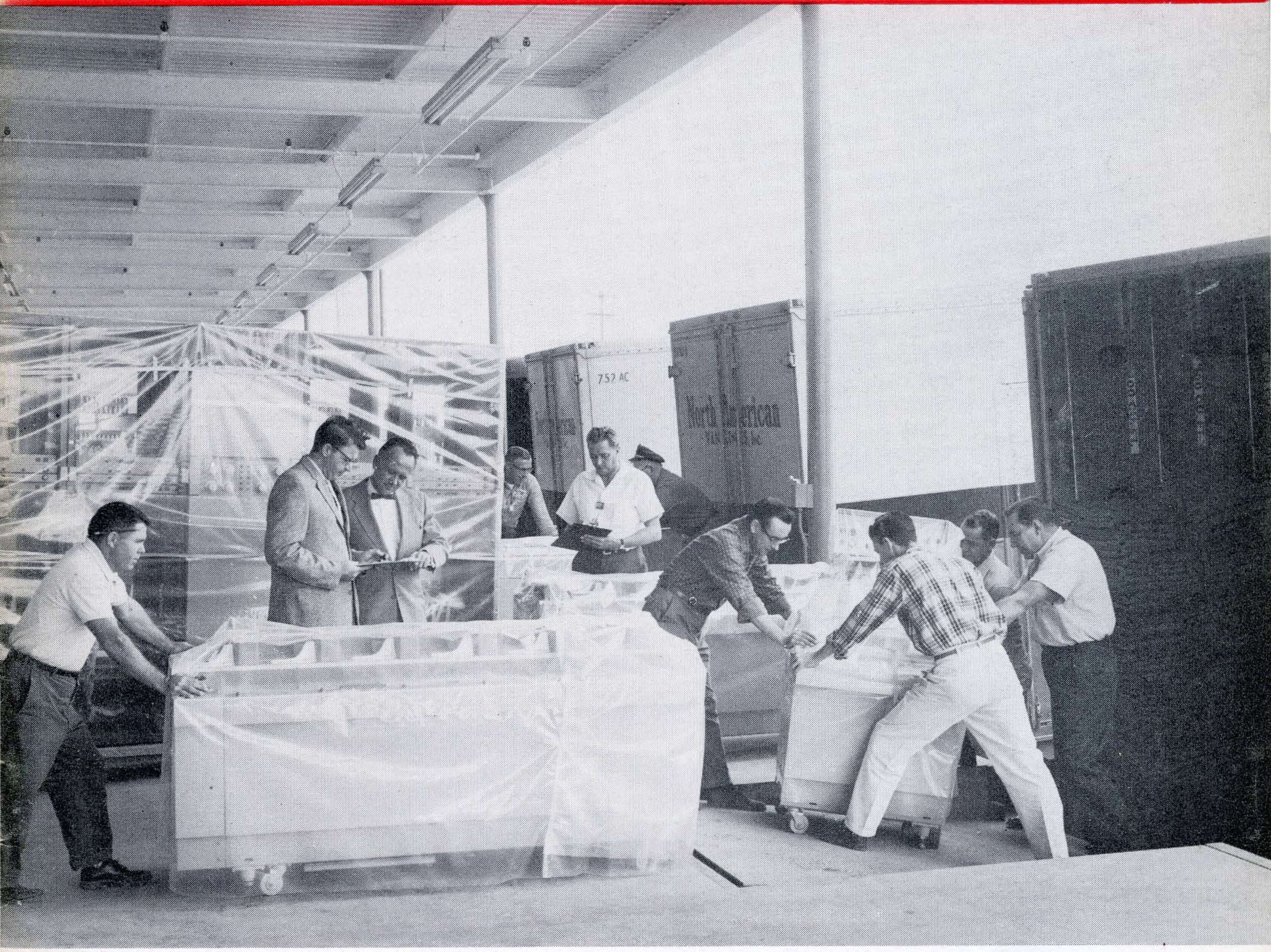
COMPUTERS
and AUTOMATION

DATA PROCESSING • CYBERNETICS • ROBOTS



A Common Language to Program Computers for Business Problems

Over 300 Areas of Application of Computers

Survey of Commercial Computers

JANUARY
1960
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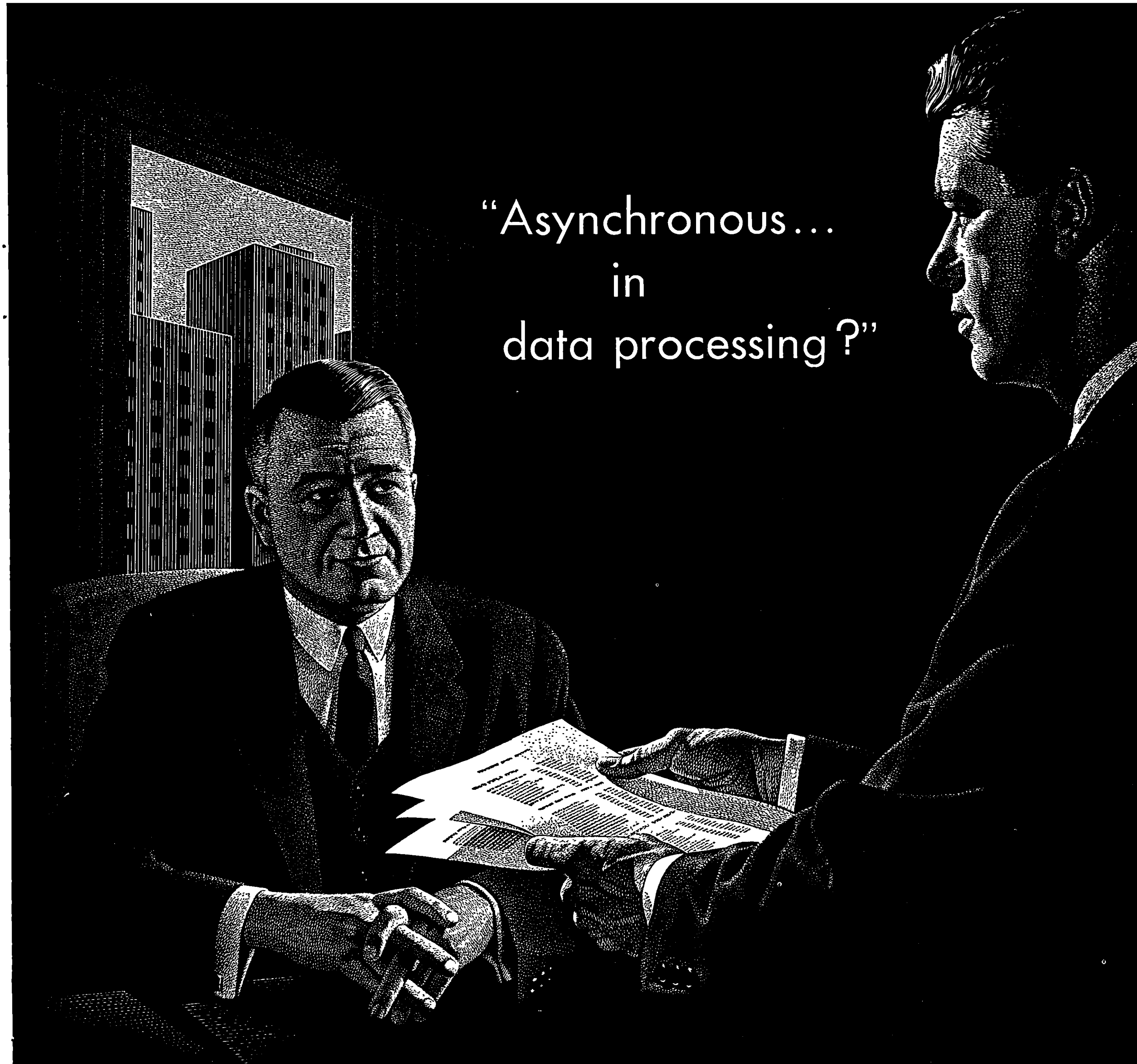
VOL. 9 - NO. 1



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COMPUTERS

and AUTOMATION

DATA PROCESSING • CYBERNETICS • ROBOTS

Volume 9
Number 1

JANUARY, 1960

Established
September 1951

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- Roster of Consulting Services (June 1959)
- Roster of Computing Services (June 1959)
- Survey of Computing Services (July 1958)

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- Survey of Special Purpose Digital Computers (Sept. 1958)
- Survey of Commercial Computers (Jan., Feb. 1960)
- Computer Census (May 1958)
- Types of Automatic Computing Machinery (Nov. 1958)

Products and Services in the Computer Field:
- Products and Services for Sale or Rent (June 1959)
- Classes of Products and Services (June 1959)
- Types of Components of Automatic Computing Machinery (Nov. 1958)
- Survey of Basic Computer Components (Feb. 1959)

Applications:
- Important Applications of Computers (Oct. 1958, Oct. 1959)
- Novel Applications of Computers (Mar. 1958, Mar. 1959)
- Over 300 Areas of Application of Computers (Jan. 1960)

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- Computer Market Survey (Sept. 1959)
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- Annual Pictorial Reports on the Computer Field (Dec. 1958, Dec. 1959)
- A Pictorial Manual on Computers (Dec. 1957, Jan. 1958) (reprint available)

Words and Terms:
- Glossary of Terms and Expressions in the Computer Field (Oct. 1956, reprint available)

Information and Publications:
- Books and Other Publications (many issues)
- New Patents (many issues)
- Computer Talks (many issues)
- Survey of Recent Articles (many issues)

With the ever-increasing expansion of the field of automatic handling of information, it is easy to predict that more and more reference information of these and other kinds will need to be published; and this we shall do. For it is a fact that reference information of the kind here described is not computable from automatic computing machinery — instead, it comes from collecting observations and reports about the real world. This is our job.

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Readers' and Editor's Forum

FRONT COVER: SIX VANS FULL OF EDP EQUIPMENT

The front cover shows four million dollars worth of electronic digital computing and data processing equipment being loaded into six vans at General Electric, Phoenix, Arizona. The vans have taken the equipment to locations at the Bank of America in California and a U.S. government facility also in California. The equipment is fully transistorized.

SAMPLE OF COMPUTER TRANSLATION CAPACITY

At the Department of Numerical Automation, Birkbeck College, University of London, England (this department is under the direction of Dr. Andrew D. Booth), some work has been done on the machine translation of languages.

Here is what a visitor last summer was told.

"We believe we have solved the basic problems.

"Take a vocabulary of 200 to 300 words, say, in scientific French. Take all the grammar you want, and construct anything you like out of these words — no restriction on the length of the sentence, for example.

"Place it on our MAC (Magnetic drum Automatic Calculator, finished about 1956) using our program of approximately 600 instructions.

"Here is a sample of input and corresponding output:

> L etude des fonctions definies par une equation differentielle, dans tout leur domaine d existence, est un probleme dont la solution complete, dans le cas general, depasse actuellement la puissance de l analyse. On a cependant obtenu des resultats du plus haut interet en se limitant a l etude des integrales infiniment voisines d une integrale connue. H. Poincare a pu demontrer l existence d une infinite de solutions periodiques et de solutions asymptotiques a une solution periodique.
>
> The study of functions defined by a differential equation, in all their domain of existence, is a problem of which the complete solution, in the general case, surpasses at present the power of the analysis. One has meanwhile obtained of results of most high interest in limiting oneself to the study of infinitely neighbouring integrals of a known integral. H. Poincare has been able to demonstrate the existence of an infinity of periodic solutions and of asymptotic solutions to a periodic solution.

"The speed of translation is about 1000 words an hour."

AUTOMATION AND LABOR

(Editorial in the New York Times, October 28, 1959, reprinted with permission)

The recent convention of the Amalgamated Lithographers of America has marked another step forward in the unique efforts of this union to cope with the problems of automation in the interests of its members — which certainly don't conflict with those of the employers and the public. The A.L.A. has long been committed to the theory — proved true in its industry — that technical improvements and more efficient organization mean more business in the long run, with greater income for the employes and expanding employment, in spite of the inevitable job dislocations.

Last year the A. L. A. set up a special committee of union officials which had three objectives: first to get all the information possible — through close contact with equipment manufacturers and employers — as to new machines, materials and methods in the industry; second, to inform the union members of important changes to come; third, to work with the locals — and with employers, too — in dealing with the human problems of change in the most effective and least disturbing way.

After hearing a full report from the committee's chairman, Edward Swayduck, the delegates at this year's convention voted unanimously to establish a permanent department and staff at the union's international headquarters — the first of its kind — to carry on the work in which the committee had pioneered. Commenting on this step Mr. Swayduck said:

"We do not believe in unreasoning opposition to new developments even though particular jobs are affected. The A. L. A. welcomes new equipment and processes which contribute to the growth and success of lithography. * * * We are confident in our capacity to make necessary adjustments to provide the skills needed for continued growth and development of the lithographic industry."

This is sound doctrine. It should be far more widely accepted than it has yet been in the automational revolution of today.

INTELLECTRONICS

Simon Ramo

Thompson-Ramo-Wooldridge Corp.
Los Angeles, Calif.

(Excerpts from an address, "The Impact of Space on Electronics," given at the 5th National Communications Symposium, Utica, N.Y., Oct. 7, 1959)

The science of extending man's Intellect by Electronics — described by the new word, Intellectronics — will become the nation's greatest industry within a decade. The new man-machine partnership in intellectual activities for the world of the future will determine the relative position of nations more than any other single factor. . . .

Space has awakened us to a new appreciation of the impact of science and technology on our way of life. However, electronics and Intellectronics in particular, will be more influential than space exploration for the foreseeable future. This will continue as long as we are largely a surface civilization. It will be more accurately the Intellectronics age than the space age until

[Please turn to page 23]

Computer Talks:

1959 Eastern Joint Computer Conference, Boston, Mass., Dec. 1–3, 1959

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1959 Eastern Joint Computer Conference, Boston, Mass., Dec. 1-3, 1959.

1. Conference Welcome, F. E. Heart, Chairman 1959 EJCC, Lincoln Laboratory.
2. Computers of the Future, R. Rice, IBM.
3. Negative-Resistance Elements As Digital Computer Components, M. H. Lewin, RCA Laboratories.
4. Deposited Magnetic Films as Logic Elements, A. Franck, G. Marette, and B. Parsegyan, Remington Rand Univac.
5. Solid State Microwave High Speed Computers, J. A. Rajchman, RCA Laboratories.
6. The Engineering Design of the STRETCH Computer, E. Bloch, IBM.
7. Design of the LARC System, Part I, J. P. Eckert, J. C. Chu, and A. B. Tonik, Remington Rand Univac; Part II, H. Lukoff, L. M. Spandorfer, and F. F. Lee, Remington Rand Univac.
8. Control and Arithmetic Techniques in a Multi-Programmed Computer, N. Lourie, H. Schrimpf, R. Reach, and W. Kahn, Datamatic Division, Minneapolis-Honeywell Regulator Company.
9. The Virtual Memory in the STRETCH Computer, J. Cocke and H. G. Kolsky, IBM.
10. A Combined Analog-Digital Differential Analyzer, H. K. Skramstad, National Bureau of Standards.
11. The System Organization of MOBIDIC B, S. K. Chao, Sylvania Electric Products.
12. A Universal Computer Capable of Executing an Arbitrary Number of Sub-Programs Simultaneously, J. Holland, University of Michigan.
13. The Multi-Sequence Computer as a Communications Tool, J. N. Ackley, International Electric Corporation.
14. Synthesis of Switching Two Terminals Based on the Theory of G. R. Kirchhoff and O. Veblen, S. Okada, Brooklyn Polytechnic Institute.
15. Applications of Boolean Matrices to the Analysis of Flow Diagrams, R. T. Prosser, Lincoln Laboratory.
16. SIMCOM — The Simulator Compiler, T. Sanborn, Space Technology Laboratories.
17. Techniques and Methods Employed in a Digital Computer Program to Solve General Transient Heat Transfer Problems, D. J. Campbell and Mrs. D. Vollenweider, General Electric.

Group Discussions:

18. Large Signal Equivalents in the Analysis of Circuit Tolerance; Panelists: E. U. Cohler, Sylvania Electric Products; R. J. Domenico, IBM; J. G. Linvill, Stanford University; T. A. Murrell, University of Illinois; R. L. Pritchard, Texas Instrument; W. J. Poppelbaum, University of Illinois.
19. The Role of Computers in the Development of Digital Systems; Panelists: T. H. Crowley, Bell Telephone Laboratories; P. W. Case, IBM; W. Gordon, Datamatic Division, Minneapolis-Honeywell Regulator Company; J. P. Malbrain, Ramo-Wooldridge; A. L. Leiner, National Bureau of Standards.
20. System Aspects of the Utilization of Kilomegacycle Components; Panelists: R. A. Kudlich, AC Spark Plug; M. C. Andrews, IBM; J. P. Eckert, Sperry Rand; S. Frankel, Consultant; D. L. Hogan, Department of Defense; R. E. Meagher, University of Illinois.
21. Judicious Use of Your Computer; Panelists: J. A. Buckland, Shell Oil Company; D. L. Johnson, University of Washington; F. J. Maginniss, General Electric; L. N. McClung, Johns Hopkins University; H. W. Richmond, System Development Corporation; H. Semarne, Douglas Aircraft Company.

---

22. The Automatic Transcription of Machine Shorthand; G. Salton, Harvard University and Sylvania Electric Products.
23. Critical-Path Planning and Scheduling; J. E. Kelley, Jr. and M. R. Walker, Mauchly Associates.
24. The Automatic Digital Computer as an Aid in Medical Diagnosis; C. B. Crumb, Jr., Bendix Systems Division; and C. E. Rupe, M.D., Henry Ford Hospital.
25. An Advanced Magnetic Tape System for Data Processing; R. B. Lawrance, Datamatic Division, Minneapolis-Honeywell Regulator Company.
26. A High Speed, Small Size Magnetic Drum Memory Unit for Ultra Small Digital Computers; R. A. Howard, M. May, G. Miller, and G. Shifrin, Ramo-Wooldridge.
27. Temperature Compensation for a Core Memory; A. Ashley, E. Cohler, and W. S. Humphrey, Sylvania Electric Products.
28. Use of a Computer to Design Character Recognition Logic; R. J. Evey, IBM.
29. A Self Organizing Logical System; R. L. Mattson, Lockheed Missiles and Space Division.
30. Alpha-Numeric Character Recognition Using Local Operations; J. S. Bomba, Bell Telephone Laboratories.
31. Pattern Recognition and Reading by Machine; W. W. Bledsoe and I. Browning, Sandia Corporation.
32. Discussion of Problems in Pattern Recognition; Authors: O. G. Selfridge, Lincoln Laboratory; U. Neisser, Brandeis University; R. Kirsch, Bureau of Standards; M. Minsky, Lincoln Laboratory.
33. Status of Computer Developments in the Soviet Union; Dr. W. H. Ware, The RAND Corporation.

A Common Language To Program Computers For Business Problems

Charles A. Phillips

Director, Data Systems Research Staff
Office of the Ass't Sec'y of Defense
Washington 25, D.C.

(Based on a talk given at the Meeting of the Association for Computing Machinery, Cambridge, Mass., September 1959)

My subject is a project that has been started by defense and industry computer users and equipment manufacturers to develop a common language that can be used to program computers for business problems.

To begin at the beginning, the idea behind this project came out of a meeting of a group of computer people — users, manufacturers, and teachers — at the University of Pennsylvania Computing Center on April 8, 1959.

This group observed the recent development of separate, but remarkably similar, languages for automatic programming, such as FLOWMATIC, COMTRAN, and AIMACO, and concluded that it might be feasible to develop specifications for a problem-oriented but machine-independent common language for business problems following somewhat the pattern of ALGOL (the currently developing international common language for mathematical problems).

The group also concluded that such a project would require energetic sponsorship and that such sponsorship must be completely neutral, so far as manufacturers are concerned, and have a stature and position that would command attention of the manufacturers and encourage participation by most users of automatic data processing equipment. They decided to ask the Department of Defense, as an appropriate agency with a major interest in this field, to sponsor the first meeting to organize the project. They then proceeded to draft an agenda for the first meeting and prepare a list of persons who should be invited to participate.

The Department of Defense was pleased to undertake this project; in fact, we were embarrassed that the idea for such a common language had not had its origin by that time in the Defense Department since we would benefit so greatly from the success of such a project, and at the same time one of the Air Force commands was in the process of developing one of the business languages: AIMACO.

Department of Defense Interests and Costs

Let me tell you something of our computer interests, our costs, and some of our problems.

We presently have installed in the Department of Defense around 225 internally programmed, general-purpose electronic computers with about 175 more systems on order. These figures exclude computers used in weapons systems and weapons systems testing. Most of Defense's 225 systems are on business problems; 85% of these have supply applications. It may be of interest that civilian agencies of the Federal Government have installed about 60 additional systems with approximately 30 more on order.

By the end of 1960 we expect to have about 400 business systems installed — about double the number now in operation. This tremendous growth highlights our growing concern about the cost of these systems. In FY (fiscal year) 1959 our ADP (automatic data processing) rentals for business purposes only, are about 44 million dollars with an additional 40 mlilion for punched card equipment rental. For FY 1960 our ADP rentals are estimated at 85 million dollars with about 35 million for EAM (electric accounting machine) rentals.

While I have no exact figures on the cost of programming, personnel and supplies generally run about equal to rental costs; and programming in the first year of operation accounts for nearly 2/3 of the personnel cost. On this basis, we estimate that our programming costs for business purposes were 15 million dollars or more in FY 1959 and will be about 29 million dollars in FY 1960.

During the past few months we have undertaken some very detailed performance evaluations of a number of our older installations. We find that programming is almost always far behind its anticipated schedule. The time requirements and cost of programming have invariably been seriously underestimated.

In addition to costs, and technical difficulties in programming, we also have serious problems of compatibility. There is developing within some of the technical services and commands a strong support for the idea that all equipment should be identical, at least within a technical service or command. This could be done by standardizing on a given model of a particular manufacturer or by developing military specifications on which various manufacturers would be asked to bid. My office is presently inclined to the view that hardware standardization at this time would be premature; but we cannot deny the seriousness of the compatibility problem and the need for some solution. A common language in which many differing machines could be programmed might provide at least a temporary answer to this problem.

These, then, are some of the reasons why the Department of Defense is vitally interested in developing a standard problem-oriented language which can be used with all types of business computers, and why we are happy to lend our support to this project.

The Meeting in May 1959

Now, let me tell you what our informal organization of users and manufacturers has done to date.

First, we convened a meeting on May 28 and 29, 1959, in the Pentagon with some 40 representatives of manufacturers, consultants and users in attendance. With minor changes, we used the agenda developed by the "idea group" at the University of Pennsylvania together with their list of participants; but we recognized that we would be stepping on lots of toes since there were many persons who are prominent in the automatic programming field who should have been present. We discussed in some detail the need, the feasibility, and the desired characteristics of a Common Business Language (CBL). We found complete agreement for the need — in fact, an urgent need. As to the feasibility, there was general agreement that it **could** be done, but differences in ideas as to how long it would take or how difficult it would be. As to the desired characteristics of the language, there were many views. But we did agree: (1) that it must first of all be open-ended, capable of continuous change and amendment; (2) that it should be problem-oriented and machine-independent; and (3) that it should use simple English or pseudo-English and avoid symbolism as far as possible.

In trying to decide how the program should be conducted, we found such a wide variety of ideas among the 40 who were in attendance that we formed a smaller Steering Committee under the Chairmanship of Joe Cunningham of the Air Force to lay out a course of action. This group recommended the creation of an Executive Committee. I was designated Chairman of this group. The group is composed of: Joe Cunningham, Department of the Air Force; E. J. Albertson, U. S. Steel Corporation; Gregory Dillon, DuPont Company; Mel Grosz, Esso Standard Oil Company; and the Chairmen of the three task groups. Also, we named Dr. Grace M. Hopper of Sperry Rand and Mr. Robert W. Bemer of IBM as technical advisors to the Committee. The Committee is charged with the over-all direction of the program and the monitoring, organizing and coordination of the work of the task groups and subcommittees.

We concluded that the project should be divided into three stages and time-frames, each to be undertaken by a separate Task Group.

First Task

The first task is in the hands of the **Fact-Finding and Short-Range Language Task Group,** which is sometimes referred to as the "P.D.Q. Group" since we established a target date for this group of early September. Joe Wegstein of the Bureau of Standards was named chairman of this group. It was charged with accomplishing a fact-finding study of the strengths and weaknesses of existing automatic business compilers (such as FLOW-MATIC, AIMACO and COMTRAN) and coming up with a composite of these or something else that will work. We recognized that such a short-range product would involve much compromise and might have deficiencies which would be corrected in the later stages. The emphasis, in the case of the short-range committee, was on speed.

Joe Wegstein's group and its various task forces had held up to mid-September a total of 12 working meetings at which they have extensively examined existing compilers and have worked toward the development of a single interim system.

Second Task

The Intermediate-Range Group will pick up where the Short-Range Group leaves off; in effect, they will take the CBL (common business language) package developed by the first group, and begin to modify and refine it within a time-frame ending sometime in 1961. This progression toward the ultimate objective would, or could, result in a language which would be used to define all systems requirements, in a manner and form which would be capable of the same degree of computer application as the previous CBL but which could be used to define properly and completely any system so that such system could be implemented on any equipment with an appropriate compiler. A. E. (Gene) Smith, of the Navy Department, is the Chairman of this Group. It has had an organizational meeting and designated two working groups: a task group on language structures; and a task group on business systems structures. The Intermediate Range Group is proposing to invite wide-spread participation in their work by associate members. Such associate members would provide the Task Forces with the benefit of experience and thinking of people engaged in all aspects of business data processing.

Third Task

The final phase of this project is in the hands of the **Long-Range Group.** It will explore the fundamentals and philosophies of all language users regardless of whether they were designed for use on scientific or business type problems. The objective here will be to develop a language which might supersede both ALGOL in the scientific area and the "CBL" or IBL (intermediate business language) which will result from the work of our first two Groups. The merger of scientific and business languages would represent the ultimate or Universal Computer Language. Recognizing the importance of this Long-Range effort, a special subcommittee consisting of Robert Curry, Vice President and Comptroller of Southern Railway, Howard Engstrom, Vice President of Sperry Rand, and John McPherson, Vice President of IBM, has agreed to nominate a chairman and help him to develop a work plan.

Comments

We believe that this joint effort on the part of manufacturers and users is not contrary to the action of the ACM (Association for Computing Machinery) Committee on Computer Languages. In fact, we hope it will complement their efforts and that we can cooperate very closely in the interchange of ideas and materials.

We have discussed this matter at length with most of the computer manufacturers, and have been assured of their complete support. They recognize that individuality and creativeness can still flourish freely within the framework of effective language standards. Also these manufacturers have agreed to implement the language that will be developed with compilers or processors, so as to translate this CBL into the language of their particular machines.

We are very much encouraged by the number of letters from large commercial and industrial users of computers who have heard of this program. They have written to ask that they be given a chance to participate

[Please turn to page 23]

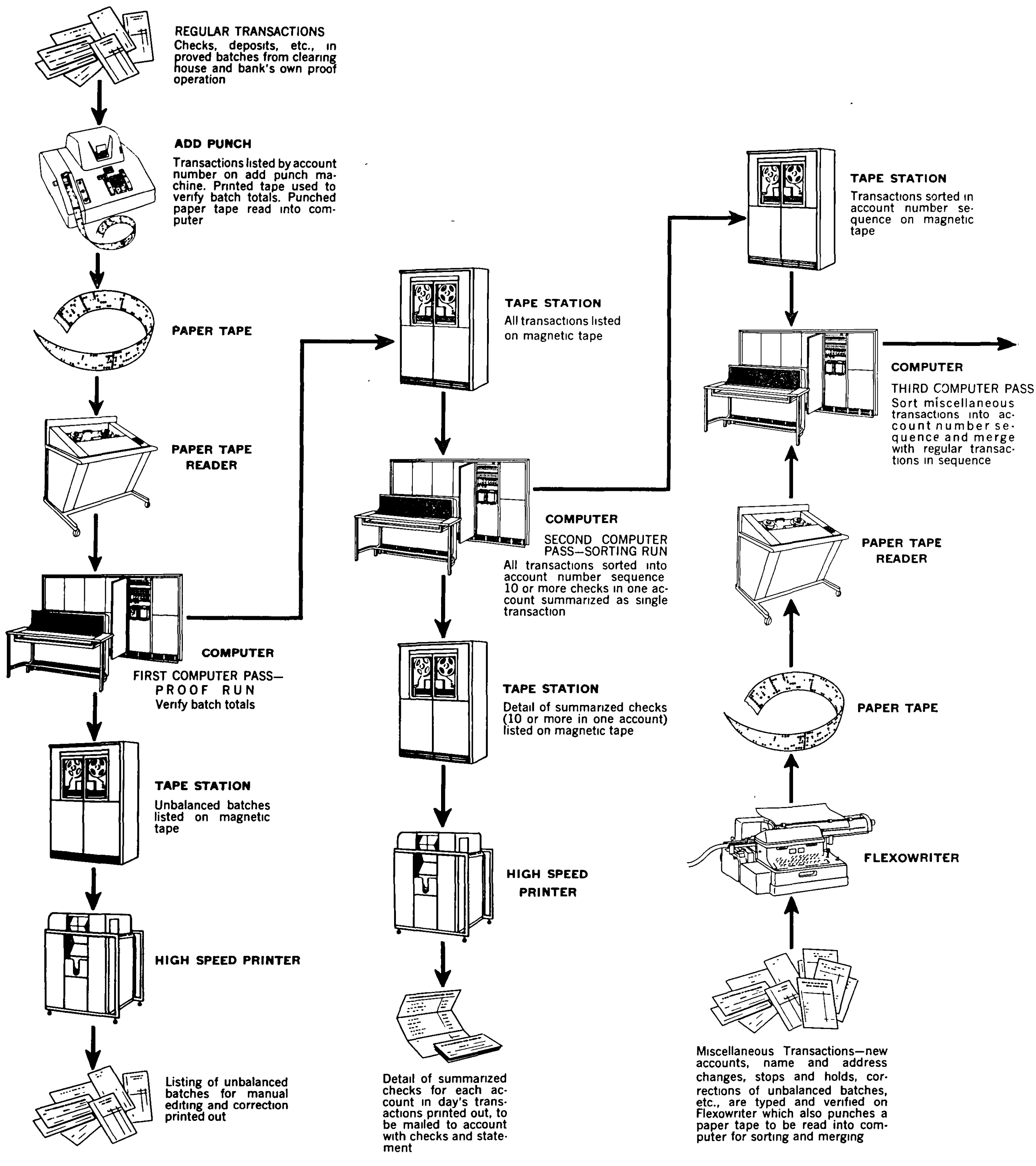
Processing An Average Of 90,000 Check And Deposit Transactions Daily

S. J. Kramer

Radio Corp. of Amer.
Camden, N.J.

Complete demand deposit accounting (the average is 90,000 check and deposit transactions a day) is being processed by the Fidelity Philadelphia Trust Company in a little more than half a shift daily on a medium-sized RCA 501 EDP System.

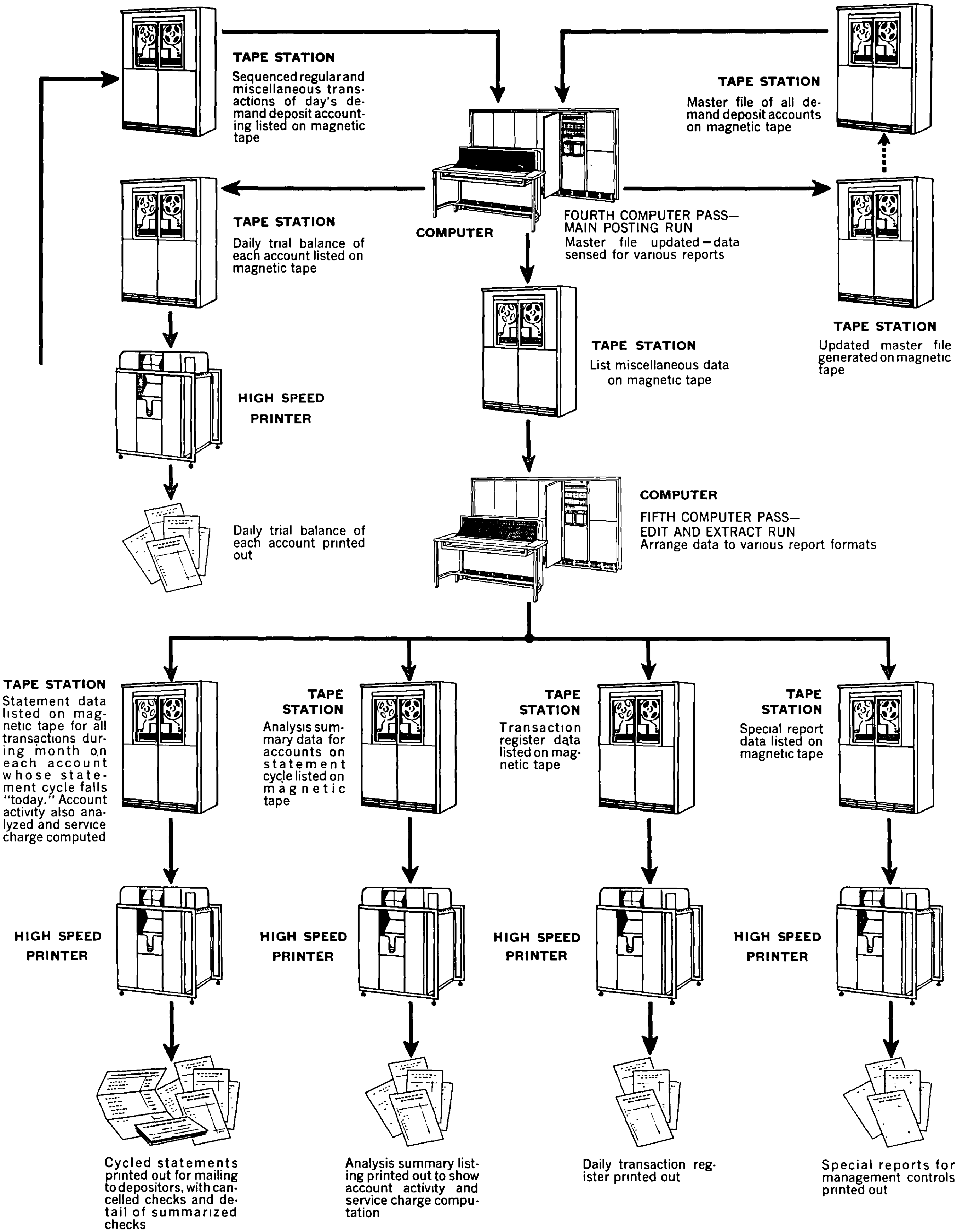
The equipment complement for this operation — all fully transistorized — includes a computer and associated devices (program control, high-speed punched paper tape reader, a single module of high-speed memory storage with 16,384 character locations, control console,



and monitor printer), eight magnetic tape stations, an off-line high-speed printer, and a switching panel which may be used to connect six tape stations with six user devices for off-line operation. (Modular expansibility of the Model 501 permits addition of high-speed memory units up to a total of 262,144 character locations, of magnetic tape stations up to a total of 63, and of as many off-line devices as needed.)

In performing demand deposit accounting, this is what the 501 is doing:

1. The machine updates the master file each day for over 80,000 accounts and prints out at the start of



business each morning a daily trial balance of every account. It lists, by account number sequence for rapid reference: the name of the account, the date of the last transaction, and indication of stops, holds and overdrafts, and the present balance.

2. For the 5% batch of accounts whose statement cycle falls on each day, the machine analyzes the month's account activity, calculates the service charge, and prints a complete statement.
3. The machine can use the "date of last transaction" for trial audit, to increase efficiency in searching out desired data. The computer can jump directly in the master file to the transactions desired for a specific day without hunting through unneeded data.
4. The machine prints reports on overdrafts, stops, and holds. It lists the accounts involved by number, identifies each by name, and indicates in code the situation flagged, the branch office for the account, the old balance, new balance, and average balance, and other pertinent information.
5. The machine generates and prints out a daily transaction register of demand deposit activity, which lists each transaction by account number, identifies by code whether it is a check or deposit, and lists the number of units and the total amount, since some of the transactions may be summaries of ten or more items.

This system does all the bookkeeping and accounting on regular and Special Checking demand deposit accounts as follows:

Beginning with an input of transactions for the clearing house and the bank's proof department on punched paper tape, the first computer pass is the proof run to verify batch totals. Unbalanced batches are printed out for clerical editing and correction.

In the second computer run, all transactions are sorted into account number sequence. If there are ten or more checks for an account, they are summarized into a single transaction, while the separate items are printed out on a list to be attached to the checks and mailed with the statement.

For the third computer run, a punched paper tape of miscellaneous transactions — name and address changes, new accounts, stops, holds, corrections of unbalanced batches, etc. — is merged with the sequenced regular transactions on magnetic tape.

The next computer pass is the main posting run. It updates the master file, generates the daily trial balance tape, which is printed out, and senses the transactions for various reports.

The final computer run edits and extracts the data for the various special reports, and arranges the information for the desired format. It generates a data tape of the month's account activity and computes the service charges for statements for the accounts whose statement cycle falls each day. It also generates the magnetic tapes of data to be printed out for the analysis summany of those accounts receiving statements.

CALENDAR OF COMING EVENTS

Feb. 1-4, 1960: 1st ISA Instrument-Automation Conference and Exhibit of 1960, Rice Hotel and Sam Houston Coliseum, Houston, Tex.

Feb. 2-5, 1960: National Symposium on Machine Translation, University of Calif., Los Angeles, Calif.

Feb. 25-26, 1960: Univac Users Association Semi-Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

March 21-24, 1960: IRE National Convention, Coliseum and Waldorf Astoria Hotel, New York, N.Y.

April 18-19, 1960: Third Annual Conference on Automatic Techniques, Cleveland-Sheraton Hotel, Cleveland, Ohio.

May 2-6, 1960: Western Joint Computer Conference, San Francisco, Calif.

May 9-12, 1960: 2nd ISA Instrument-Automation Conference and Exhibit of 1960, Civic Auditorium and Brooks Hall, San Francisco, Calif.

May 17-18, 1960: Symposium on Superconductive Techniques for Computing Systems, sponsored by Information Systems Branch, Office of Naval Research, at Dept. of Interior Auditorium, Washington, D.C.

May 23-25, 1960: 9th Annual Telemetering Conference (West Coast), sponsored by ISA with ARS, AIEE and ISA cooperating, Miramar Hotel, Santa Barbara, Calif.

June 1-3, 1960: 6th Annual ISA Instrumental Methods of Analysis Symposium, Montreal, Canada

June 22-24, 1960: 1960 National Conference and Business Show, National Machine Accountants Association, Mark Hopkins and Fairmont Hotels, and Calif. Masonic Memorial Temple, San Francisco, Calif.

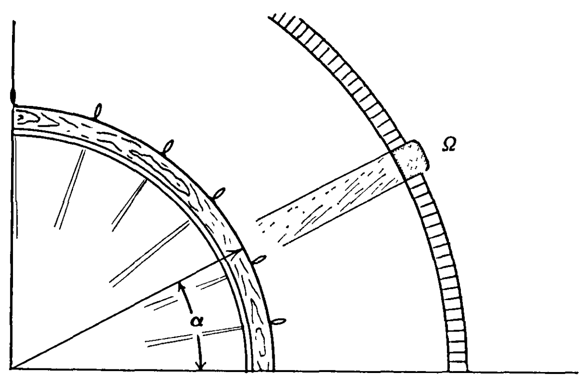
June 25 - July 5, 1960: 1st International Congress for Automatic Control, AACC sponsored, with ISA, ASME, IRE and AICE cooperating, Moscow, U.S.S.R.

August 23-25, 1960: Annual Meeting of the Association for Computing Machinery, Marquette Univ., Milwaukee, Wisc.

Sept. 26-30, 1960: 3rd ISA Instrument-Automation Conference and Exhibit of 1960, and ISA's 15th Annual Meeting, New York Coliseum, New York, N.Y.

Nov. ?, 1960: 13th Annual Conference on Electronic Techniques in Medicine & Biology, sponsored by ISA, with IRE and AIEE cooperating, Washington, D.C.

Computer Art



This motif reflects the measurement and control of angular direction, echoing the ship's steering wheel, and the sliding potentiometer arm.

OVER 300 AREAS OF APPLICATION OF COMPUTERS

Neil Macdonald

Assistant Editor
Computers and Automation

One of the indications of the tremendous growth of the Second Industrial Revolution is the large number of areas of applications for automatic computers. Following is a list of slightly over 310 types of applications — only 15 years after the first automatic digital computer started working, the Harvard IBM Automatic Sequence Controlled Calculator.

The list will undoubtedly lengthen rapidly. We invite additions, clarifications and corrections from our readers.

I. BUSINESS

Banking
- Check processing accounting
- Corporate trust accounting
- Demand deposit accounting
- Factoring accounts processing
- Fund accounting
- Installment loan accounting
- Inter-office record transmission, filing, and recall
- Loan accounting, records, and analysis
- Mortgage loan accounting
- Payroll accounting
- Personal trust accounting
- Real estate loan accounting
- Savings and loan postings
- Savings Club deposit accounting
- Signatures verification
- Stockholder records

Business
- File maintenance
- Filing operations, single and multiple
- Mailing list operations
- Management games
- Management reports using the exception principle, and others
- Management statistics analysis
- Management strategy analysis and simulation
- Overhead cost allocation
- Payroll determination and issuing
- Production scheduling
- Vending machine programming
- Warehousing and stocking records and analysis

Finance
- Bond evaluation
- Dividend calculation
- Equipment trust accounting
- Fund analysis
- Portfolio evaluation
- Stock analysis
- Stock price index computed hourly, etc.
- Stock transfers

Government
- Census analysis
- Election return analysis
- Mail sorting and routing
- Planning
- Simulation of sections of the economy
- Statistical analysis
- Supplies: inventory and control

Insurance
- Agency accounting
- Agents' commission calculations
- Automobile coding
- Dividend formula analysis
- Dividend scale calculations
- Gross premiums calculation
- Group annuity calculations
- Group insurance commissions
- Mortality tables
- Net premiums calculation
- Policy reserves calculation
- Renewal rating calculations

Law
- Crime analysis and prediction
- Laws: analysis and consistency studies
- Traffic violations: recording, accounting, analysis

Libraries
- Abstracting from scientific materials
- Information retrieval
- Records and control

Magazine publishing
- Renewal analysis
- Subscription fulfillment

Manufacturing
- Budgeting and forecasting
- Inventory control
- Labor allocation and distribution
- Materials and parts: requirements, allocation, scheduling, and control
- Machine tools: control for automatic reproduction of complete parts, etc.
- Machine utilization analysis
- Overhead costs: allocation and control
- Process control
- Production load scheduling, forecasting, and control
- Quality control studies
- Repair and maintenance records, scheduling, and control
- Vacation scheduling
- Wage and salary analysis

Oil Industry
- Aerial surveys and exploration: analyses
- Bulk stations: wholesale sales, billing, accounting
- Credit card accounting
- Crude oil: analysis of properties, evaluation
- Depletion accounting
- Economic factors: studies, analysis
- Flow: control
- Fuel deliveries: degree-day accounting
- Gasoline blending
- Heat and material balances
- Inventory: control, forecasts
- Lease and well expenses and investments: records and analysis
- Map construction
- Market research: studies, applications of operations research
- Off-shore installations: studies of design variations
- Oil and gas production: accounting
- Oil field analysis: correlation of data from different drill holes; correlation of data from seismic tests; estimated amount and direction of flow of fluids through porous rocks
- Oil purchase accounting
- Quality control

Refinery and gas plant components: design, operation
Refinery shutdown and maintenance: scheduling calculations
Refinery simulation
Royalty calculations
Secondary recovery: analysis
Seismic data reduction
Well logs: corrections
Wells and fields: prorating analysis

Public Utilities

Billing
Circuits and lines: mileage analysis
Demand forecasting
Electric distribution networks
Equipment: attrition and life expectancy
Gas distribution networks
Natural gas measurement
Pipe line design
Power distribution calculations
Power plants: stability of control
Power production scheduling
Rate determination
Repair calls: dispatching, scheduling
Sag-tension studies
Steam turbine output
Transmission line design and losses
Water reservoir management

Sales

Accounts receivable, posting and rebilling
Advertising effectiveness analysis
Billing and invoicing
Mailing list updating and addressing
Market research: analysis, simulation of consumer decisions, etc.
Price analysis
Sales analysis
Sales area distribution
Transportation optimization

Transportation

Aircraft maintenance scheduling
Air traffic control
Collision warning systems
Elevators: automatic control
Navigating systems
Railroad freight cars: accounting, allocation, distribution, control
Rail traffic control, centralized
Subways: automatic control
Trains: automatic control
Travel reservations

II. SCIENCE and ENGINEERING

Aeronautical Engineering

Aerodynamical formulas: evaluation
Airframe stress analysis
Critical speed problems
Curve fitting
Factor analysis
Flight simulation
Flight test data reduction
Flight training devices
Flutter analysis
Ground controlled approach: programming
Gyroscopic calculations
Heat transfer analysis
Helicopter piloting studies
Navigation training devices
Satellite tracking
Systems evaluation
Theodolite data reduction
Vibration analysis
Wind tunnel data reduction

Biology

Animals: behavior models
Hybrid optimization
Livestock-feed ingredient-mix: optimization
Species characteristics: correlation analysis
Species varieties: automatic classification

Chemical Engineering

Chemical compounds: structure studies
Distillation processes: determination of starting times, etc.
Equilibrium equations: studies
Hydrocarbons: structure analysis
Ion exchange column: performance appraisal
Mass spectrometer analysis
Organic compounds: file searching
Process control
Process simulation
Reaction analysis

Chemistry

Organic compounds: classification
Spectrum analysis

Civil Engineering

Highway Engineering

Cut and fill calculations
Photogrammetric data reduction
Route optimization
Traffic density: pictorial simulation
Traffic simulation
Transformation of coordinates
Traverse adjustment
Traverse closure

Soils Engineering

Freezing and thawing of soils
Pressure distribution in layered media

Electrical Engineering

Antenna design
Cathode tube design
Circuit analysis and design
Component design
Electromagnetic wave propagation in various media
Filter analysis
Generator calculations
Logical networks: design
Motor calculations
Radar echos
Radio interference
Systems evaluation
Transformer design
Transient performance
Traveling wave tube calculations
Triode design

Hydraulic Engineering

Backwater profiles
Compressible and incompressible flow analysis
Flood and flow forecasting
Flood control
Flood frequency analysis
Flood routing
Ground water: flow of
Hydraulic circuits and components: design
Hydraulic network analysis
Hydroelectric dam design
Multi-purpose water reservoir system: management
Pipe stresses
Reservoir aggradation
Shock-wave effect analysis
Surge-tank analysis
Turbine speed regulation
Unit hydrographs: determination
Water hammer analysis
Wave motion analysis
Wind-wave analysis

Linguistics

Concordances: construction
Syntax pattern analysis
Translation from one language to another
Word frequency analysis

Marine Engineering

Compartment pressures in emergency situations
Compartment ventilation calculations
Force analysis of space structures
Form calculations
Fuel rate analysis
Gyroscopic-compasses sea-test: data reduction
Hydrostatic functions
Large ship maneuvering
Plate and angle combinations: calculations
Ship displacement calculations
Ship models: extrapolation of observations
Ship waterline characteristics
Shock isolators

- Turbine reduction gear systems: vibration analysis
- Ullage tables

Mathematics

- Boolean algebra calculations
- Calculus of variations
- Constants, important: evaluation
- Curve fitting
- Difference equations solution
- Differential equations solution
- Differentiating symbolically
- Eigenvalues and eigenvectors: calculations
- Function tables: computation
- Integration of functions
- Linear programming
- Matrix inversion and other calculations
- Maximum likelihood functions
- Numerical base conversion
- Polynomial roots
- Simulation of mathematical equations and solutions
- Simultaneous linear equations
- Stochastic difference equations
- Table computation (evaluation of functions)

Mechanical Engineering

- Air conditioning calculations
- Arch analysis and design
- Building frames for reinforced concrete construction: Hardy Cross analysis
- Cam design
- Critical speeds
- Foundation settling: effects
- Heat flows
- Machine vibration analysis
- Moments of inertia
- Pipe-stress analysis
- Reinforced concrete: bending, stress, etc.
- Rigid frames: moment distribution analysis
- Shell analysis: stress distribution
- Temperature stresses
- Truss analysis: stress and deflections

Medicine

- Anaesthesia control
- Diagnosis of disease

Metallurgy

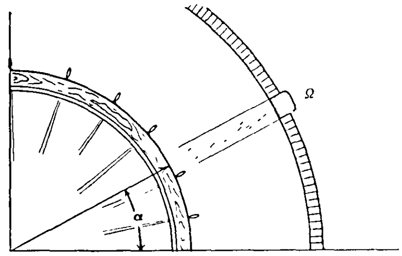
- Alloy calculations
- Crystal structure computations

Meteorology

- Weather forecasting

Military Engineering

- Ballistic trajectories



- Bomb impact analysis
- Fire control
- Missiles: calculations re launching, directing, intercepting, and recovery
- Pursuit and combat control
- Rocket trajectories
- Strategy analysis and optimization

Naval Engineering

- Cavitation studies
- Component attrition rate analysis
- Decompression tables
- Submerged flow: potential patterns

Nuclear Engineering

- Neutron diffraction
- Radioactive fallout analysis and prediction
- Radioactive level calculations
- Reactor design and evaluation
- Reactor simulators

Photography

- Color separation negatives: scanner for automatic production

Physics

- Cosmic radiation: statistical analysis
- Crystallography analysis
- Electron distributions
- Electron trajectories
- Lens coating calculations
- Optical ray tracing and optical system design
- Thermodynamic equations

Statistics

- Analysis of variance
- Correlation
- Factor analysis
- Forecasting
- Least square polynomial fitting
- Moments
- Multiple regression
- Time series analysis and adjustment

MANUSCRIPTS

WE ARE interested in articles, papers, reference information, and discussion relating to computers and automation. To be considered for any particular issue, the manuscript should be in our hands by the first of the preceding month.

ARTICLES: We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it.

Consequently, a writer should seek to explain his subject, and show its context and significance. He should define unfamiliar terms, or use them in a way that makes their meaning unmistakable. He should identify unfamiliar persons with a few words. He should use examples, details, comparisons, analogies, etc., whenever they may help readers to understand a difficult point. He should give data supporting his argument and evidence for his assertions.

We look particularly for articles that explore ideas in the field of computers and automation, and their applications and implications. An article may certainly be controversial if the subject is discussed reasonably. Ordinarily, the length should be 1000 to 3000 words. A suggestion for an article should be submitted to us before too much work is done.

TECHNICAL PAPERS: Many of the foregoing requirements for articles do not necessarily apply to technical papers. Undefined technical terms, unfamiliar assumptions, mathematics, circuit diagrams, etc., may be entirely appropriate. Topics interesting probably to only a few people are acceptable.

REFERENCE INFORMATION: We desire to print or reprint reference information: lists, rosters, abstracts, bibliographies, etc., of use to computer people. We are interested in making arrangements for systematic publication from time to time of such information, with other people besides our own staff. Anyone who would like to take the responsibility for a type of reference information should write us.

NEWS AND DISCUSSION: We desire to print news, brief discussions, arguments, announcements, letters, etc., anything, in fact, if it is not advertising and is likely to be of substantial interest to computer people.

PAYMENTS: In many cases, we make small token payments for articles, if the author wishes to be paid. The rate is ordinarily ½c a word, the maximum is $15, and both depend on length in words, whether printed before, etc.

All suggestions, manuscripts, and inquiries about editorial material should be addressed to: *The Editor,* COMPUTERS *and* AUTOMATION, *815 Washington Street, Newtonville 60, Mass.*

Survey of Commercial Computers
Part I

Neil Macdonald
Assistant Editor
Computers and Automation

Introduction

Recently we mailed out to over 100 organizations (including divisions of organizations) a letter saying that we planned to publish a revised edition of a Survey of Commercial Computers and Data Processors, both analog and digital. (The last edition was published in "Computers and Automation," Nov. 1958.) We enclosed forms asking particularly for certain information. Copies of the forms appear below.

Summaries of the replies, constituting basic descriptions of 52 commercially available analog and digital computers are given in this report.

Nearly all the abbreviations used in these summaries are like those used in a telephone book — contractions of words of such a kind that the words can be easily guessed, especially if the reader refers to the survey form summarized. In particular, "ms" means "millisecond"; "us" means "microsecond" (the "u" suggests Greek "mu" which suggests "micro"). "*C" means "checked by the organization"; "58" means "in 1958", etc.

The editors will be glad to receive additional entries or corrections or revisions for publishing in an early issue.

Commercial Analog Computers

From a comparison of the reports on the twelve analog computers we can make the following statements:

Accuracy varies from 2 to 5 significant figures.
Capacity ranges up to and beyond 1000 variables stored
Adders: maximum reported, 96; more are readily possible
Multipliers: maximum reported, 138; more are readily possible
Integrators: maximum reported, 96; more are readily possible
Arbitrary functions: maximum reported, 50; more are readily possible
In-out methods: practically everything — manual, voltages, plug boards, tape
Automatic checking: nearly always
Operating ratio: characteristically 95% to almost 100%
Sale price: $350 up to $3,000,000.

To understand the individual summaries here given, the reply used in the survey should be examined:

REPLY FORM (may be copied on any piece of paper)

1. Name of Analog Computer: ....
2. Typical field(s) of application: ( )Scientific ( )Business ( )Real-time ( )Not real-time ( )Other (please describe) ....
....
3. Accuracy of numerical information the machine will take in and put out, in number of significant figures: ( )2 ( )3 ( )4 ( )5 ( )Other (please describe) ....
4. Number of physical variables that the machine can store at one time: ....
5. Number of units in the computer for performing mathematical operations (OK to give maximum in largest existing installation):
a. Adders: .... b. Multipliers: ....
c. Integrators: .... d. Arbitrary functions: .... e. Branching operations: ....
f. Other (please explain): ....
6. Programming: a. Automatic programming of new problem when a problem changes? ( )Yes ( )No
b. Typical amount of time needed to change from one program to another: ....
7. Input-Output: a method of giving information or problems to the machine: ....
8. Reliability: a. Automatic checking? ( )Yes ( )No
b. Typical operating percent (good time DIVIDED BY attempted-to-run time): ....%
9. Price range:
a. One sum: between $.......... and $..........
b. Monthly rental: between $.......... and $..........
10. Sales: a. Number sold or rented: ....;
b. Number on order: ....
11. Any remarks? ....
....
....

Filled in by .... Title ....
Organization ....
Address ....
Please return this form when filled in to Neil Macdonald, Assistant Editor, **Computers and Automation,** 815 Washington St., Newtonville 60, Mass.

Roster of Analog Computers

AN/ASN-15 Navigational System / for aircraft problems / ACCUR: 5 signif figures / CAPAC: store 5 variables / ADDERS: 3 / MULT: 0 / INTEGRATORS: 1 / ARBIT FUNCT: 22 / PRGMG CHANGEOVER: 5 min / IN-OUT: manual dial settings / RELIAB: no autom checking; operg ratio, 100% / sale $20,000 to $100,000 / sold or rented, 3; on order, 3 / Waldorf Instrument Co., Wolf Hill Rd., Huntington, N.Y. / *C 58

Computer Systems MC-5800 / scientific, engineering, and other problems / ACCUR: 4 or 5 signif figures / CAPAC: no limit / ADDERS: essentially no limit / MULT: 30 or more / INTEGRATORS: 80 or more / ARBIT FUNCTIONS: many types / IN-

OUT: up to 60 solutions per second / electronic generators of functions of 2 or more variables; real-time, expanded time, or high-speed compressed time; automatic parameter searching by iteration; etc. / Computer Systems, Inc., (formerly Mid-Century Instrumatic Corp.), 611 Broadway, New York 12, N.Y.

Desired Generation Computer / for electric power utilities problems / ACCUR: 2 signif figures / CAPAC: store 1000 variables (actually no limit) / ADDERS: 10 / MULT: 4 / INTEGRATORS: 4 / ARBIT FUNCT: square, square root / PRGMG CHANGEOVER: 1 to 15 min / IN-OUT: AC-voltages / RELIAB: has autom checking; operg ratio 95% / sale $50,000 to $500,000 / sold or rented, 2; on order 7 / Tied into automatic process control directly / Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa. / *C 58

Dian 120 / for scientific problems, both real-time and other / ACCUR: 4 signif figures / ADDERS: 72 / MULT: 64 / INTEGRATORS: 48 / PRGMG: automatic changeover / RELIAB: has autom checking; operg ratio, 99.99% / Dian Labs, Inc., 611 Broadway, N.Y. 12, N.Y. / *C 58

Donner 3100 / scientific; real-time or not / ACCUR: 3 signif figures / CAPAC: store 15 variables / ADDERS: 15 / MULT: 6 / INTEGRATORS: 15 / ARBIT FUNCT: 6 / PRGMG CHANGEOVER: 1 min / RELIAB: has autom checking / sale, $12,000 to $20,000 / Donner Scientific Co., 888 Galindo St., Concord, Calif. / *C 59

Gravity Analogue Computer / for scientific problems and potential field studies / ACCUR: 3 signif figures / CAPAC: store 1 variable / UNITS: optical system, 1 unit / PRGMG CHANGEOVER: 3-5 min / IN-OUT: shaded drawings to scale / RELIAB: no autom checking; operg ratio, 95% / sale $2,000 / sold or rented, 5; on order, 1 / Instrument uses opaque plate with light openings arranged accord to the math of the problem. Problem is presented to instrument as drawing of varying opacity / Seismograph Service Corp., Box 1590, Tulsa, Okla.

EASE (Electronic Analog Simulating Equipment), 1100 Series / scientific; real-time and other (on-line hardware) / ACCUR: 4 signif figures / CAPAC: store 450 variables / ADDERS: 96 / MULT: 138 / INTEGRATORS: 96 / ARBIT FUNCT: 40 / 28 electronic sine generators, 450 coefficient potentiometers / PRGMG: autom changeover, 10 min / IN-OUT: "DO/IT" (Digital Output-Input Translator), patchboard, and paper tape; also direct pushbutton entry / RELIAB: has autom checking; operg ratio 90-95% / sale, $10,000 to $450,000; rental, $500 to $13,500 per mo / sold, 100 / Beckman Instruments, Inc., Berkeley Division, 2200 Wright Ave., Richmond 3, Calif. / *C 59

Electronic Associates 221R / scientific; real-time or not / ACCUR: 4 signif figures / CAPAC: store 20 variables / ADDERS: 27 / MULT: 30 / INTEGRATORS: 18 / ARBIT FUNCT: 30 / Other: resolvers and fixed function generators also avail / PRGMG CHANGEOVER: 10 min / IN-OUT: patch panel / RELIAB: has autom checking; operg ratio, 90% / sale, $16,850 to $120,000 / sold or rented, 15 / a medium-to-large, 0.01%, general purpose analog computer / Electronic Associates, Inc., North Long Branch, N.J. / *C 59

Electronic Associates 231R / scientific; real-time or not / ACCUR: 4 signif figures / CAPAC: store 30 variables / ADDERS: 45 / MULT: 50 / INTEGRATORS: 30 / ARBIT FUNCT: 50 / Other: resolvers and fixed function generators also avail / PRGMG CHANGEOVER: 10 min / IN-OUT: punched paper tape and patch panel / RELIAB: has autom checking; operg ratio, 90% / sale, $20,000 to $250,000 / sold or rented, 150 / a medium-to-large .01% general purpose analog computer / Electronic Associates, Inc., North Long Branch, New Jersey

Electronic Associates TR-10 / scientific; real-time or not real-time / ACCUR: 3 signif figures / CAPAC: store 8 to 12 variables / ADDERS: 12 / MULT: 9 / INTEGRATORS: 10 / ARBIT FUNCT: 9 / Other: resolvers and fixed function generators also avail / PRGMG: no autom changeover; 15 min changeover time / IN-OUT: patch panel / RELIAB: has autom checking; operg ratio, 90% / sale, $3,750 to $10,000 / sold or rented, 10 / a small, transistorized, desk-top, 0.1%, general purpose analog computer / Electronic Associates, Inc., North Long Branch, N.J. / *C 59

Philbrick K2, K3, K5, K7 / scientific, business; real-time or not / ACCUR: 3 signif figures / CAPAC: modular, therefore number of variables a function of size / ADDERS: 50 / MULT: 12 / INTEGRATORS: 80 / ARBIT FUNCT: 10 BRANCHING OPER: 20 / PRGMG CHANGEOVER: Possible in some cases, 5 min to 1 hour / IN-OUT: Decode coefficient and voltage settings / RELIAB: operg ratio, 95% / sale, $350 to $220,000 (typically) / George A. Philbrick Researches, Inc., 285 Columbus Ave., Boston 16, Mass. / *C 59

REAC®: Reeves Electronic Analog Computer / for scientific and process simulation problems; real-time and other / ACCUR: 4 signif figures / ADDERS, MULT, INTEGRATORS, ARBIT FUNCT: no limitations / PRGMG CHANGEOVER: 5 min / IN-OUT: manual, tape / RELIAB: has autom checking; operg ratio, 95% / sale $20,000 to $3,000,000 / Size of installation not limited by any design considerations / Reeves Instrument Corp., Roosevelt Field, Garden City, N.Y. / *C 59

Commercial Digital Computers

From a comparison of the reports on the 40 digital computers (omitting a couple which are of special type), we can make the following statements:

Rapid memory: ranges from 4 registers to about 97,000 registers

Slow memory: (on magnetic tapes) ranges up to about 300 million machine words

Addition speed: ranges from about 1 microsecond to about 1.8 milliseconds

Multiplication speed: from about 4 microseconds to about 160 milliseconds

Division speed: from about 32 microseconds to about 140 milliseconds

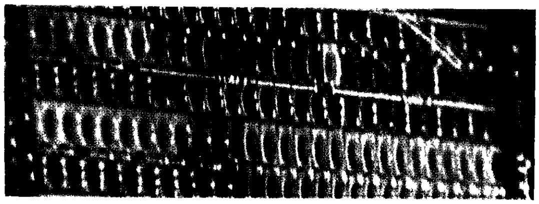
Instructions: from 19 to 161

Library routines: up to "over 500" routines

[Please turn to page 20]

58 FACTS PROVE THE MC-5800 OBSOLETES EVERY OTHER ANALOG COMPUTER MADE

solves problems faster, more accurately, and at less cost!



The MC-5800 provides FASTER answers

1. Selection of real-time, expanded-time or high-speed compressed-time without reprogramming.

2. Real-time precision @ speeds to 60 solutions/sec.

3. Dynamic memory with time-base accuracy of ± 10 μsec provides automatic parameter searching by iteration—an exclusive capability.

4. It programs 134 amplifiers, 30 electronic multipliers, 18 diode function generators, 2 time-delay generators, 8 relay amplifiers, and 6 servos from one 2128-hole patchboard.

5. Unique automatic problem check checks problem-board patching in seconds and can record errors.

6. Exclusive electronic generators of the function of two-or-more variables may be programmed at patchboard in same time required for setup of single-variable generators.

7. Complete control of all amplifiers, multipliers, dividers, and non-linear equipment at patchboard.

8. Quick overload recovery in less than 1 sec.

9. It is the only computer offering card-programmed diode function generators.

The MC-5800 performs MORE ACCURATELY

10. Amplifiers provide lowest noise level output—less than one millivolt at unity gain.

11. Greatest distortion-free amplifier output—30 mils at $\pm$ 120 V—only 12 mils quiescent drain.

12. Lowest amplifier grid-current $< 10^{-9}$ ampere.

13. Stable amplifier operation over the entire feedback range from zero to infinity.

14. Drift < 50 μv in 8 hours in summing mode.

15. Amplifier frequency response—flat to 10,000 cps and only 3 db down at 28 kc.

16. Only diode function generators utilizing resistors, potentiometers, and diodes of equal quality to those in computing networks.

17. Only diode function generators with individual hi-lo gain positions for *each* segment.

18. Lowest function generator drift < 5 mv/8 hrs.

19. Highest servo multiplier accuracy, $\pm 0.008\%$.

20. Only fully shielded patch *bay* and patchboard.

21. All contacts in patching system gold-plated.

22. Highest performance electronic multiplier—flat to 10,000 cps and only 3 db down at 20 kc.

23. Only servo multipliers and resolvers with zero backlash gearing—maximum one part in 36,000.

24. DC tachometer feedback on all servos.

25. Dynamic servo error—less than 50 mv at one cps.

26. Lowest step-function overshoot—less than 1%.

27. EVERY SPECIFICATION IS GUARANTEED TO BE TRUE PERFORMANCE STANDARD—IN SUSTAINED OPERATION.

28. Highest sin-cos resolver accuracy $\pm 0.03\%$ peak-to-peak.

29. Power supplies eliminated from console—lowest, most stable operating temperatures—rise $< 3°$C.

30. Passive networks stabilized at $< 1°$C above room ambient—no oven required.

31. Servo-set pots can be set to 2 parts in 10,000.

32. Accuracy of computing networks at least 0.01%.

33. Lowest computer cross-talk—rejection greater than 2,000 to 1.

The MC-5800 can be operated at LESS COST

34. Greatest available problem capacity per dollar—by 20%.

35. Least cost for future expansion.

36. Output tube filaments operate with DC bias for maximum life.

37. Centralized overload indication for quicker trouble-shooting.

38. Only computer with hermetically sealed transformers.

39. Choppers employ double-contacts in parallel for maximum life.

40. Plug-in relays and step switches throughout for least down time.

41. Plug-in dynamic components ease maintenance.

42. Quickest trouble-shooting by automatic problem check.

43. Costliest and best patching system for lowest programming cost thru maximum reliability of patchcord connections.

44. Choppers de-energized when computer in standby for max. life.

45. Separate power-supply venting minimizes room heat load.

46. Exclusive equipment-door packaging for free access and quick maintenance *without* shutdown.

47. Insulated patchboard prevents costly shorting accidents.

48. Sealed servo gear boxes for maximum reliability.

49. Fully transistorized ADRAC system with plug-in logic modules.

50. Available on lease basis as well as for purchase.

The MC-5800 can SOLVE MORE OF YOUR PROBLEMS

51. Exclusive dynamic memory makes automatic iterative solution of statistical or optimization problems a reality.

52. Dynamic memory + high-speed quick-reset rep-op provide practical approach to solution of simultaneous partial differential equations.

53. Exclusive bi-variable function generators can also be used as amplifiers, multipliers, or generators of single-variable functions.

54. More computer capacity per dollar means more solutions.

55. Solution of problems with up to 15 amplifiers in closed loops.

56. Starting with as few as ten amplifiers, at a cost of little more than the cheapest available computer, you can build to a complete computing center of unsurpassed performance.

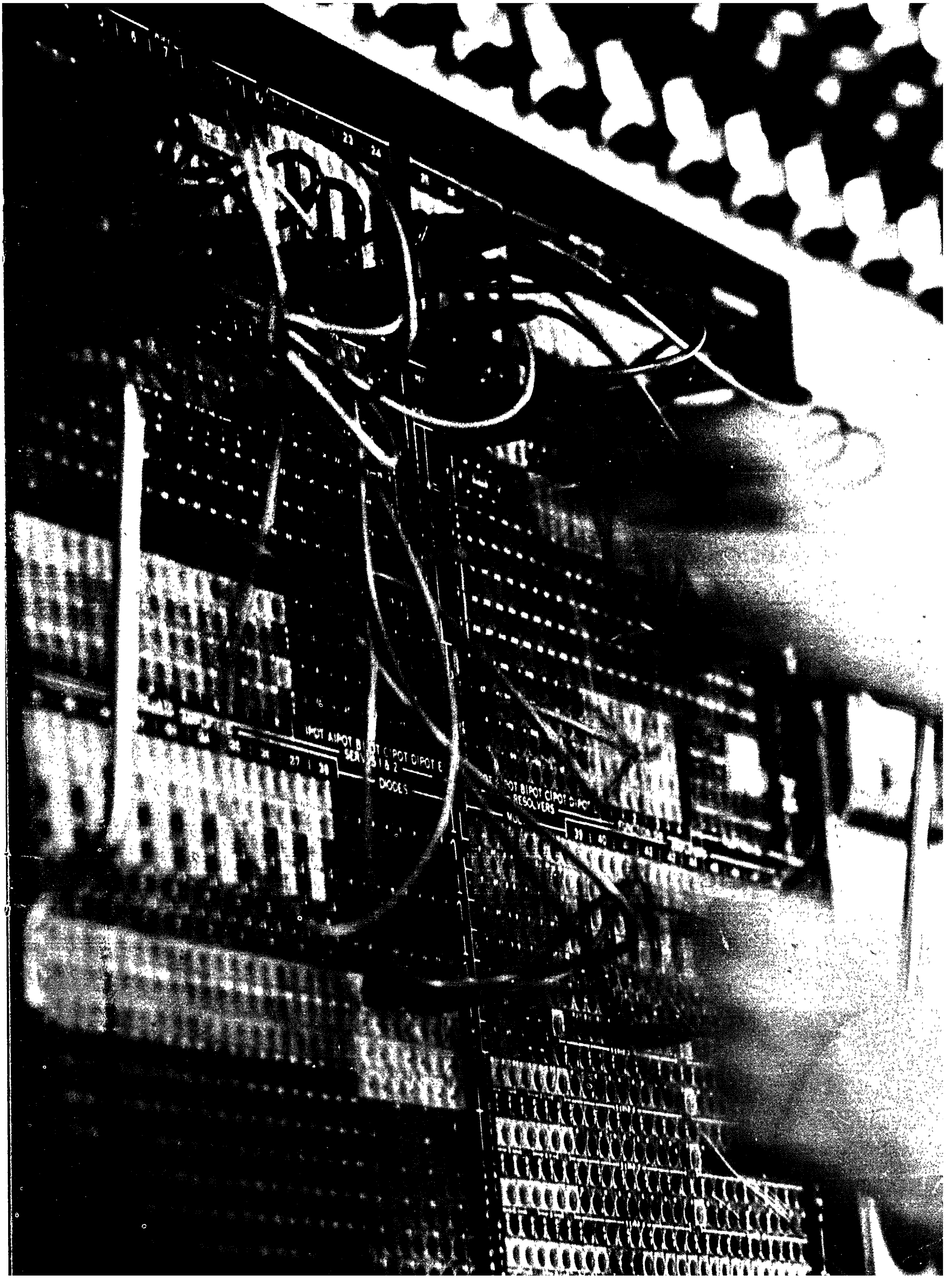
57. Add-on capacity up to 134 amplifiers, 30 electronic multipliers, 18 diode function generators, 2 time-delay generators, 8 relays with amplifiers, 4 bi-variable function generators, 6 servos, 8 function switches—all field-expandable without mechanical rework or rewiring.

58. Add-on features include automatic problem check, integrator rate test, high-speed repetitive operation, dynamic memory, expanded-time base, compressed-time base, servo-set potentiometers, and ADRAC (Automatic Digital Recording and Control) system—all field expandable without mechanical rework or rewiring.

There are over 100 more facts—let us tell you about them in person, or better still, visit our factory—and see for yourself!

COMPUTER SYSTEMS, INC., 611 Broadway, New York 12, N.Y. • SPring 7-4016

A Schlumberger Subsidiary • formerly Mid-Century Instrumatic Corp.


DIODES
RESOLVERS
SERVOS 1 & 2

Survey of Commercial Computers

[Continued from page 17]

In-out speed: from about 1 machine word per second to about 125,000 machine words per second

Automatic (or partially automatic) *checking* is present in about 90% of computers.

Operating ratio ranges from 95% to 99%

Sale price ranges from about $15,000 to about 6 million dollars

To understand the individual summaries, the reply form used in the survey should be examined:

REPLY FORM (may be copied on any piece of paper)

1. Name of Digital Computer or Data Processor: ....
2. Typical field(s) of application: ( )Scientific ( )Business ( )Real-time ( )Not real-time ( )Other (please describe) ....
3. Numerical System: a. Number of characters per machine word: ....
   b. Number of bits (binary digits of information) per character: ....
4. Memory: a. Number of registers of rapid memory (for example, magnetic cores): ....
   b. Time of access to rapid memory, in microseconds: ....
   c. Number of registers of slow memory (for example, magnetic tape): ....
5. Arithmetic Unit: a. Time for a complete addition, in microseconds: ....
   b. Time for a complete multiplication, in microseconds: ....
   c. Time for a complete division, in microseconds: ....
6. Programming: a. Number of different kinds of machine instructions: ....
   b. Approximate number of different library routines available: ....
7. Input-Output: a. Machine words in or out, per second, maximum: ....
   b. Ability to calculate during input-output? ( )Yes ( )No
8. Reliability: a. Automatic checking? ( )Yes ( )No
   b. Typical operating percent (good time DIVIDED BY attempted-to-run time): ....%
9. Price Range: a. One-sum: between $.......... and $..........
   b. Monthly Rental: between $.......... and $..........
10. Sales: a. Number sold or rented: ....;
    b. Number on order: ....
11. Any remarks? ....

Filled in by .... Title..........

Organization ....

Address ....

Please return this form when filled in to Neil Macdonald, Assistant Editor, **Computers and Automation,** 815 Washington St., Newtonville 60, Mass.

Roster of Digital Computers

ALWAC III-E / for scientific, and business problems; numerical control of machine tools; production control; real-time and other / NUM SYS: 8 numeric or 5 alphabetic char per mach word; 4 bits per char / RPD MEM: 128 reg; 4 ms access / MED MEM: 8,192 reg / SLOW MEM: 16 magn tape units — 7,168,000 reg / ADN: 500 us / MULT: 0.5 to 17.0 ms / DIV: 0.5 to 17.0 ms / PRGMG: 128 instruc; 50 library routines / IN-OUT: 603 mach words per sec; simultaneous calculating / RELIAB: has autom checking; operg ratio, 96% (as reported by over 30 installations) / sale, $64,950 to $500,000; rent, $2,000 to $16,000 / sold or rented 38 / Alwac Computer Div., El-Tronics, Inc., 13040 S. Cerise Ave., Hawthorne, Calif. / *C 58

Bendix G-15 / scientific; real-time; business; on-line control; etc. / NUM SYS: 7 or 14 dec digits per mach word; 4 bits per char / RPD MEM: 4 fast access recirculating drum registers plus 2160 words of regular drum storage: 0.54 ms access time to drum can usually be eliminated through use of fast access coding facilities / SLOW MEM: 4 magnetic tape units, 1,200,000 reg per unit / ADN: 0.27 ms to 0.54 ms / MULT: 2.16 to 32.8 ms (arbitrary precision) / DIV: 2.16 to 32.8 ms (arbitrary precision) / PRGMG: 50 (up to 1300 variations) mach instruc; over 500 library routines / IN-OUT: over 3600 mach words per sec; simultaneous calculating / RELIAB: automatic checking by programmed checks only; operg ratio, 96.5% / sale, $49,500 and up; rent, $1,485 and up / sold or rented, 260 / Bendix Computer Division, 5630 Arbor Vitae St.; Los Angeles 45, Calif. / *C 59

Burroughs 205 / for scientific and business problems; real-time and other / NUM SYS: 11 char per mach word; 4 bits per char / RPD MEM: 4,080 word drum, 850 us access / SLOW MEM: tape, 200 million reg / ADN: 1.85 ms / MULT: 8.3 ms / DIV: 10 ms / PRGMG: 71 instruc / IN-OUT: 600 mach words per sec (tape); simultaneous calculating / RELIAB: has autom checking; operg ratio 98% / sale, $150,000 to $350,000; rent, $4,300 to $9,000 / sold or rented, 100; on order, not released / ElectraData Div. of Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif. / *C 58

Burroughs 220 / for scientific and business problems; real-time and other / NUM SYS: 11 char per mach word; 4 bits per char / RPD MEM: cores, 2,000 to 10,000 words, 10 us access / SLOW MEM: 55 million words (max) / ADN: 185 us / MULT: 2.1 ms / DIV: 4.0 ms / PRGMG: 94 instruc / IN-OUT: 2400 mach words per sec (magn tape); simultaneous calculating / RELIAB: has autom checking / sale, $250,000 to $800,000; rent, $7800 to $20,000 / first deliveries made in Oct. 1958 / ElectroData Div. of Burroughs Corp., 460 Sierra Madre Villa, Pasadena, Calif. / *C 58

CLARY DE-60 / scientific, business, real-time / NUM SYS: 18 char and sign per mach word; 4 bits per char / RPD MEM: 32 reg; 8.5 us access / SLOW MEM: paper tape / ADN: 3 ms / MULT: 160 ms / DIV: 140 ms / PRGMG: 36 instruc; 60 library routines / IN-OUT: 1 mach word per sec; no simultaneous calculating / RELIAB: no autom checking;

operg ratio, 97.5% / sale, $15,000 to $23,000; rent, $450 to $690 / sold or rented, 4; on order, 5 / Transistorized; Power, 115V, 1.3A; portable; no cooling required. Storage may be increased to 160 words / Clary Corp., 408 Junipero St., San Gabriel, Calif. / *C 59

Control Data 1604 / scientific, business / NUM SYS: 48 bits per mach word / RPD MEM: 2.2 us access, 6.4 us cycle / SLOW MEM: 6,000,000 char per tape, 4 to 24 tapes, variable block length / ADN: 7.2 us including access time / MULT: 44.4 us aver / DIV: 65.2 us aver / PRGMG: 62 mach instruc, plus many subinstructions; library routines under preparation / IN-OUT: 50,000 mach words per sec; simultaneous calculating / RELIAB: automatic checking by programming; operg ratio, "high" / sale, $700,000 to $1,085,000 / on order, several; first deliveries, fall 1959 / Control Data Corp., 501 Park Ave., Minneapolis 15, Minn. / *C 59

Datamatic 1000 / for business and scientific problems; not real-time / NUM SYS: 12 decimal digits or 8 alphanumeric char (or combns) per mach word / RPD MEM: cores, 2000 registers, adnl 2000 registers optional, 10 us access / SLOW MEM: 3,100,000 words per tape reel, and up to 100 tape units may be directly connected to Central Processor / ADN: 232 us / MULT: 1 ms / DIV: .89 to 3.75 ms / PRGMG: 33 instruc (67 variations), many library routines / IN-OUT: 10,000 mach words per sec, simultaneous calculating / RELIAB: has autom checking plus immediate automatic correcting ("ORTHOTRONIC CONTROL"); operg ratio, 95% / sale $1,523,000 and up; rent $32,225 and up / sold or rented 6, on order 4; also one in operation as a Service Bureau in Boston / Orthotronic Control mentioned above provides for *immediate automatic* correction of errors as they are detected /DATAmatic Div, Minneapolis-Honeywell Reg Co, 151 Needham St., Newton Highlands 61, Mass. / *C 59

DISTRIBUTAPE / business / NUM SYS: 11 digits or 38 bits per word / RPD MEM: 4 reg; 1 ms access / SLOW MEM: 1000 reg / ADN: 1 ms / PRGMG: 6 instruc / IN: 17 mach words per sec; OUT: 3 mach words per sec; no simultaneous calculating / RELIAB: has autom checking; operg ratio, 97% / sale, $35,000 / sold, 1; on order, 1 / Special purpose business computer designed to summarize at high speed data recorded in punched paper tape / Monroe Calculating Machine Co., Inc., a Division of Litton Industries, Orange, N.J. / *C 59

GE-150 Data Processing System / business / NUM SYS: sign and 6 or sign and 12 char per mach word; binary coded decimal, 4 bits per char / RPD MEM: 4000 to 8000 reg; 64 us to 96 us access / SLOW MEM: 1.6 million words per reel up to 13 reels / ADN: 192 us / MULT: 710 us / DIV: 1360 us / PRGMG: 117 mach instruc, extensive library routines / IN-OUT: 55,000 char per sec, simultaneous calculating / RELIAB: has autom checking / sale, $788,600 to $1,220,500; rent, $16,420 to $22,370 / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-250 Information Searching Selector / information storage and retrieval in all aspects, business, industry, government, science / NUM SYS: variable char per mach word / OPERNS: automatically reviews and compares 15,000 characters per second — 50 to 100 abstracts per second; up to 10 unrelated inquiries can be searched simultaneously / IN-OUT: simultaneous calculating / RELIAB: automatic checking / sale, $100,000 to $110,000; rent, $2000 to $2500 / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-302 Data Accumulator System / real-time / NUM SYS: variable number of char per mach word; 4 pure binary bits per char / RPD MEM: 30 us access, wired direct to drum / ADN: 30 to 120 us per char / PRGMG: wired instruc / IN-OUT: simultaneous calculating / RELIAB: has automatic checking; operating ratio 99% per 5,000 hours / sale, $50,000 to $100,000 / Special industrial system / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-309 Gage Logging System / NUM SYS: binary coded decimal, 4 bits per char / RPD MEM: 8 reg; 4 us access / SLOW MEM: none / ADN: 10 us / OUT: 10 mach words per sec; simultaneous calculating / RELIAB: no automatic checking / sale, $25,000 to $50,000 / Special industrial system / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-310 Data Acquisition System / offline logging / NUM SYS: 4 bits per char / PRGMG: 10 instruc, pin board / IN-OUT: 10 char per sec / sale, $35,000 to $100,000 / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-311 Process Computing System / NUM SYS: 5 char per mach word; 4 bits per char / RPD MEM: 1024 reg, 10 us or 800 us access / SLOW MEM:

20,000 words / ADN: 100 us / MULT: 500 to 2500 us / DIV: 3500 us / PRGMG: 80 instruc, 15 library routines / IN-OUT: 200 char per sec in, 60 char per sec out; simultaneous calculating / RELIAB: has automatic checking; operating ratio 99% / sale, $100,000 to $400,000 / Includes input data multiplexer, A-D converter, punched tape in/out, logging typewriters / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

GE-312 Control Computer System / NUM SYS: 5 char per mach word; 4 bits per char / RPD MEM: 1024 reg, 10 us or 800 us access / SLOW MEM: 20,000 words / ADN: 100 us / MULT: 500 to 2500 us / DIV: 3500 us / PRGMG: 80 instruc, 15 library routines / IN-OUT: 200 char per sec in, 60 char per sec out; simultaneous calculating / RELIAB: has automatic checking; operating ratio 99% / sale, $150,000 to $500,000 / Includes input data multiplexers, A-D converters, D-A converter, punched tape in/out, digital displays / General Electric Co., Computer Dept., Phoenix, Ariz. / *C 59

Honeywell 800 / scientific, not real-time, business / NUM SYS: 12 decimal digits or 8 alphanumeric characters per mach word; 4 bits per decimal digit; 6 bits per alphab char / RPD MEM: basic 4096 words, expandable to 16,384 words; 6 ms access / SLOW MEM: up to 64 mag tape units on line / ADN: 24 us / MULT: 150 us / DIV: 312 us / PRGMG: 52 basic instruc, many variations; many library routines / IN-OUT: 8000 mach words per second per tape unit; can simultaneously read from 8 drives and write on 8 drives, thus providing maximum transfer rate of 128,000 words per second; simultaneous calculating / RELIAB: automatic checking; automatic error correction (Orthotronic feature); operg ratio 95% / sale, $550,000 and up; rent, $11,350 and up / on order, over 15 / DATAmatic Div. of Minneapolis-Honeywell Regulator Co., 151 Needham St., Newton Highlands 61, Mass. / *C 59

IBM 650 Data Processing System / scientific, business / NUM SYS: 10 digits plus sign; 5 bits per digit (drum), 7 bits per digit (arith) / RPD MEM: 60 words core reg, 2000 to 4000 words drum reg; 96 us access / SLOW MEM: 48,000,000 digits — random access mem, max 6 mag tape units / ADN: 672 to 768 us / MULT: 2.4 to 19.6 ms / DIV: 6.2 to 23.4 ms / PRGMG: 96 instruc, 200 library routines / IN-OUT: card, 125 words per sec — 3 units; mag tape, 1174 words per sec; simultaneous calculating / RELIAB: has autom checking / sale, $182,400 to $630,900 and up; rent, $3,750 to $12,400 and up / IBM Corporation, 112 E. Post Road, White Plains, N.Y. / *C 59

IBM 704 Data Processing System / for scientific, business problems; real-time / NUM SYS: 10 char per mach word; 36 bits per word / RPD MEM: 4,096, 8,192, or 32,768 reg; 12 us access / SLOW MEM: 10 mag tape units; 16,384 words (drum) / ADN: 24 us / MULT: 240 us / DIV: 240 us / PRGMG: 86 instruc; 750 library routines / IN-OUT: 2500 mach words per sec; no simultaneous calculating / RELIAB: has autom checking / sale, $1,000,000 to $2,500,000; rent, $20,000 to $50,000 / IBM Corporation, 112 E. Post Rd., White Plains, N.Y. / *C 59

IBM 705 Data Processing System / scientific, business / NUM SYS: one char per mach word; 6 bits per char / RPD MEM: Model I: 20,000 reg; Model II: 40,000 reg; Model III: 40,000 or 80,000 reg, magn cores; access: Model I, II: 17 us; Model III: 9 us / SLOW MEM: up to 30 magn drums (60,000 char each); up to 100 magn tape units / ADN: I, II: 119 us; III: 86 us / MULT: I, II: 800 us; III: 600 us / DIV: I, II: 3.9 ms; III: 3.1 ms / PRGMG: I, II: 41 instruc; III: 47 instruc / IN-OUT: 62,500 char per sec for one tape unit; has simultaneous calculating / RELIAB: has autom checking / sale, $1,250,000 to $2,750,000; rent, $25,000 to $55,000 / International Business Machines Corp., 112 East Post Rd., White Plains, N.Y. / *C 59

IBM 709 Data Processing System / for scientific and business problems; real-time / NUM SYS: 10 char per mach word; 36 bits per char / RPD MEM: 8,192 or 32,768 reg; 12 us access / SLOW MEM: 16,384 words drum; and 48 tapes / ADN: 24 us / MULT: 24 us to 240 us / DIV: 24 us to 240 us / PRGMG: 161 instruc; 750 library routines / IN-OUT: 2500 mach words per sec; simultaneous calculating / RELIAB: has autom checking / sale, $1,750,000 to $3,750,000; rent, $35,000 to $75,000 / IBM Corporation, 112 E. Post Rd., White Plains, N.Y. / *C 59

[To be continued in the February issue]

Readers' and Editor's Forum

[Continued from page 6]

we have the motivation and the means for permanent colonies on the moon and other planets, and hence space travel, communications, and trade on an interplanetary basis. . . .

Increasing the nation's brain power is more urgent for our national position and for the welfare of civilization than space conquest. We should, of course, do both, but in the end, improving human brain power by education and extending man's intellect by machine will buy us more benefits in social as well as scientific advance than concentration on any other one field. . . .

New systems of education in the future will involve a partnership between a human teacher and a vast array of teaching aids. Just as a physician can be more effective in diagnosis and cure if he is backed up by X-rays, electrocardiograph machines, and good hospitals and clinics, so can a human teacher provide better education if aided to the fullest by potential engineering advances. Machines that are now technically feasible are well beyond books, blackboards, and even closed-loop television. These new machines can present information in ways that are automatically modified as the machine discovers by steady testing whether or not the student understands the material being presented.

Intellectronics could make possible a more rapid diagnosis of what is bothering the student, take care of presenting routine material, record student progress, assist the student in understanding, memorizing, exploring, and general learning, thus properly leaving the more difficult intellectual tasks of teaching for the professional teacher.

Nothing will do more in the coming years to elevate the teacher's position in society and his effectiveness in making important contributions to our way of life than to be relieved of the less intellectual tasks which electronics can do just as well or better. . . .

A Common Language to Program Computers for Business Problems

[Continued from page 9]

in the program and announced their wish to use such a Common Business Language as soon as it becomes available. Two groups from Great Britain, one representing six manufacturers and the other a group of government users, have also indicated their interest and a desire to participate.

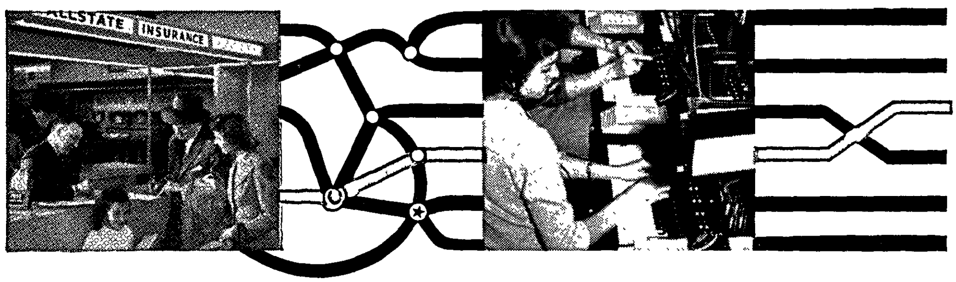
We earnestly solicit advice, assistance, and ideas from all persons who have an interest in this problem. We ask that you communicate with us either through the chairman of the Executive Committee or through one of the chairmen of the task groups.

With so much interest already generated on this problem, on the part of users and manufacturers, and with the impelling need which we have in Government, I feel very optimistic that real progress is being made and will continue to be made towards our ultimate goal of an effective Common Business Language.

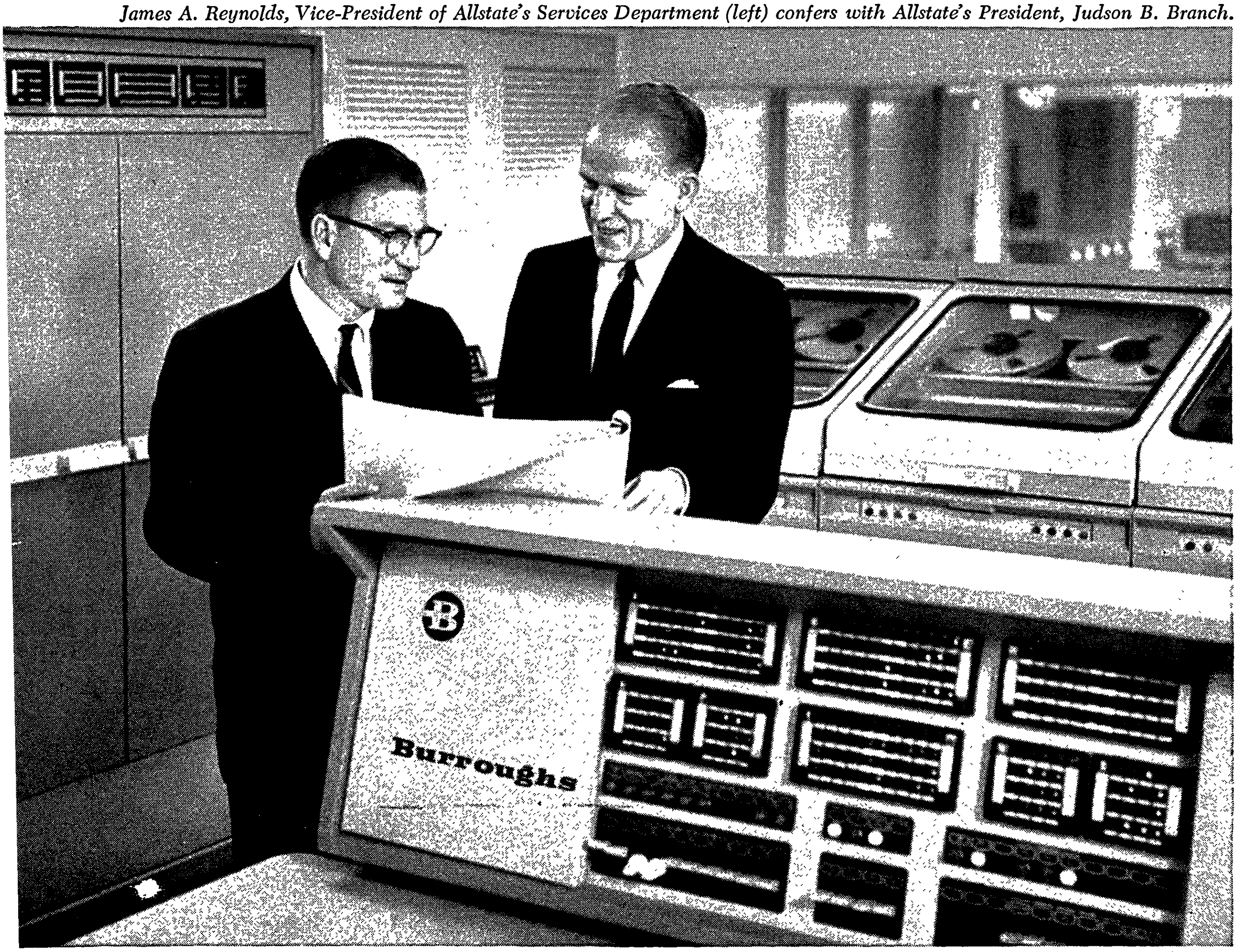
A Statement from Allstate Insurance Company:

"We bought our first Burroughs computer in 1954, now own seven, and have more on order... these are big reasons why Allstate will continue to offer speedier customer service at low cost."

JUDSON B. BRANCH, *President of Allstate Insurance Companies*



James A. Reynolds, Vice-President of Allstate's Services Department (left) confers with Allstate's President, Judson B. Branch.



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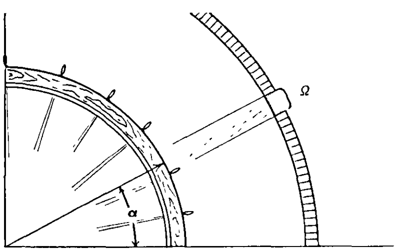

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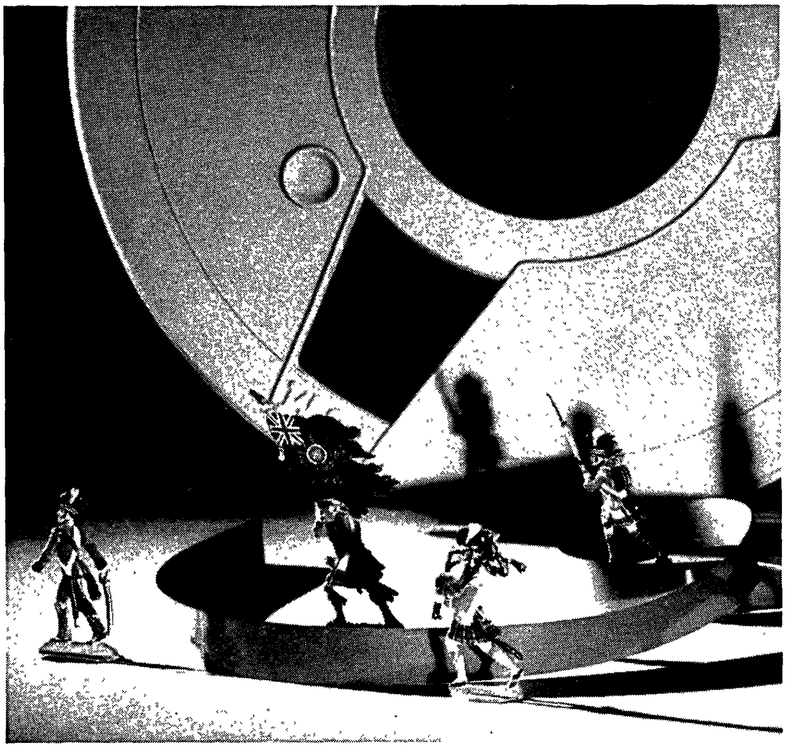
Wight, R. M., "Automatic Classification of Plant Varieties by Computer" (in Readers' and Editor's Forum), 8/4 (Apr.), 16
Wilkes, M. V., "The International Conference on Information Processing Held in Paris by Unesco, June 15-20, 1959 — Brief Report," 8/9 (Sept.), 9
"Working Group on Socially Desirable Applications of Computers" (in Readers' and Editor's Forum), 8/10 (Oct.), 6
Worsley, Beatrice H., "Blueprint for a Library," 8/4 (Apr.), 17

X: X-Ray "Computer Works With X-Ray for Quality Control of Steel" (in Readers' and Editor's Forum), 8/4 (Apr.), 16

Z: Zeidler, H. M., "1960 Western Joint Computer Conference — Invitation for Papers" (in Readers' and Editor's Forum), 8/10 (Oct.), 30



SURVEY OF RECENT ARTICLES

Moses M. Berlin

Cambridge, Mass.

We publish here a survey of articles related to computers and data processors, and their applications and implications, occurring in certain magazines. We seek to cover at least the following magazines:

- Automatic Control
- Automation
- Automation and Automatic Equipment News (British)
- Business Week
- Control Engineering
- Datamation
- Electronic Design
- Electronics
- Harvard Business Review
- Industrial Research
- Instruments and Control Systems
- ISA Journal
- Proceedings of the IRE
- The Office
- Scientific American

The purpose of this type of reference information is to help anybody interested in computers find articles of particular relation to this field in these magazines.

For each article, we shall publish: the title of the article / the name of the author(s) / the magazine and issue where it appears / the publisher's name and address / two or three sentences telling what the article is about.

PILOT — A New Multiple Computer System / A. L. Leiner, W. A. Notz, J. L. Smith, and A. Weinberger, Nat'l. Bureau of Standards, Wash., D. C. / Journal of the Assn. for Computing Machinery, vol. 6, no. 3, July, 1959, pp 313-35 / Assn. for Computing Machinery, 2 East 63 St., New York 21, N. Y.

The PILOT data processing system contains three interconnected computers and multiple input-output channels. These units operate concurrently, providing rapid data processing, and rapid transfer into and out of the system. A descriptive summary of the characteristics of the three computers is given, with a discussion of the over-all logical plan of the system.

Testing High-Speed Digital Computer Circuits / R. G. Norquist, Staff Res. Engineer, Denver Res. Institute, U. of Denver, Denver, Colo. / Electronics, vol. 32, no. 29, July 17, 1959, p 50 / McGraw-Hill Pub. Co., Inc., 330 West 42 St., New York 36, N. Y.

This article presents a convenient way to check out an automatic computer, or other high-speed digital equipment. The procedure allows for any one of more than 65,000 sixteen-bit words to be selected and fed in at the rate of 10mc.

A Comparison of Methods for Generating Normal Deviates on Digital Computers / M. E. Muler, Princeton U., and IBM Corp. / Journal of the Assn. for Computing Machinery, vol. 6, no. 3, July, 1959, pp 376-83 / Assn. for Computing Machinery, 2 East 63 St., New York 21, N. Y.

The purpose of this paper is to review the several methods for generating pseudo random normal deviates within a large-scale computer, including certain specific comparisons of these methods for an IBM 704. Two more recently developed techniques are reviewed, "A Direct Approach," and "An Inverse Approach."

Applying the Digital Computer to Open-Hearth Operations / Engineering Staff, GPE Controls, Inc., / Control Engineering, vol. 6, no. 8, August, 1959, pp 94-100 / McGraw-Hill Pub. Co., Inc., 330 West 42 St., New York 36, N.Y.

This is an engineering proposal to apply a digital computer and its automatic control instruments to the steel industry's open-hearth furnace operations. Such an application will bring the steel industry closer to "closed-loop" controls, while other industries may be able to apply the system to "close the loop" at the present time. Computer input, output, data scanning and logging, heat cycle logging, routine furnace program, and heat cycle program, are some of the aspects described.

The Information Machine / D. N. Chorafas, IBM World Trade Service Corp., Paris / Systems & Procedures, vol. 10, no. 3, Aug., 1959, pp 30-5 / S. & P. Assn., 4463 Penobscot Bldg., Detroit 26, Mich.

"Man is essentially an information machine," and if he uses the computer to supplement his memory and calculation capacities, he will greatly increase his ability to plan and control. Business data processing, a real-time system and some small industrial applications, are covered in this article.

Installation of a 305 RAMAC / R. M. Anderson, Mgr., Systems and Procedures, Carter Carburetor Div., ACF Industries, Inc. / Systems & Procedures, vol. 10, no. 3, Aug., 1959, pp 22-9 / S. & P. Assn., 4463 Penobscot Bldg., Detroit 26, Mich.

A feasibility study is part of an initial approach to computer use. The study consists of hardware evaluation, economic consideration, and adaptability. This article discusses a company's use of the above, and relates some of its experiences with electronic data processing.

750,000 Policies on a Computer / P. M. Hunt / Automatic Data Processing, vol. 1, no. 6, July, 1959, p 36 / Business Publications Ltd., 180 Fleet St., London, EC 4.

A computer is used by an insurance company to handle such matters as premium billing and collection, settlement payments, certain transactions including policy loans, claims and reinstatements. These and other applications are discussed.

Ninety Percent of Computer Users are Satisfied / Automatic Data Processing, vol. 1, no. 6, July, 1959, p 41 / Business Publications Ltd., 180 Fleet St., London, EC 4, England.

The result of a survey of the U. S. business world by the research department of John Diebold & Associates, is presented in this report. The report thoroughly discusses a number of factors which determine the success or failure of computer installations.

Unnormalized Floating Point Arithmetic / R. L. Ashenhurst and N. Metropolis, University of Chicago, Chicago, Ill. / Journal of the Assn. for Computing Machinery, vol. 6, no. 3, July, 1959, pp 415-428 / Assn. for Computing Machinery, 2 East 63 St., New York 21, N. Y.

This article describes algorithms for floating point computer arithmetic, in which fractional parts are not subject to the usual normalized convention. The algorithms give results in a form which provides some indication of their degree of precision. An attempt is made to develop rules which lead to a more favorable situation with regard to error propagation.

Soviet Equipment Design / J. M. Carroll, Managing Editor, Electronics / Electronics, vol. 32, no. 30, July 24, 1959, p 37 / McGraw-Hill Publg. Co., Inc., 330 West 42 St., New York 36, N. Y.

Among the industrial and consumer units on display at the Soviet exhibition in New York is a transistorized analog computer. One of the computer's 24 operational amplifiers is shown in a diagram accompanying a description of the computer, and other electronic devices.

Management Games Using Punched Cards and Computers / Clifford J. Craft / Punched Card Data Processing, vol. 1, no. 6, Sept.-Oct., 1959, p 17 / Gille Associates, Inc., 956 Maccabees Bldg., Detroit 2, Mich.

The role of the computer in simulation games is discussed in this article, which points out the advantages to be gained in simulation with data processing. Some of the pitfalls are mentioned.

NEW PATENTS

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

THE following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the United States Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington 25, D.C., at a cost of 25 cents each.

August 18, 1959: 2,900,134 / Floyd G. Steele, Manhattan Beach, and William F. Collison, Walteria, Calif. / Northrop Corp., a corp. of Calif. / A digital differential analyzer.

2,900,135 / Reno B. Benaglio, Birmingham, Jack M. Patterson, Berkeley, and Charles A. Piper, Detroit, Mich. / Bendix Aviation Corp., a corp. of Del. / A digital differential analyzer.

2,900,136 / Kenneth B. Tuttle, Playa Del Ray, and Lee C. Keene, Palos Verdes Estates, Calif. / Northrop Corp., Hawthorne, Calif. / An electronic computer for solving polynominals.

2,900,137 / Samuel Giser, Sharon, Mass. / Research Corp., New York, N.Y. / An electronic multiplier for four quadrant multiplication of two variables.

2,900,458 / Eugene Rawdin, Levittown, Pa. / U.S.A. as represented by the Sec. of the Air Force / A method of eliminating scaling errors in analog computation.

2,900,572 / John Harold Lucas, Caterham, and Kenneth Leslie Smith, Oysington, Eng. / Powers-Samas Accounting Machines Lim., London, Eng. / An electronic storage and data routing apparatus.

2,900,623 / Milton Rosenberg, Santa Monica, Calif. / Telemeter Magnetics, Inc., a corp. of Calif. / A magnetic core memory system.

2,900,624 / Raymond Stuart-Williams, Pacific Palisades, and Milton Rosenberg, Santa Monica, Calif. / Telemeter Magnetics, Inc., a corp. of Calif. / A magnetic memory device.

August 25, 1959: 2,901,166 / Francis E. Hamilton, Binghamton, and George V. Hawkins, Robert Lawheed, Jr., and Ernest S. Hughes, Jr., Vestal, N.Y. / International Business Machines Corp., New York, N.Y. / magnetic drum digital computer.

2,901,168 / Warren P. Burrell and Arnold A. Cohen, Minneapolis, and George A. Hardenbergh, St. Paul, Minn. / International Business Machines Corp., New York, N.Y. / A digital data circuit system.

2,901,169 / Jean Cauboue, Les Pavillons-sous-Bois, and Claude J. Gergaud, Vanves, France / International Business Machines Corp., New York, N.Y. / A variable radix counter.

2,901,172 / Robert E. Thomas, Walnut Creek, Calif. / U.S.A. as represented by the U.S. Atomic Energy Commission / An electronic multiplier circuit.

2,901,549 / Robert Serrell, Princeton, N.J. / Radio Corp. of America, a corp. of Del. / A magnetic recording system.

2,901,602 / Elmer L. Younker, Madison, N.J. / Bell Telephone Lab., Inc., New York, N.Y. / A binary half adder.

2,901,663 / Searle G. Nevius, Tujunga, Calif. / Telecomputing Corp., North Hollywood, Calif. / An electronic digitizing device.

2,901,730 / William A. Goddard, Los Gatos, Calif. / International Business Machines Corp., New York, N.Y. / A digital data storage apparatus.

2,901,737 / John Reed Stovall, Jr., Mount Airy, Pa. / Sperry Rand Corp., New York, N.Y. / A corp. of Del. / A disk recording compensating device.

Sept. 1, 1959: 2,902,217 / George M. Davis, Golders Green, London, Eng. / National Research Development Corp., London, Eng. / A control gating means for a digital computer.

2,902,218 / Maurice A. Meyer, Natick, Mass. / Laboratory for Electronics, Inc., Boston, Mass. / A multiplier employing amplitude modulation.

2,902,219 / Richard H. Wilcox, Washington, D.C. / — / An electronic multiplier data processing circuit.

2,902,674 / Theodore E. Billings, Ithaca, N.Y., Charles P. Keshler, Jr., Framingham, Mass., and Harvey W. Wainwright, Clinton, N.Y. / General Electric Co., a corp. of N.Y. / A transistor memory circuit.

2,902,676 / Edgar Alan Brown, Vestal, N.Y. / International Business Machines Corp., New York, N.Y. / A non-destructive sensing of magnetic cores.

2,902,677 / Richard G. Counihan, Poughkeepsie, N.Y. / International Business Machines Corp., New York, N.Y. / A magnetic core current driver.

2,902,678 / Walter F. Kosonocky, Newark, N.J. / Radio Corp. of America, a corp. of Del. / A magnetic switching system.

2,902,679 / William J. DePhillipo, Philadelphia, Pa., and Kun Li Chien, Fullerton, Calif. / Radio Corp. of America, a corp. of Del. / An information translating system.

September 8, 1959: 2,903,523 / Hershel Toomin, North Hollywood, and George H. Hare, Pasadena, Calif. / Beckman Instruments, Inc., Pasadena, Calif. / A bidirectional zero adjustment circuit for producing an output signal as a function of an input signal.

2,903,605 / Kay H. Barney, Roslyn

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

Bendix Products Div., 401 No. Bendix Dr., So. Bend, Inc. / Page 31 / MacManus, John & Adams, Inc.

Broadview Research Corp., 1811 Trousdale Dr., Burlingame, Calif. / Page 21 / L. C. Cole Co., Inc.

Burr & Co., Box 122, Wellesley Hills 81, Mass. / Page 29 / —

C. P. Clare & Co., 3101 Pratt Blvd., Chicago 45, Ill. / Page 23 / Reincke, Meyer & Finn

Computer Systems, Inc., 611 Broadway, New York 12, N.Y. / Pages 18, 19 / Smith, Winters, Mabuchi, Inc.

ElectroData, Div. of Burroughs Corp., 460 No. Sierra Madre Villa, Pasadena, Calif. / Pages 24, 25 / Carson Roberts Inc.

Hughes Products, Industrial Systems Div., International Airport Station, Los Angeles 45, Calif. / Page 36 / Foote, Cone & Belding

Norden Div., United Aircraft Corp., Data Systems Dept., 13210 Crenshaw Blvd., Gardena, Calif. / Page 22 / Claude D. Graham Advertising

Philco Corp., Government & Industrial Div., 4700 Wissahickon Ave., Philadelphia 44, Pa. / Page 3 / Maxwell Associates, Inc.

Radio Corp. of America, Electronic Data Processing Div., Camden 2, N.J. / Page 35 / Al Paul Lefton Co., Inc.

System Development Corp., 2406 Colorado Ave., Santa Monica, Calif. / Page 2 / Stromberger, LaVene, McKenzie

Technical Operations, Inc., 3520 Prospect St., N.W., Washington 7, D.C. / Page 32 / Dawson MacLeod & Stivers

Technical Operations, Inc., 305 Webster St., Monterey, Calif. / Page 33 / Dawson MacLeod & Stivers

Heights, N.Y., and Lawrence Greenspan, San Diego, Calif. / Sperry Rand Corp., a corp. of Del. / An extended gate generating circuit.

2,903,606 / Daniel L. Curtis, Manhattan Beach, Calif. / Hughes Aircraft Co., Culver City, Calif. / A logical decision circuitry for digital computation.

2,903,607 / Frederick G. Danner, Glen Oaks, and Gene C. Browne, North Amityville, N.Y. / Sperry Rand Corp., a corp. of Del. / A flip-flop resetting circuit.

September 15, 1959: 2,904,253 / Edward G. Schwarm and Carrol L. Duren, Binghampton, N.Y. / Link Aviation, Inc., Binghamton, N.Y. / A servo multiplier having reduced error.

2,904,706 / John Romanelli, Fullerton, Calif. / Hughes Aircraft Co., Culver City, Calif. / A pulse forming network.

2,904,752 / William Perzley, Hi-Nella, N.J. / Kaiser Metal Products, Inc., Oakland, Calif. / A timing system for providing a pulse delayed by a predetermined interval with respect to a reference pulse.

2,904,776 / Glyn A. Neff, Pasadena, Calif. / An information storage system / Consolidated Electrodynamics Corp., Pasadena, Calif.

2,904,777 / Bonnar Cox and Jacob Goldberg, Palo Alto, Calif. / General Electric Co., New York, N.Y. / A magnetic tape reading system.

2,904,778 / Donald Adams Weir, London, Eng. / International Standard Electric Corp., New York, N.Y. / An intelligence storage system.

2,904,779 / Louis A. Russell, Poughkeepsie, N.Y. / International Business Machines Corp., New York, N.Y. / A magnetic core transfer circuit.

2,904,780 / Albert J. Meyerhoff, Wynnewood, Pa. / Burroughs Corp., Detroit, Mich. / A logic solving magnetic core circuit.

September 22, 1959: 2,905,299 / William J. Hildebrandt, Simsbury, Conn. / Underwood Corp., New York, N.Y. / A data recording device or devices and programming means therefor.

2,905,383 / George B. Bruce, Jr., Poughkeepsie, N.Y. / International Business Machines Corp., New York, N.Y. / A circuit for testing the state of a multiorder register of a predetermined radix for determining the presence of a zero state therein.

2,905,384 / David J. Green, Pacific Palisades, Calif. / Gilfillan Bros., Inc., Los Angeles, Calif. / A carrier-modulating function generator with adaption for simultaneous multiplication.

2,905,385 / George L. Larse, Van Nuys, Calif. / Lockheed Aircraft Corp., Burbank, Calif. / A ratio computer having an unbalancing circuit in the feedback loop.

2,905,520 / Ralph A. Anderson, Deerfield, Ill. / Information Systems, Inc., Skokie, Ill. / Apparatus for monitoring and recording data on a number of variables.

new improved "Memo-Scope"® oscilloscope

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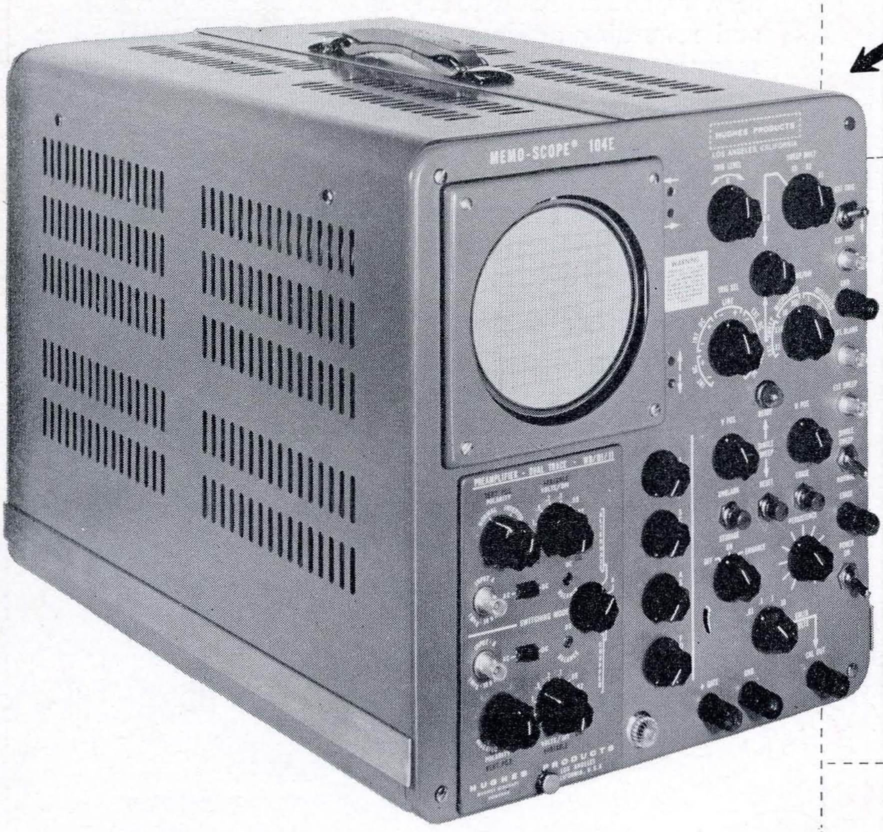

The Hughes "Memo-Scope" oscilloscope (Model 104E) stores nonrepetitive events for an indefinite period—hours, or days—keeping them available for thorough study until intentionally erased.

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- Semiconductor testing
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For complete information on the new improved Hughes "Memo-Scope" oscilloscope (Model 104E), detailed data sheets and application analysis of your transient measurement problems, write or wire: HUGHES PRODUCTS Industrial Systems Division, International Airport Station, Los Angeles 45, California

INDUSTRIAL SYSTEMS DIVISION

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